ABBREVIATIONS AND ACRONYMS

3PL	third-party logistics
AHP	analytic hierarchy process
B-BBEE	broad-based black economic empowerment
BSC	balanced scorecard
BU	business unit
CAGR	compound annual growth rate
CIF	cost, insurance and freight
CSCMP	Council of Supply Chain Management Professionals
dti	Department of Trade and Industry
ERP	enterprise resource planning
GDP	gross domestic product
GTWLS	Greater Than Warehousing & Logistics Services
ISM	interpretive structural modelling
ISO	International Organization for Standardization
IoDSA	Institute of Directors Southern Africa
IT	information technology
JIT	just-in-time
KPI	key performance indicator
MCDM	multi-criteria decision-making
NIEHS	National Institute of Environmental Health Sciences
RACI	responsible, accountable, consulted and informed
RFP	request for proposal
RSA	Republic of South Africa
SaaS	software as a system
SACD	South African Container Depots
SAP	Systems, Applications and Products
SC SS	Supply Chain Shared Services
SCOR	supply chain operations reference
SCSI	service, category of 3PL provider, strategic alignment and investment
SHE	safety, health and environment

SLA	service level agreement
SSIM	structural self-interaction matrix
SWOT	strengths, weaknesses, opportunities, and threats
TOPSIS	technique for order of preference by similarity to ideal solution
Unisa	University of South Africa
vs	versus

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF TABLES IN APPENDICES

CHAPTER 1
INTRODUCTION TO THE STUDY

1.1 BACKGROUND

"Logistics – the flow of material, information, and money between consumers and suppliers – has become a key boardroom topic. It is the subject of cover features in business publications from *The Wall Street Journal* to *BusinessWeek*. Annual global logistics expenditure exceeds $3.5 trillion, nearly 20 percent of the world's GDP [gross domestic product] making logistics perhaps the last frontier for major corporations to significantly increase shareholder and customer value." (Frazelle, 2002: fourth cover). Logistics is an important part of the economy, and consequently, of all businesses (The World Bank, 2014). This is illustrated by viewing logistics costs as a percentage of a country's GDP.

Logistics costs accounted for 11.8% of the GDP for South Africa in 2009; 11.49% in 2010; 11.0% in 2011; 11.7% in 2012; and 11.1% in 2013, followed by a steady increase in percentage of GDP in 2014 (11.2%) and 2015 (11.7%) (Havenga, Simpson, King, de Bod & Braun, 2016). The logistics costs as a percentage of GDP for South Africa for 2016 is confirmed at 11.8% (Focus on Transport and Logistics, 2018: para 2). The cost of logistics as a percentage of GDP is significant, and consequently comprises a large area of investment and spending. It is within this area, of logistics spending, that the third party logistics (3PL) provider industry operates. The logistics costs as a percentage of GDP in America have declined from nearly 20% in the 1970s, to 8.6% in 2003 (Coyle, Langley, Gibson, Novack & Bardi, 2009). With the global trend of logistics costs declining as a percentage of GDP, it was projected, however, that the global 3PL provider market would grow at a compound annual growth rate (CAGR) of 5.27% for the period 2013 to 2018. This is specifically for the Americas, Europe, the Middle East, Africa and the Asia-Pacific regions (ReportsnReports, 2012). In the light of the CAGR of the 3PL provider market and its relationship with regard to total logistics spending, the 3PL provider industry, simply put, constitutes a major business and attracts global importance (Armstrong & Associates, 2013; Sahay and Mohan, 2006). The research by Armstrong & Associates (2013) indicates that, for the period 2010 to 2012, the 3PL provider market revealed growth in all regions of the

world, except Europe. Latin America, in contrast to Europe, showed aggressive growth during the period 2010 to 2011, at 43.6%. Asia-Pacific also showed tremendous growths of 21.2% and 23.6% for the periods 2010 to 2011 and 2011 to 2012, respectively. According to the research of Armstrong & Associates (2013), the market for 3PL providers in the United States is expected to grow over the next few years. Furthermore, it is estimated that the global logistics market will reach $1,24 trillion by 2025, according to Grand View Research, Inc. (2017).

Businesses are increasingly exposed to risks which are attributable to the globalisation of markets, shorter product and technology life cycles, and the growing use of partners within the manufacturing, distribution and logistics fields (Christopher and Lee, 2004; Lloyd's, 2016). Sahay and Mohan (2006), as well as Dovetail (2016), have researched the benefits brought about by 3PL providers and found that 3PL providers facilitate the trade-off between the need to reduce overall supply chain inventory and reduced lead times, while capturing economies of scale.[1] Outsourcing to 3PL providers is aimed mainly at cost conservation by a shipper organisation (Diabat, Khreishah, Kannan, Panikar & Gunasekaran, 2013). The recent Annual Third-Party Logistics Study (Capgemini Consulting, 2014) indicated that the 3PL provider market was then competitive, and shippers reported positive results experienced when utilising 3PL providers. The results reported were:

i) cost reduction of logistics ± 11 %;

ii) inventory reduction ± 6 %; and,

iii) fixed logistics cost reduction of ± 23 % (Capgemini Consulting, 2014).

It is deduced that the positive results experienced were an indication of the benefits realised by shippers and also of the value proposition of the 3PL provider market. When shippers elect to outsource to 3PL providers, the motivation is encapsulated by the perceived benefits sought, such as variable cost reduction, inventory reduction, fixed cost reduction and improved service delivery. The

1 Factors which cause the average cost of production to fall per unit as production volume increases (The Economist, 2017).

services offered by the 3PL provider assist in realising the perceived benefits sought by shippers. The 3PL provider services typically comprise systems that deal with transportation/distribution, warehousing, inventory, orders, and information. The following three processes were found to be outsourced most frequently in the Australian services environment, in ranking order of most frequent to least frequent:

- warehouse management;
- order fulfilment; and
- fleet management (Rahman, 2011).

The top three most frequently outsourced logistics processes confirmed by Capgemini Consulting (2015) are, firstly, warehouse management, followed by transportation management and, lastly, visibility as it relates to order fulfilment. Bottani and Rizzi (2006), Farahani, Rezapour and Kardar (2011) and Capgemini Consulting (2016) describe the logistics processes associated with 3PL providers as comprising transportation, distribution, warehousing, inventory management, packaging and reverse logistics, as shown in Table 1.1. Table 1.1 lists the logistics processes and indicates the activities associated with the logistics processes.

Table 1.1: Activities associated with 3PL providers

Logistics processes	Activities
Transportation	Road, rail, sea, intermodal management, shipping, forwarding, packaging, express carrier, custom brokering, deconsolidation, perishable/hazardous goods management, freight bill payment/audit
Distribution	Order fulfilment and processing, picking, sorting, dispatching, post-production configuration, installation of products at customer's site
Warehousing	Storage, receiving, cross-docking, (de)consolidation, perishable/hazardous goods
Inventory management	Forecasting, slotting/layout design, location analysis, storage/retrieval management
Packaging	Design, labelling, assembly and packaging, palletising
Reverse logistics	Pallet flow management, recycling, reuse, remanufacturing, disposal management, repair, testing and product serving, return shipment management

Source: Bottani and Rizzi (2006), Farahani *et al.* (2011) and Capgemini Consulting (2016)

Table 1.1 serves as departure point for further discussion in the study, and reflects a suitable grouping of activities associated with the corresponding logistics process. A 3PL provider can provide a single activity in a logistics process to a shipper, or can provide a variety of activities across different logistics processes (Yang, 2014). Motivational factors in support of outsourcing to 3PL providers are grouped as economic factors, capability building or enhancement, flexibility of operations, access to sophisticated technology and reduced business risk (Rahman, 2011). Each of the five motivational factors is supported by several well-known researchers, indicated in Table 1.2.

Table 1.2: 3PL provider motivational factor research

Motivational factor	Well-known authors having researched this motivational aspect
Economic factors	Richardson (1990), Sheffi (1990), Bardi and Tracey (1991), Lieb and Randall (1996), Gooley (1997), Larson and Gammelgaard (2001) and Sahay and Mohan (2006) addressed economic factors in relation to outsourcing, such as cost savings and reduction of capital investment.
Capability building or enhancement	Rahman (2011), and other renowned authors, Sheffi (1990), Larson and Gammelgaard (2001), Sahay and Mohan (2006) and Arroyo, Gaytan and De Boer (2006), addressed capability building with regard to outsourcing to concentrate on a shipper's core business.
Flexibility of operations	Among other well-known authors, Gooley (1997), Van Laarhoven (2000), Larson and Gammelgaard (2001) addressed flexibility of operations as a motivational factor to outsourcing.
Access to sophisticated technology	Among other well-known authors in the field of access to sophisticated technology, Bhatnagar *et al*. (1999) and Arroyo *et al*. (2006) researched this aspect with regard to outsourcing.
Business risk reduction	Among other well-known authors in the field of reduced business risk as a factor to outsourcing, Lynch (2004) and Arroyo *et al*. (2006) researched reduced risk as a motivational factor to outsourcing.

The research, based on the motivational factors in support of outsourcing (Table 1.2), indicates and supports outsourcing practices and confirms the value proposition of the 3PL provider market. Rahman (2011) found that cost reduction is a major motivation for organisations in Australia to outsource logistics operations to 3PL providers, followed by reduction in capital investment and enhanced operational flexibility. Of less importance is the focus on core business activities and access to new markets. Notwithstanding the ranking of a specific motivational factor, according to Rahman (2011), the motivational factors

constitute an indication that shippers have perceived the benefits of the 3PL provider offering, which forms a driving force to outsource. The 3PL provider industry's value proposition indicates that the use of outsourcing has major business advantages, such as variable cost reduction, inventory reduction, fixed cost reduction and improved service delivery (Capgemini Consulting, 2014). The latter notion confirms the research by Rahman (2011) by way of the motivational factors for outsourcing, specifically economic cost savings. Waugh and Luke (2011) found the reasons for outsourcing by South African manufacturers to be to focus on core competencies, cover expanded geographic markets, and achieve improved customer service and reduced costs.

A South African study, entitled the 2014 Supply Chain Foresight Survey (Barloworld Logistics, 2014: i), indicates the following as the six major trends in South African supply chains:

- improving service levels to customers;
- integration of technology;
- lowering procurement costs and reducing order lead times;
- improving visibility in the supply chain;
- improving the flow of business intelligence; and
- aligning with key players in the supply chain.

The six major trends in South African supply chains are driving organisations to pursue the benefits offered by 3PL providers. The major trends in South African supply chains are aligned with the value proposition offering of the 3PL provider industry, namely improving customer service levels. The trend of improved customer service levels is not unique to supply chains in South Africa, and is deemed globally important. Tian, Ellinger and Chen (2010), for instance, similarly demonstrated that a 3PL provider's customer orientation has a significant positive influence on shipper firms in China.

Integration is among the major trends in South African supply chains (Barloworld

Logistics, 2014). In an effort by organisations to stay profitable in an ever-changing environment where pressures to perform are high, organisations have collaborated on several different bases, of which outsourcing to a 3PL provider is one such basis (Durrani, 2017). Outsourcing has taken root as a result of the perceived supply chain and organisation benefits, albeit that successful alignment and supply chain success through outsourcing are failing to appropriately align on expectations (Emmett and Crocker, 2016). Rushton and Walker (2007); 3PL News (2016); Lieb (2014); and Koch (2013) have indicated that the reasons for the failure of outsourcing ventures are based on misalignment of key aspects, namely:

- no clear strategy;
- an absence of an objective selection process;
- inefficient costing methodology;
- a lack of project implementation strategy; and
- an absence of a specific performance measurement system.

Globally, shippers and 3PL providers have experienced misalignment to varying degrees. Shippers and 3PL providers in China are not exempted from the typical misalignment issue of integration between shipper and 3PL provider (Tan, Yifei, Zhang & Hiloma, 2014). Tan *et al.*'s research was based on focus group interviews with China's leading 3PL provider organisations, followed by a survey of 70 organisations. The aim of their research was to establish global trends in the 3PL provider industry and investigate how China's 3PL provider industry is positioned in terms of its strengths and weaknesses. In Spain, outsourcing to 3PL providers, in general, is done sporadically, as it was found that shippers outsource based on cost-cutting, handling of short-term shortfall and scarcity of inputs (Núñez-Carballosa and Guitart-Tarrés, 2011). The sporadic nature of outsourcing further creates a shortfall between organisation strategies, and generally creates misalignment of the outsourcing partnership. This misalignment and a general lack of strategic decision-making is a universal problem experienced during the outsourcing venture (IDG, 2016 and SSON, 2016).

1.2 PROBLEM STATEMENT

Supply chain vs supply chain competition proposes that competition will be between groups of organisations, formally or informally, thereby creating independent supply chains and competing as nearly one entity (Moser, 2007: 90) Business fragmentation is phased out by competitive market powers, and integration is pursued (Gattorna, Ogulin & Reynolds, 2003; SupplyOn, 2017). Integration and alignment is a major trend in South African supply chains (Barloworld Logistics, 2014). Although attempting to attain the benefits derivable from using 3PL providers, outsourcing ventures are failing in the majority of instances. Inbound Logistics (2015) publishes annual reports, based on research conducted globally that analyses 400 questionnaires returned by 3PL providers and 5 000 questionnaires by shippers. According to the research done in 2015, the perceptions of why 3PL provider partnerships fail are indicated from both a shipper's perspective and a 3PL provider's perspective (Figure 1.1). Figure 1.1 indicates the perceptions from both shippers and 3PL providers about why the outsourcing decision/relationship is failing.

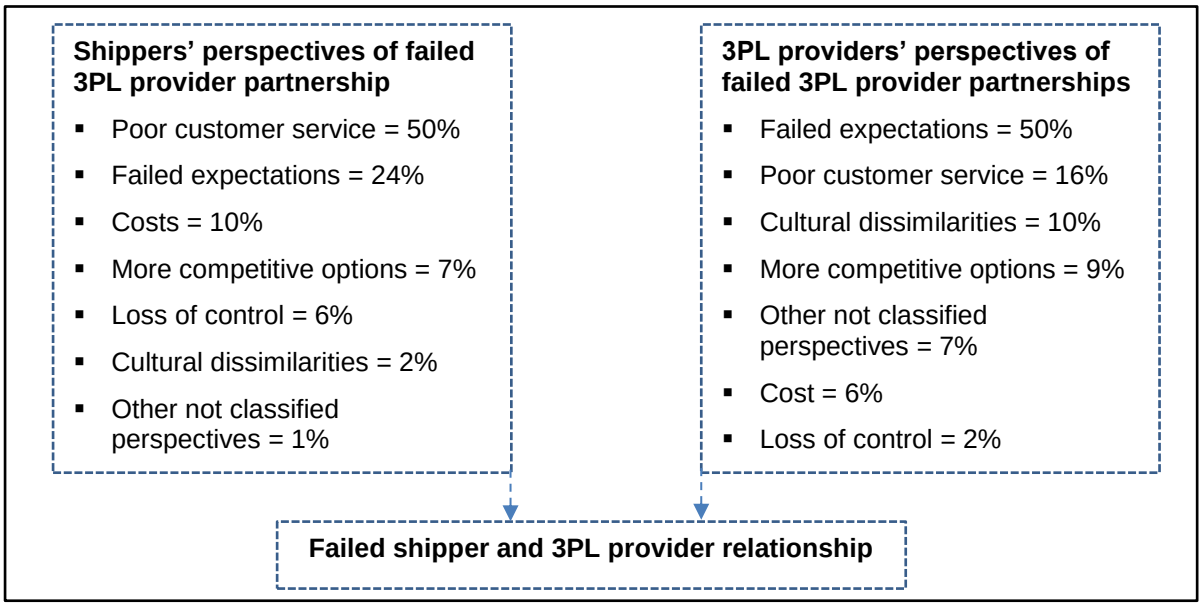

Figure 1.1: Shipper and 3PL provider challenges

The failing of the outsourcing venture is attributable to different strategic objectives, which translate into a different set of deliverables in terms of –

- collaboration and integrated planning systems;
- performance measurement; and
- broad-based black economic empowerment (South Africa specifically).

The misalignment between the shipper and the 3PL provider is encapsulated by the key challenges as found by Inbound Logistics (2015), which are listed below in ascending order:

- corporate social responsibility (CSR) (12%);
- global convergence (14%);
- contingency planning and risk management (25%);
- making a profit (28%);
- meeting customer service requirements (35%);
- finding and retaining customers (36%);
- finding and retaining qualified labour (51%);
- regulation (55%);
- rising operational costs (55%);
- technology investment (56%); and
- capacity (67%).

The challenge relating to capacity was found to be a major challenge facing the 3PL provider industry and consequently constitutes the primary hurdle for the outsourcing partnership. Technology was listed as the second major obstacle facing the partnership, and in third place, rising operational costs. Inbound Logistics (2015) and Rushton and Walker (2007) found the key areas of failures and the reasons for the failure of the 3PL provider relationship as being:

- unclear contracts;
- no performance measurement programme;
- poor implementation; and
- poor communication.

These failures arise as a result of circumstances relating to both 3PL providers and shippers. The failure of alignment between 3PL provider and shipper poses a risk to the shipper organisation, specifically. “Risk is about the uncertainty of events; including the likelihood of such events occurring and their effect, both positive and negative, on the achievement of the organisation’s objectives” (Institute of Directors Southern Africa [IoDSA], 2016: 16). The outsourcing decision inherently carries risk, which should be managed appropriately (Rousseau, Kotze & Fitzcharles, 2015).

The issues concerning alignment between shippers and 3PL providers constitute a global phenomenon, and this extends into being a very specific issue for Sasol, specifically Sasol Base Chemicals, as experienced in their operations. Sasol Base Chemicals is responsible for marketing Sasol’s commodity chemicals based on the Fischer Tropsch and natural gas value chains (Sasol, 2017), including the chemical feedstock of ethane, ethylene, propylene and ammonia (Sasol, 2015). The Sasol Base Chemicals business comprises several different product supply chains, namely explosives, fertilisers, polypropylenes, waxes, solvents and polyvinyl chlorides. These product supply chains are focussed on the outbound delivery of final packaged products to customers of Sasol. The Sasol Base Chemicals business was established in July 2014 as part of Sasol’s Project Phoenix to streamline the whole of Sasol’s business under the business principle of ‘buy’, ‘make’ and ‘sell’ (Sasol, 2017), coupled to a changing energy landscape, i.e. a lower-for-longer crude oil price.

With the establishment of Sasol Base Chemicals, the product streams mentioned were grouped together, whereas previously these were managed under separate business units (BUs). Each BU followed its own approach for delivering products

to customers. At the time of this study, several individual approaches are followed within the newly formed Sasol Base Chemicals business, with no defined method to choose or align with 3PL providers, or to even decide whether there should be 3PL providers or not. This silo approach to different product supply chains is hindering the business from achieving the benefits derivable from the value proposition of the 3PL provider industry. Adding to the complexity of, and risk inherent in, the outsourcing decision and silo approach followed for just one product stream, i.e. the fertilisers division, there is a mixture of 3PL providers utilised (unnecessary complexity added to the system as a whole), no clear strategy, no objective selection process, an inefficient costing methodology, a lack of project implementation strategy, and the absence of a specific performance measurement system. These aspects were identified earlier by Koch (2013) regarding the key reasons for misalignment.

The foundation of collaboration and integrated planning systems, and the performance measurement of 3PL providers, have been analysed before. Following their research conducted in Europe, Selviaridis and Spring (2007) indicated that there is a difference in procuring commodity 3PL provider services and in procuring specialised 3PL provider services. Prockl, Pflaum and Kotzab (2012) focussed on value-creation models for 3PL providers through the identification of basic and advanced 3PL provider service offerings. Bolumole (2003) focussed on collaboration and on how this affects the 3PL provider venture. Research by Mellat-Parast and Spillan (2014) in the United States of America focussed on manufacturing firm integration in terms of 3PL providers to ensure competitive advantage. Knemeyer and Murphy (2005) considered the relationship management of the 3PL provider venture. Large, Kramer and Hartmann (2011) focussed on performance management of the 3PL provider venture in terms of shipper adaption of the 3PL provider. Qureshi, Kumar and Kumar (2007) modelled outsourcing relationship variables in order to achieve the perceived benefits of 3PL providers. In their research, Sahay and Mohan (2006) focussed in part on the total supply chain view when deploying 3PL providers, and they consequently indicate that 3PL providers facilitate a trade-off between reduction in inventory and reduced lead times, while capturing economies of scale

(integrated planning and systems).

Spillan, McGinnis, Kara and Yi (2013) researched Chinese and American manufacturing organisations in terms of integration by means of process strategy, market strategy and information strategy. As mentioned previously in his research, Rahman (2011) considered the top three motivational factors for outsourcing, namely cost reduction, capital investment reduction and enhanced operational flexibility, which means the perceived benefits must be achieved through collaboration and integrated planning systems and performance measurement. Following their research into the state of 3PL providers in China, Tan *et al.* (2014) indicate the role of integrated planning and systems. Hum (2000) extended the Hayes–Wheelwright model to enable performance management of the 3PL provider. Qureshi, Kumar and Kumar (2008) present an integrated model to identify and classify key criteria for assessing the 3PL provider. Datta, Samantra, Mahapatra, Mandal and Majumdar (2013) focussed their research on the appraisal and selection of 3PL providers. They consequently classify the evaluation and selection of 3PL providers as a multi-criteria decision-making (MCDM) process. Perçin (2009) recommends utilising the modified Delphi technique, followed by the analytic hierarchy process (AHP), to select 3PL providers. Joo, Keebler and Hanks (2013) focussed their research on measuring the performance of 3PL provider operations. Jothimani and Sarmah (2014), in turn, concentrated their research on 3PL provider measurement and utilised the supply chain operations reference (SCOR) model to identify key performance indicators (KPIs). In their research, they also made use of the balanced scorecard (BSC), the AHP and the technique for order of preference by similarity to ideal solution (TOPSIS). Huo, Selen, Yeung and Zhao (2008) also studied 3PL provider performance drivers. Their research was conducted from a Hong Kong perspective, which utilised the estimated path model and found that both cost and service performance are necessary to achieve financial performance. Wang, Huo, Lai and Chu (2010) focussed their research on performance drivers in mainland China.

Research in terms of collaboration and integrated planning systems, and performance measurement of 3PL providers indicates that many investigations have already been done. However, a complete, end-to-end, strategic lever or mechanism to assist the process has not yet been developed. Such lever or mechanism should serve as a systematic whole for the process, from the strategic intent of an organisation through to the operational performance and measurement, in order to ensure optimal alignment between shipper and 3PL provider. The global significance of the 3PL provider industry has already been illustrated, as well as the role it plays in terms of logistics spending (ReportsnReports, 2012). However, the steady growth of the 3PL provider industry is not without failure, as indicated by Rushton and Walker (2007) and Emmet and Crocker (2016). This is a very specific issue for Sasol Base Chemicals, as Sasol is not reaping the perceived benefit of outsourcing to 3PL providers. The problem statement for this research thus calls for an investigation into what is necessary for optimal alignment between 3PL providers and Sasol's final packaged product supply chain in order for it to become a successful outsourcing venture, as measured by variable cost reduction, inventory reduction, fixed cost reduction and improved service delivery.

1.3 AIM AND OBJECTIVES OF STUDY

In order to achieve the value proposition of the 3PL provider market, organisations (both shippers and 3PL providers) have to align business specifics appropriately in terms of 'what' needs to be outsourced, 'how' the shipper intends to manage the partnership, and 'who' needs to be involved in the partnership, i.e. a strategic decision-making model. In order for shippers to achieve the advantages/value proposition of 3PL providers, both the shipper and 3PL provider need to ensure suitable alignment in order to achieve success.

1.3.1 Primary objective

The primary objective of this study was to develop a workable, end-to-end, supply chain strategic decision-making model for optimal alignment between prospective 3PL providers and Sasol's final packaged product supply chain.

1.3.2 Secondary objectives

In order to develop the strategic decision-making model successfully, eight secondary objectives are researched for gauging the optimal alignment of 3PL providers with Sasol's outbound final packaged product supply chain, and these are to –

- develop a services continuum with the objective that it will be utilised as a mechanism that would provide detailed placement on the continuum, based on four aspects, namely services type required, category of 3PL providers, strategic alignment and investment required. The development of the services continuum is termed *development one*, and is a mathematical model, which allows for optimal results to be obtained (first secondary objective);
- review and classify outsourcing models by means of the services continuum (second secondary objective);
- explain the unit of analysis in terms of collaboration and integrated planning, performance measurement and the South African specific of broad-based black economic empowerment (B-BBEE) (third secondary objective);
- review risk in relation to outsourcing and the creation of an outsourcing risk matrix. The outsourcing risk matrix is termed *development two* (fourth secondary objective);
- establish a generic application of the services continuum with the objective

to arrive at an abridged reference table for each of the four permutation results (fifth secondary objective);

- define a strategic decision-making methodology process path, specifically for application in relation to Sasol's outbound final packaged product supply chain (sixth secondary objective);
- confirm parameter alignment with Sasol's outbound final packaged product supply chain by means of structured interviews (seventh secondary objective); and
- conduct a value analysis of prospective 3PL providers in relation to establishing the most applicable 3PL provider, based on Sasol's outbound final packaged product requirement (eighth secondary objective).

1.4 RESEARCH METHODOLOGY

The model approach followed in this study consisted of a dualistic development, followed by a methodology process path. The first development comprised the establishing of a services continuum, and the second development comprised the management of risk related to outsourcing, i.e. the outsourcing risk matrix. The services continuum was developed as a permutation matrix, consisting of four categories of importance in relation to the outsourcing venture:

- service type;
- category of 3PL provider;
- strategic alignment; and
- investment.

The literature review was done in terms of the classification of models in relation to the categories of the services continuum. The services continuum was utilised to enable the research undertaken in this study. The outsourcing risk matrix is

aligned with the International Organization for Standardization (ISO) 31000:2009 risk management processes. The outsourcing risk matrix enables cross-verification of the initial risk experienced, coupled to mitigating action with residual risk. The risk profile is referenced back to the services continuum to verify whether outsourcing placement is correct and acceptable. The dualistic nature of the research was brought together via a research methodological process path forming the strategic decision-making model. The research conducted in this study was primarily focussed on secondary data research, that is, the study focussed strongly on the literature reviews presented in Chapters 2 and 3 in order to develop a services continuum and outsourcing risk matrix (termed *development one* and *development two*). The primary data research, to a lesser extent, was conducted in order to establish the parameter alignment required from Sasol for effective development and application of the strategic decision-making model.

The advantage of multi-method research is the capability it provides for attaining better and more accurate results than mono-research does (Ngulube and Ngulube, 2015). According to their research, it was found that of the articles published in the *South African Journal of Economic and Management Science* in the period 2003 to 2011, only 2% utilised multi-method research vs 89% that utilised empirical research. Yet, as stated by Ngulube and Ngulube (2015: 9–10):

> Economic and management sciences deal with relativistic, complex and dynamic social constructs that influence a variety of contexts. [Multi-method research] provides the possibility to best understand and make assumptions about the complex problems that economic and management science scholars engage with.

The research in this study depended on empirical and non-empirical research and on quantitative and qualitative research. The empirical data in this study was collected from structured interviews, historic operations reports, journals, articles, books, websites and observations. The empirical research in this study was combined with non-empirical research, i.e. research guided by the researcher's experience in the field of Sasol's final packaged product supply chain. The research draws on the experiments conducted at Sasol Explosives, Fertilisers, Polypropylenes, Waxes, Solvents and Polyvinyl Chlorides facilities. The inclusion of non-empirical research gave more depth to the present research and provided

a better understanding of the complex environment.

Figure 1.2 indicates the research methodology followed in the study.

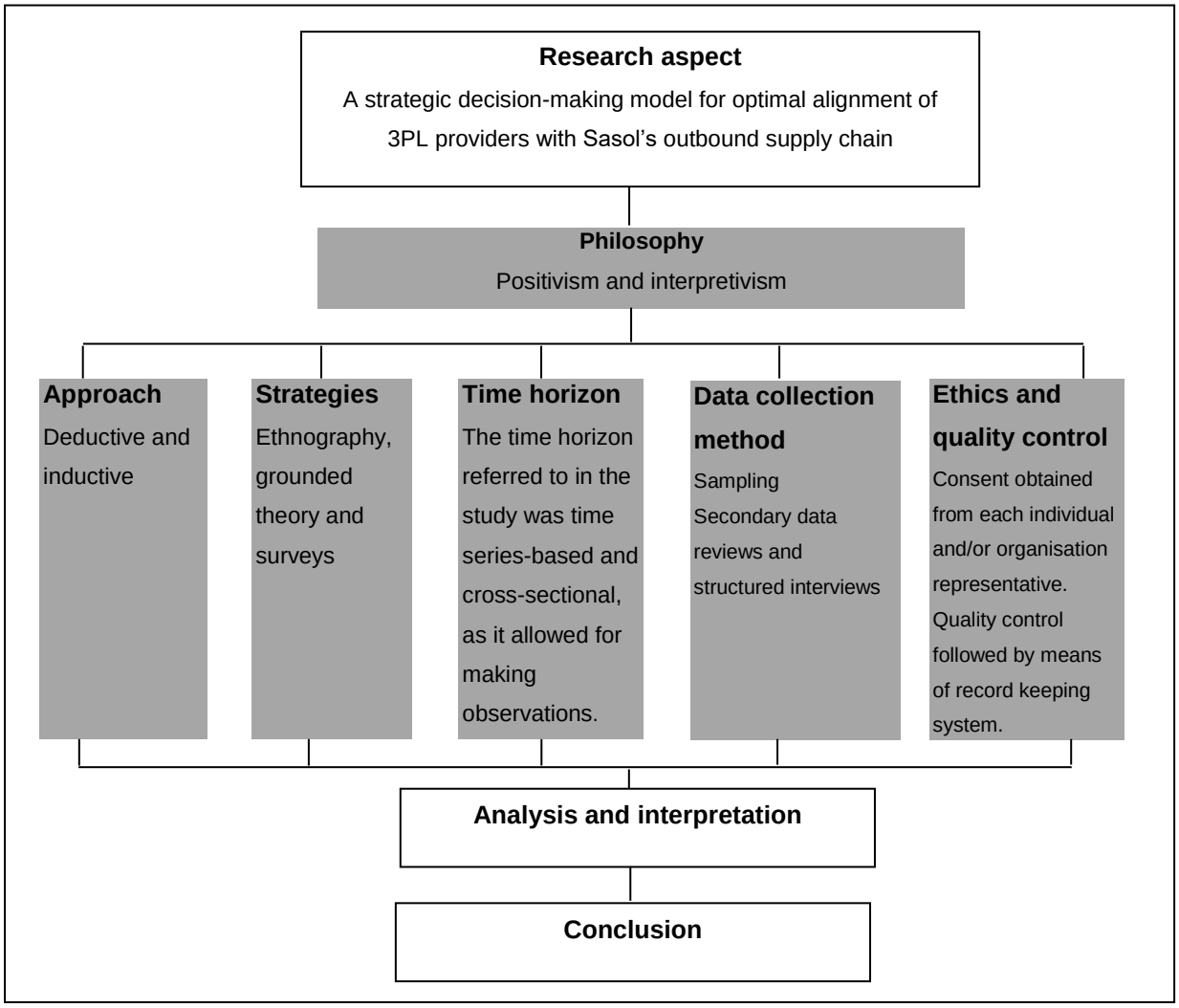

Figure 1.2: Research methodology followed

From Figure 1.2, the research aim for the present study was to develop a strategic decision-making model for optimal alignment between 3PL providers and Sasol's outbound supply chain. The research philosophy utilised in the study was both positivistic and interpretivistic. The research approach was therefore both deductive and inductive. The strategy utilised was based on ethnography, grounded theory and surveys. The time horizon was cross-sectional, as it allowed for more than a single observation to be made (different data sets were collected for different aspects researched). Data collection methods utilised were: sampling and data collection (structured interviews, historic operations reports, journals,

articles, books, websites and observations based on close interaction).

Observing ethics and ensuring quality control were critical in order to attain worthy research. All research conducted as part of this study obtained ethical clearance and consent (Appendix A). Ethics are important in research, and the close co-operation and structured interviews made it necessary to adhere to trust, accountability, mutual respect and fairness (National Institute of Environmental Health Sciences [NIEHS], 2011). Consent was obtained from each individual and organisation representative participating in the research (Appendix B), and the role of each participant in the research was explained to him or her (Appendix C). A quality control and record system was employed to ensure all research done was accurately controlled and protected from compromise. Once all the research data had been gathered, it was analysed and interpreted (Chapter 5).

Primary data research was conducted in the form of structured interviews to ensure that key aspects were included and were validated for the strategic decision-making model, based on the sample procedure. Interviews were conducted with top and middle management regarding the strategic decision-making model for optimum alignment of 3PL providers with Sasol's outbound supply chain. Ten structured interviews (sample size) were conducted to ensure that the information received would not be biased, but applicable in order to meet objectivity for the application of the strategic decision-making model on Sasol. The aim of the interview process was to validate design requirements as well as to gauge Sasol's perceptions concerning key role players within the Sasol 3PL provider sphere. These 3PL providers were:

- Katoen Natie: Katoen Natie is a supplier of logistics and semi-industrial services (Katoen Natie, 2016). At the time of this research (2017), Katoen Natie had been servicing the polymer product supply chain in Secunda, Mpumalanga, South Africa, which forms part of Sasol's Secunda Chemicals Operations. The principal motivation for including Katoen Natie was based on the fact that, at the time, Katoen Natie had been actively involved in the operations in question.
- South African Container Depots (SACD): SACD is a provider of import and

export management services and offers customers a complete, end-to-end, supply chain management solution (SACD, 2016). The reason for including SACD in the research was that SACD had been utilised by Sasol for their 3PL provider services for more than a decade (1999–2012). However, since 2013, Sasol and SACD have not conducted business on a considerable scale. The reason for this was explored in order to gain an understanding of why this was the case in order to define shortcomings that need to be addressed. This provided valuable information when the strategic decision-making model specifics were drawn up, thereby establishing what factors were deemed more substantial than others were.

- Barloworld Logistics: Barloworld Logistics is a supplier of integrated strategic warehousing and distribution solutions (Barloworld Logistics, 2016). Barloworld was included in the research as it is regarded as best-in-class, coupled with Imperial Logistics (African Decisions, 2017), for the specifics needed from the research.
- Imperial Logistics: Imperial Logistics is a supplier of fit-for-purpose and client-specific warehouse storage solutions through managing and operating customised storage space (Imperial Logistics, 2016). Imperial Logistics and Barloworld Logistics were included in the research to gain a world-class perspective on the specifics for the development of the strategic decision-making model.
- Sammar Investments: Sammar Investments is a supplier of cartage and transportation services (African Advice, 2018). At the time of this study in 2017, Sammar Investments was being utilised as a 3PL provider for Sasol's Wax final packaged product supply chain, warehoused in Durban, KwaZulu-Natal, South Africa. The reasoning for why there is a need for the product to be warehoused in Durban should be understood in the research, as well as why Sammar Investments is actively utilised for its services in Durban (see Table 5.10, page 148).
- Greater Than Warehousing & Logistics Services (GTWLS): GTWLS is a supplier of warehousing and logistics consultancy services (Kapitol, 2018).

At the time of this study, GTWLS had been contracted as a 3PL provider for both the fertilisers and polymers overflow warehouse requirements. There are three long-term contracts with GTWLS for facilities in Bethal, Leandra and Standerton, Mpumalanga, South Africa. Depending on factory throughput and market demand, GTWLS also manages overflow facilities in Gauteng, South Africa.

The purpose of the structured interview process was to establish key shortcomings in the current operational alignment models and practices in order to establish and refine the strategic decision-making model for Sasol's final packaged product supply chain.

Sampling is the process of obtaining data from an all-inclusive population and is used to make statistical inferences about the population (Janicak, 2007). "A crucial human skill is to be selective about the data we choose to analyse and, where possible, to summarise the information as briefly and usefully as possible" (Graham, 1994: 64). The purpose of sampling in the present study was to ensure that viable and reliable information was extracted. According to Murphy and Davidshofer (2004), reliability and validity determine the quality of the measurements chosen. This study used non-probability[2] judgement[3] sampling for the structured interviews, as limited knowledge existed with regard to Sasol's final packaged product supply chain. In order to eliminate potential bias based on sampling, the following sampling procedure was employed to ensure obtaining a balanced view of the selected sample. The sampling procedure for this research comprised only individuals –

- who were knowledgeable in the specific field of 3PL provider service rendering; or
- who have rendered a typical 3PL provider service to Sasol; or
- who were rendering a similar 3PL provider service to Sasol; or

2 Non-probability sampling is used where subsets of the population do not experience an equal opportunity to be selected (Explorable, 2017).

3 This is a sampling technique where the researcher selects units to be sampled, based on knowledge and professional judgement (Explorable, 2017).

- who were regarded by industry peers as leaders in the field of 3PL provider service rendering.

The scope of the sampling procedure is discussed in detail in Chapter 5 (see Table 5.1).

1.5 DEFINITION OF TERMS

The following subsections (1.5.1 – 1.5.6) explain the key terms that are utilised in this study, in alphanumeric order.

1.5.1 3PL provider

This term is used in the present study to describe the supplier of outsourced services. Following the definition of the Council of Supply Chain Management Professionals (2013), a 3PL provider does not take ownership of the product or material, but takes full accountability of the process being managed. Yang (2014) researched the status of 3PL providers and indicates that, while agreement still has to be reached between academics and business, the broadly agreed-upon definition of a 3PL provider involves the rendering of a logistics service to a shipper, for example warehousing, transportation and auxiliary services. However, as mentioned above, the 3PL provider does not take ownership of the product or material in the warehouse or in shipment. This is aligned with the United States legal definition of a 3PL provider, as signed into law (HR 4040) (Cerasis, 2013).

1.5.2 Optimal alignment

'Optimal' refers to the best possible solution in terms of the outsourcing venture. Business alignment on key aspects of the outsourcing venture is based on collaboration and integrated planning systems, as well as performance measurement systems. Selviaridis and Spring (2007) explain the dyad level as the function of service offerings, contract duration and the customer motivation for

outsourcing. Optimal alignment is further explained as managing the 3PL provider relationship, such as with contracts, information exchange and performance measurement. Optimal alignment and coordination in service supply networks have been investigated by Spring, Selviaridis and Zografos (2016) who found that, in order to achieve optimal alignment, there needs to be alignment of interests and actions between shipper and 3PL provider. In order to be successful and achieve optimal alignment, Spring *et al*. (2016) suggest the following:

- supplier selection by alignment of common goals and understanding of shipper requirements;
- integrated performance management as it relates to planning and flexibility;
- relationship management through top management support and conflict resolution;
- strategy selection by aligning joint investment and organisational planning; and
- costing methodology by alignment of risk and reward sharing.

1.5.3 Outsource risk matrix

The term ‘outsource risk matrix’ refers to the second development of the strategic decision-making model, the first being the services continuum. The outsource risk matrix is an evaluation tool to test the result obtained from the application of the services continuum, whether strategic or tactical, in order to identify possible risk in terms of outsource risk matrix levels (see Subsection 3.3.1). The outsource risk matrix was developed after the researcher had found it imperative that the optimal placement on the services continuum be tested and further operationalised in a business context to ensure that the risk is appropriately assigned and mitigated.

The perceived risk element is coupled to the probability of it occurring, such as unforeseen, highly unlikely, very unlikely, low, possible, likely and almost certain

(see Table 3.8, page 95). The likelihood of a risk and the severity of the risk are classified and assigned to either one of six levels of risk within the organisation (see Table 3.9, page 96). Each of the six levels of risk is addressed through a specific level of management in the organisation that is responsible for managing the risk accordingly. The six levels of managing risk are:

- level one, organisation board of directors;
- level two, applicable executive forums;
- level three, executive management;
- level four, divisional manager;
- level five, operations manager; and
- level six, first line manager.

1.5.4 Shipper

The term ‘shipper’ indicates the organisation that outsources either a partial process or the process in totality to another organisation for management and execution (Yang, 2014). According to the United States legal definition (HR 4040), the shipper continues to keep title to the product, but outsources a process in varying degrees.

1.5.5 Services continuum

The services continuum represents the first development of the dualistic strategic decision-making model. The second development is an outsourcing risk matrix. The services continuum is utilised as a departure point for the analysis and classification of 3PL provider models in terms of key variables to consider (see detailed discussion in Subsections 2.3.1 – 2.3.4) as well as the configuration of outsourcing elements (see the detailed discussion in Subsections 3.2.1 – 3.2.3).

Based on the key variables for consideration, outsourcing models and elements are assigned to an area most fitting in terms of the continuum. The continuum assists by classifying the outsourcing to 3PL providers into more specific categories of outsourcing, i.e. transactional, tactical and strategic outsourcing (see the detailed discussion in Section 2.3). The services continuum represents this via the strategic alignment necessary, specifically, **transactional** outsourcing is encapsulated as indicating no strategic alignment; low to moderate strategic alignment is represented as **tactical** outsourcing; and a high strategic alignment is indicated as **strategic** outsourcing (Honeycomb Worldwide Inc., 2015). In terms of transactional outsourcing, no long-term outsourcing occurs, i.e. it is transactional and of short duration. Tactical outsourcing refers to business where contracts are negotiated and information technology systems are integrated between shipper and 3PL provider. Strategic outsourcing is characterised by long-term relationships in terms of which the 3PL provider and shipper become strategic partners. In order to ensure optimal alignment, the services continuum was developed for this study, ensuring that four concepts, as they relate to the outsourcing decision, were combined in a permutation matrix in order to provide an optimal mathematical output in terms of the requirements of the shipper and the capability of the 3PL provider. Alsuwaiyel (2010) shows that the correctness of the mathematical algorithm is embedded in its description and that the output of a permutation is optimal.

In summary, the four concepts are ‘service type’, ‘category of 3PL providers’, the ‘strategic alignment’ necessary, and the level of ‘investment’ required, abbreviated to SCSI. The four concepts, brought together, form a permutation matrix in order to provide an optimal solution, given an outsource service delivery requirement. The continuum dictates, based on key criteria for each category, a set of deliverables that are necessary for optimal alignment between shipper and 3PL provider.

1.5.6 Strategic decision-making model

The strategic decision-making model is dualistic in nature, consisting of two developments, namely a services continuum and an outsourcing risk matrix. The first development was the establishment of a services continuum to enable classification of the various outsourcing models, and the second development was to classify and mitigate risk via the establishment of an outsourcing risk matrix. The free-market system objective is to make a profit (Chron, 2018). The specific method as to how the organisation chooses to go about making a profit is the strategic objective and this is encapsulated in the marketing mix of the organisation. The marketing mix is a controllable set of marketing tools used by an organisation for creating a desired response in the targeted market (Kotler, Armstrong, Wong & Saunders, 2008). Hamzah and Sutanto (2016) indicate the marketing mix as seven **P**s, namely **P**roduct, **P**rice, **P**lace, **P**romotion, **P**eople, **P**rocess, and **P**hysical evidence. The marketing mix comprising the seven **P**s, as explained by Hamzah and Sutanto (2016), is supported by Luo, Roach and Jiratchot (2016). Operations follow strategy and therefore, based on either low cost or differentiation, the organisation will deploy different operational plans. This means that when outsourcing is chosen, based on strategy, the outsourcing follows through to the operations plan. The strategic decision-making model is aided by a strategic decision-making methodology process path. The process path is a set of phases and steps that effectively draw the applicable aspects together into a unified whole and enable execution of the strategic decision-making model.

The strategic decision-making model, once executed, has the objective to address and ensure alignment on:

- supplier selection;
- integrated performance measurement;
- relationship management;
- strategy selection; and
- costing methodology.

In order to achieve these deliverables, the strategic decision-making methodology has the function at its core to review outsourcing models and elements as part of the outsourcing venture. Further, the methodology needs to establish a system for reviewing 3PL provider delivery models (services continuum), and lastly, the methodology needs to evaluate the risk and ensure the risk is appropriately managed within the shipper organisation (outsourcing risk matrix).

1.6 STUDY DELIMITATIONS

The study focusses on 3PL providers for the development of a strategic decision-making model for optimal alignment of 3PL providers and shippers. The 3PL provider definition has been provided, as well as the 3PL provider concept as utilised within the study (see Subsections 1.5.1 and 2.2, respectively). It is to be noted that 3PL providers are not the only type of logistics service providers, as there are the following additional types of logistics providers (BCR, 2018; Instafreight, 2018; Hai and Yirong, 2002):

- 1PL providers: this is a scenario whereby only two parties are involved in a transaction i.e. the manufacturer of the goods and the receiver of the goods;
- 2PL providers: this is a scenario whereby a logistics provider is specifically involved for the cartage of goods by either rail, road, sea or air;
- 4PL providers: this is a scenario whereby the logistics service provider oversees another logistics service provider on behalf of a shipper; and
- 5PL providers: this is a scenario typical of a 4PL provider, however, the 5PL provider essentially manages networks of supply chains across all logistics operations.

The strategic decision-making model is specifically developed to assist with optimal alignment between shipper and 3PL provider, in accordance with the 3PL provider definition and concept adopted for this study (see Subsections 1.5.1 and

2.2, respectively).

3PL providers operate within the supply chain, whether inbound or outbound. Key Differences (2017) indicates inbound logistics to be involved with the sourcing, expediting, and receiving of material that is coming to the organisation. On the other hand, outbound logistics is concerned with warehousing, packaging and transportation of material going out of the organisation. The development of the strategic decision-making model is specifically intended to align the outbound supply chain of Sasol with prospective 3PL providers as to attain the benefits of outsourcing, given the problem statement of the study as well as the primary and secondary objectives of the study (see Sections 1.2 and 1.3, respectively). Sasol was chosen for the current study, as Sasol is a major blue chip organisation in South Africa, and at the time of the study, Sasol was unable to optimally outsource the outbound logistics operations.

1.7 ORGANISATION OF STUDY

Chapter 1 provided an introduction to this study, 'A strategic decision-making model for optimal alignment of 3PL providers and Sasol's outbound supply chain'. The chapter indicated the problem statement (see Section 1.2), reflected the primary and secondary research objectives (see Subsections 1.3.1 and 1.3.2, respectively), and indicated the research methodology as well as key concepts for the study (see Sections 1.4 and 1.5, respectively).

Chapter 2 comprises a literature review and aligns with the first and second secondary research objectives (see Subsection 1.3.2), i.e. to –

- develop a services continuum with the objective that it will be utilised as a mechanism that would provide detailed placement on the continuum, based on four aspects, namely services type required, category of 3PL providers, strategic alignment, and investment required. The development of the services continuum is termed *development one*, and is a mathematical model, which allows for optimal results to be obtained (first secondary objective); and

- review and classify outsourcing models by means of the services continuum (second secondary objective).

The first development, namely the services continuum, was established and is discussed in Chapter 2 for the strategic decision-making model. The services continuum enables the research of the classification of 3PL provider outsourcing models as reviewed in Chapter 1.

Chapter 3 aligns with the third and fourth secondary research objectives (see Subsection 1.3.2), i.e. to –

- explain the unit of analysis in terms of collaboration and integrated planning, performance measurement, and the South African specific of B-BBEE (third secondary objective); and

- review risk in relation to outsourcing and the creation of an outsourcing risk matrix. The outsourcing risk matrix is termed *development two* (fourth secondary objective).

Chapter 3 extends the literature review and utilises the services continuum to focus on the elements/mechanisms, per category, of the continuum of services offered. The chapter determines the mechanisms available in terms of collaboration and integrated planning systems and performance measurement systems, as well as B-BBEE. The second development pertaining to the dualistic nature of the strategic decision-making model is to utilise the elements according to the placement on the services continuum and thereby endeavour to ensure that the risk is acceptable, i.e. the development of an outsourcing risk matrix. The outsourcing risk matrix is comprehensive and enables a test to be made of acceptable risk in accordance with the anticipated risk per placement on the services continuum.

Chapter 4 reflects a generic model application and aligns with the fifth and sixth secondary research objectives (see Subsection 1.3.2), i.e. to –

- establish a generic application of the services continuum with the objective to arrive at an abridged reference table for each of the four permutation results (fifth secondary objective); and

- define a strategic decision-making methodology process path, specifically for application in relation to Sasol's outbound final packaged product supply chain (sixth secondary objective).

Chapter 5 discusses the research methodology and approach followed, as well as the research findings and results. This chapter indicates the research processes followed by delineating the development and utilisation of the sample plan, as well as the development and application of the research instrument. The primary and secondary data research results are analysed and discussed in order to enable the application of the strategic decision-making model for optimal alignment between Sasol's outbound final packaged product supply chain and prospective 3PL providers. This chapter aligns with the seventh and eighth secondary objectives (see Subsection 1.3.2), i.e. to –

- confirm parameter alignment with Sasol's outbound final packaged product supply chain by means of structured interviews (seventh secondary objective); and

- conduct a value analysis of prospective 3PL providers in relation to establishing the most applicable 3PL provider, based on Sasol's outbound final packaged product requirements (eighth secondary objective).

Chapter 6 follows through on the secondary and primary research conducted and reports on the building of the strategic decision-making model for optimal alignment between prospective 3PL providers and Sasol's outbound supply chain. The focus is placed specifically on the strategic decision-making model in bridging the gap between prospective 3PL providers and Sasol's outbound supply chain. Sasol's outbound supply chain is defined as Sasol base chemicals, which comprises the following product streams: explosives, fertilisers, polypropylenes, wax, solvents and polyvinyl chloride. The chapter aligns with the primary study objective (see Subsection 1.3.1), which was to develop a workable, end-to-end supply chain strategic decision-making model for optimal alignment between prospective 3PL providers and Sasol's final packaged product supply chain.

Chapter 7 summarises the findings based on the application of the model in

Chapter 6 and indicates the limitations of the study, as well as possible future research that might emanate from the study. Figure 1.3 indicates the chapter layout.

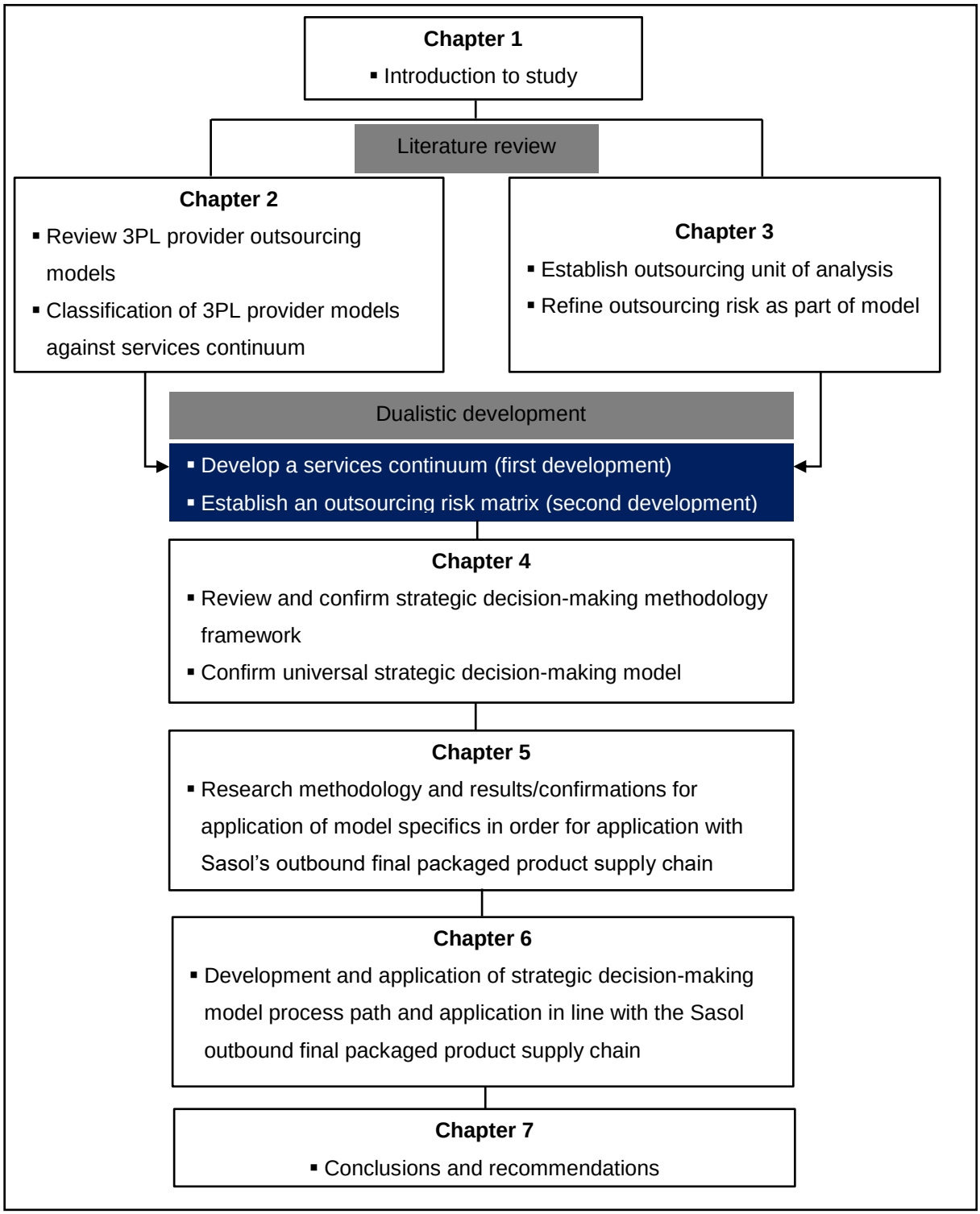

Figure 1.3: Chapter layout of the study

CHAPTER 2
REVIEW AND CLASSIFICATION OF 3PL PROVIDER OUTSOURCING MODELS VIA THE SERVICES CONTINUUM

2.1 INTRODUCTION

Chapter 2 constitutes a literature review and classification of 3PL provider outsourcing models based on a services continuum, following on the first and second secondary objectives of the study (see Subsection 1.3.2), i.e. to –

- develop a services continuum with the objective that it will be utilised as a mechanism that would provide detailed placement on the continuum based on four aspects, namely services type required, category of 3PL providers, strategic alignment, and investment required. The development of the services continuum is termed *development one*, and is a mathematical model, which allows for optimal results to be obtained (first secondary objective);

- review and classify outsourcing models by means of the services continuum (second secondary objective).

The services continuum formed the first development in terms of the dualistic nature of the strategic decision-making model. The second development was the outsourcing risk matrix (discussed in Chapter 3).

Chapter 2 starts by explaining the concept of 3PL providers in detail, which is followed by a discussion of the development of the services continuum. The services continuum was developed, as part of this study, in order to function as the foundation for analysis of the differentiation of services rendered. The differentiation of services enables the 3PL provider outsourcing models to be applied in line with the relevant service requirement in the context of a mathematical model, which enables optimal alignment, i.e. a permutation matrix. The final section of the chapter reports on the research into nine outsourcing models. This review enables outsourcing placement on the services continuum.

2.2 3PL PROVIDER CONCEPT

This section defines the 3PL provider concept for utilisation within the study. Langley (2016) indicated that the 3PL provider concept has changed considerably over the past 21 years. The Council of Supply Chain Management Professionals [CSCMP] (2013) indicates that the 3PL provider industry has evolved from an emerging industry to a global practice. Lieb (2014) concurs that the concept of logistics is ever changing and evolving. From these perspectives, it is accepted that the concept of 3PL providers is embryonic. For the purpose of this study, the concept definition of a 3PL provider, which is aligned with prominent authors in the field (Baziotopoulos, 2008; Hertz and Alfredsson, 2003; Stock and Lambert, 2001; Katsogianni and Vouzas, 2017), constitutes:

- a shipper organisation, the organisation that outsources a process in its entirety or in fragments; and
- an external provider that manages the outsourced process, the 3PL provider.

All 3PL providers facilitate a trade-off between the need to reduce the overall supply chain inventory and the reduced lead times, while capturing economies of scale (Sahay and Mohan, 2006). The United States legal definition (HR 4040) of a 3PL provider is that it is “[a] person who solely receives, holds, or otherwise transports a consumer product in the ordinary course of business but who does not take title to the product” (CSCMP, 2013: para 6).

Accenture registered the term ‘3PL provider’ as a trademark in 1996; however, it is no longer a registered trademark of Accenture, with the definition. They define a 3PL provider as “[a] supply chain integrator that assembles and manages the resources, capabilities, and technology of its own organisation with those of complementary service providers to deliver a comprehensive supply chain solution” (Cerasis, 2013: para 7). The CSCMP defines a 3PL provider as “[a] firm that provides multiple logistics services for use by customers” (CSCMP, 2013: para 6).

The definition of the 3PL concept, summarised for the purpose of the present study, is that there are two parties involved: the shipper organisation and the 3PL provider. The 3PL provider does not take ownership (title) of the product, but forms part of the normal course of business, in its entirety or partially, to ensure delivery to customers of the shipper organisation.

2.3 SERVICES CONTINUUM OVERVIEW

The problem statement was indicated (see Section 1.2) as being to ascertain what is necessary to be achieved for ensuring optimal alignment between 3PL providers and shippers. To this effect, the primary objective of this study (see Subsection 1.3.1) is to develop a workable, end-to-end, supply chain strategic decision-making model for optimal alignment between prospective 3PL providers and Sasol's final packaged product supply chain. The services continuum, developed in order to assist in achieving the primary objective, is termed *development one* (see Subsection 1.3.2, first secondary objective).

The services continuum is utilised as a departure point for analysis and classification of 3PL provider models in terms of key variables for consideration (see discussion in Subsections 2.3.1 – 2.3.4) as well as outsourcing element configuration (discussed in detail in Subsections 3.2.1 – 3.2.3). Based on key variables for consideration, both outsourcing models and elements are assigned to an area most fitting within the services continuum. The services continuum is a conglomeration of various models that assist to classify outsourcing to 3PL providers and shippers into more specific categories of outsourcing. For the purpose of the present study, it was imperative to both classify and provide structure to the various outsourcing models and elements deemed necessary for outsourcing in such a manner that differentiation can ascertained, based on the type of service required: category of 3PL providers, strategic alignment required, and investment required. In order to ensure optimal alignment, the services continuum was developed for this study, ensuring that the four concepts, as they relate to the outsourcing decision, are combined in a permutation matrix with the purpose of providing an output in terms of the requirement for both shipper and

3PL provider. The permutation matrix allows for an optimal solution to be found for the combination of the four aspects, as well as for each requirement of the services continuum.

For ease of reference, the categories within the continuum are abbreviated to **SCSI** (**S**ervice type, **C**ategory of 3PL provider, **S**trategic alignment and **I**nvestment) (also see Subsection 1.5.5). Each block within the matrix (see Figure 2.1) receives a number, from 1 through to 16, i.e. SCSI1 represents the block that matches an apprentice service, a *standard service provider*, with little to no strategic alignment and investment required. The 'service type' refers to four types of services, namely apprentice services (see Subsection 2.3.1), elementary services (see Subsection 2.3.2), intermediate services (see Subsection 2.3.3), and advanced services (see Subsection 2.3.4). Each of the four service types increases in scope/integration between 3PL provider and shipper, according to its movement to the right on the services continuum.

The four categories of 3PL providers are: *standard service provider*, *service developer*, *customer adapter*, and *customer developer* (see Subsection 2.4.7). The categories each increase in the scope and integration required between 3PL provider and shipper according to the category's movement down the services continuum. Added to the services continuum is the level of strategic alignment necessary, given the service type and category of 3PL provider – from 'little or transactional' alignment through to 'high or strategic' alignment (Cerasis, 2014). The final concept incorporated into the permutation matrix indicates the investment required. The services continuum, being a permutation matrix, implies that there is only one correct entry per row, while the rest represents a mismatch (Oren and Smilansky, 2014). The permutation results (see Subsections 2.3.1 – 2.3.4) are utilised throughout the services continuum to establish appropriate allocations within the services continuum (see Table 2.1). The services continuum is the first development (see Subsection 1.3.2, first secondary objective) made in order to address the primary objective of the study (see Subsection 1.3.1), which is to eliminate suboptimal outsourcing, as mentioned in the problem statement (see Section 1.2).

The permutation matrix, in mathematical form, is expressed as:

$$P_{\pi} = \begin{bmatrix} \varrho_{\pi}(1) \\ \varrho_{\pi}(2) \\ \varrho_{\pi}(3) \\ \varrho_{\pi}(4) \end{bmatrix}$$

where ϱ_j = row vector of length m, with 1 in the j^{th} position and 0 in every other.

The services continuum developed for this study is displayed in Figure 2.1.

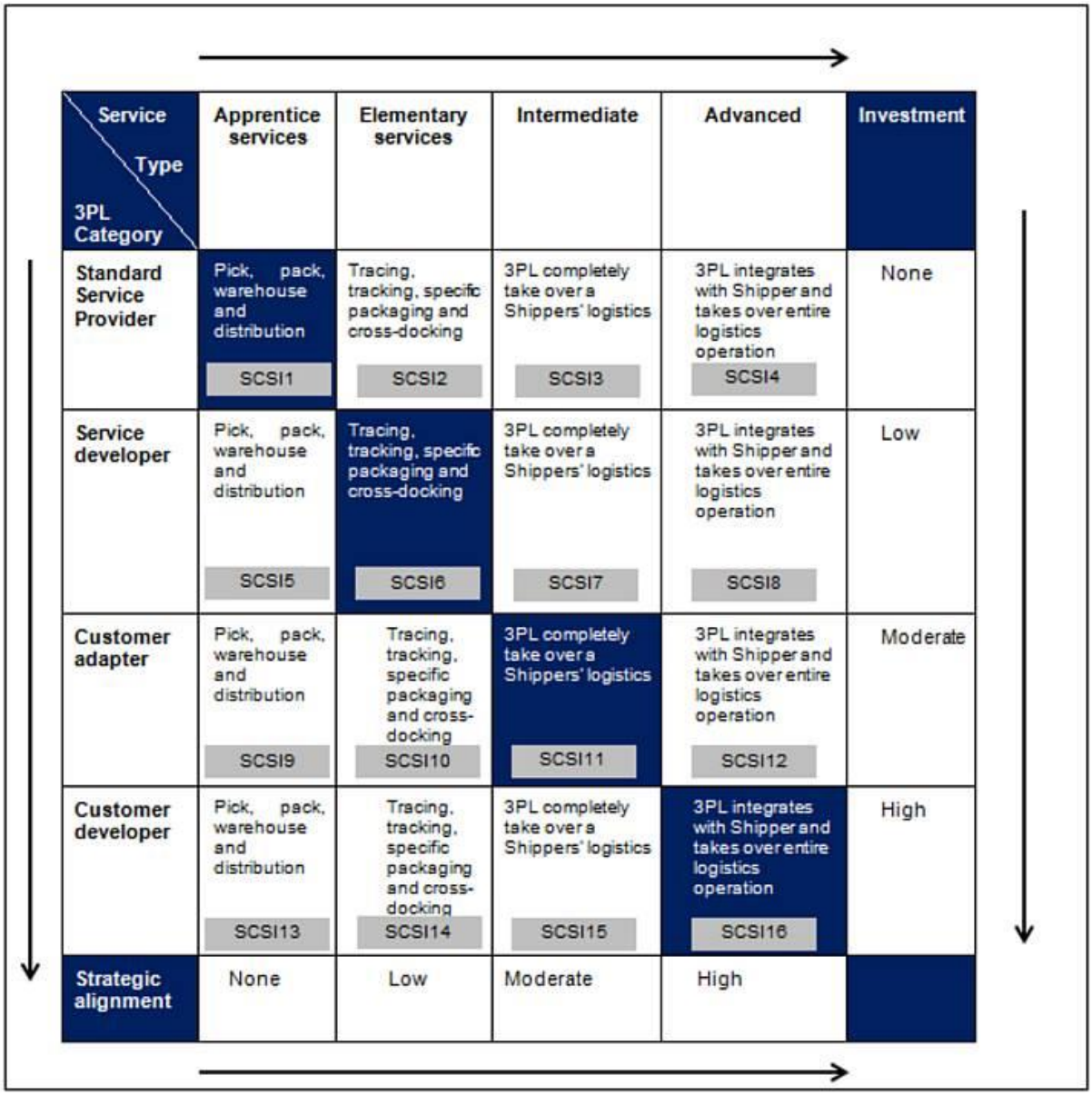

Figure 2.1: Development one: Services continuum as a mechanism for enabling the strategic decision-making model

SCSI1, SCSI6, SCSI11 and SCSI16 indicate the only correct matches, according to the services continuum. Mathematically, each of the four concepts is given a representative value, i.e. if an apprentice service is required, the service type 'S' is unknown, and is represented mathematically as S = ?, C = 1, S = 1, I = 1.

Thus:

S = C x S x I

= 1 x 1 x 1

= 1

Table 2.1 indicates the optimum alignment on the services continuum, based on mathematical formulation (permutation matrix).

Table 2.1: Services continuum mathematical alignment

Mathematical outcome	Placement on services continuum	SCSI alignment
1	SCSI1	Apprentice services, *standard service provider*, no strategic alignment and no investment required
8	SCSI6	Elementary service, *service developer*, low strategic alignment and low investment required
27	SCSI11	Intermediate service, *customer adapter*, moderate strategic alignment and moderate investment required
64	SCSI16	Advanced service, *customer developer*, high strategic alignment and high investment required

Table 2.1 indicates the optimal mathematical outcome for the four placements on the matrix. The first permutation result is 1 and the representative services continuum placement is that of the SCSI1 block. In terms of SCSI, this block translates into a certain specification of apprentice services, a *standard service provider* with no strategic alignment required, and with little to no investment required. Within the first layer, the only allowable outcome is 1, second layer 8, third layer 27 and the final layer is 64. The mathematical data set of the services continuum was developed in line with the permutation matrix, and each assigned value, according to the SCSI block, is multiplied in the subsequent value of the block. For example, an advanced service is required; thus, from the advanced services, the values of the remaining categories will be multiplied. Optimum alignment requirement is obtained once the value reaches 64. Should there be

any deviation from the standard per layer (mathematical outcome matched with placement on the services continuum, as depicted in Table 2.1), the alignment will be incorrect and the placement should be reconsidered. If the deviation is greater than the required outcome, it is indicative of wastages. The inverse is also true should the deviation be negative, and immediate adjustment is advised.

Figure 2.2 illustrates the mathematical formulation data sets of the services continuum.

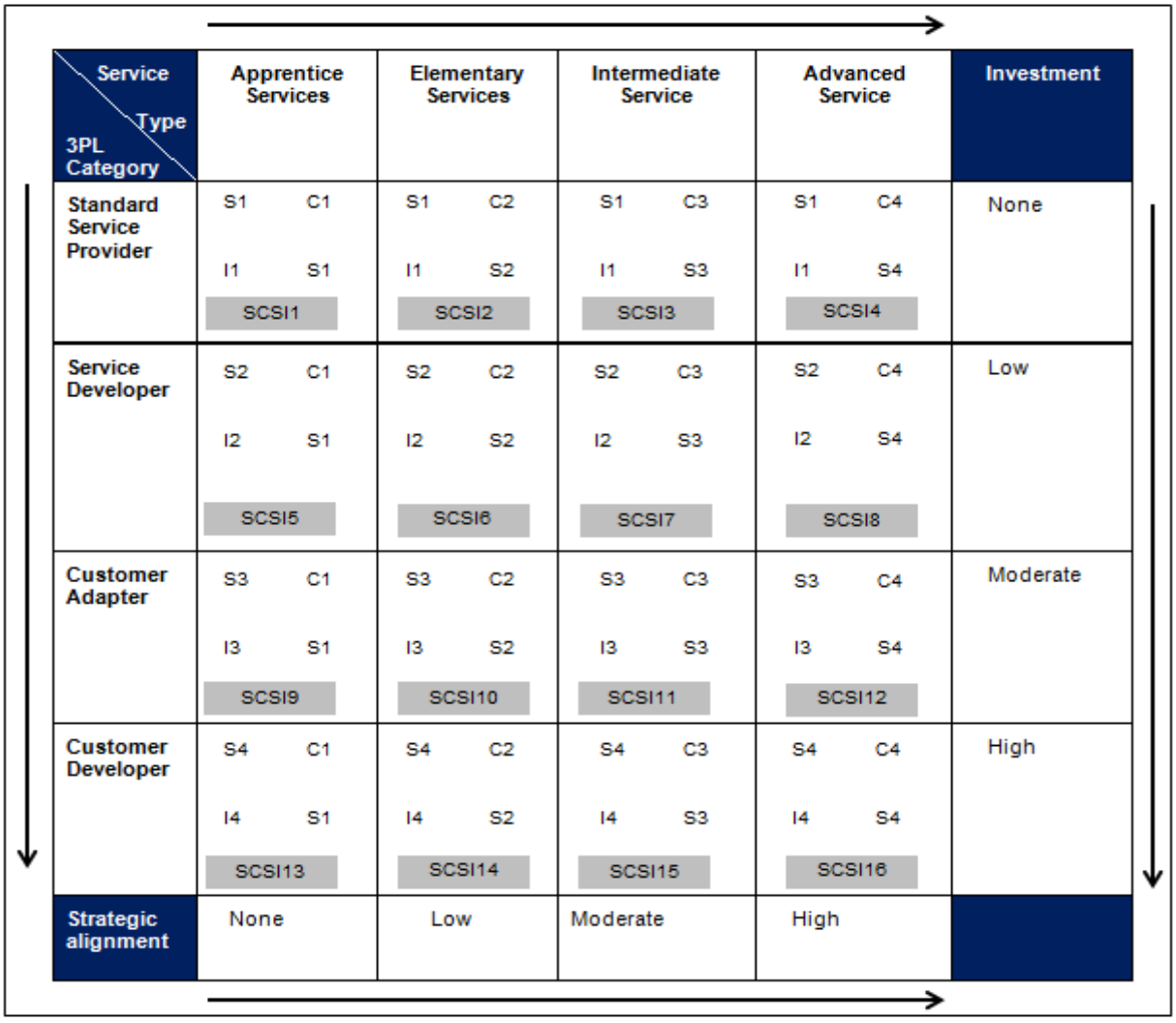

Figure 2.2: Services continuum mathematical formulation data sets

The application of the services continuum is discussed (see Subsections 2.3.1 – 2.3.4) by means of the four possible optimum permutation results, namely standard service provider (see 2.3.1), service developer (see 2.3.2), customer adapter (see 2.3.3), and customer developer (see 2.3.4) The discussion follows

the structure of permutation results in order to classify the four main optimum results possible from the services continuum.

2.3.1 Standard service provider (permutation result one)

The standard service 3PL provider represents the most basic form of outsourcing. It is typical for short-term transactional outsourcing, i.e. pick, pack, warehousing and distribution. There is no investment required by either the shipper or the 3PL provider. The services rendered are in the form of a catalogue service, coupled to a standard price for the service. Furthermore, no strategic alignment occurs between the 3PL provider and the shipper. This 3PL provider is chosen based on price, and no relationship management is required. Issue resolution is typically transactional in nature and handled via a query resolution system. An apprentice service is characterised by a 3PL provider who delivers a standard service. Figure 2.3 indicates the first permutation result in the highlighted block, 'apprentice services'.

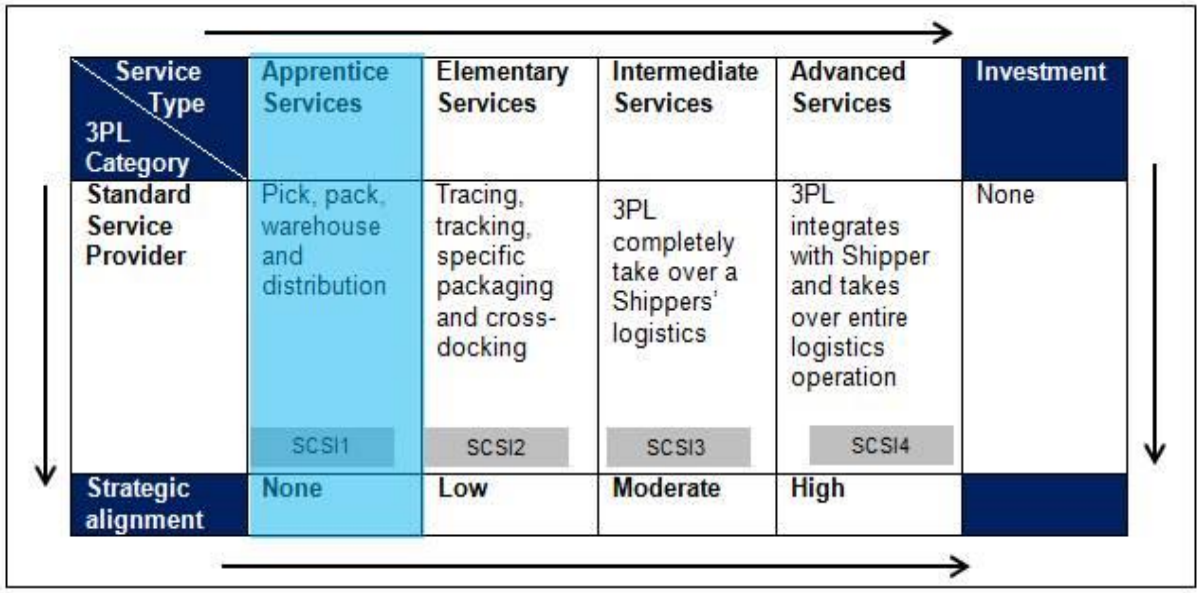

Figure 2.3: Services continuum – standard service provider / apprentice services SCSI1

The service type, reflected in Table 2.2, marks the standard service.

Table 2.2: Activities associated with 3PL providers – apprentice services illustration

Logistics processes	Activities
Transportation	Road, rail, sea, intermodal management, shipping, forwarding, packaging, express carrier, custom brokering, deconsolidation, perishable/hazardous goods management, freight bill payment/audit
Distribution	Order fulfilment and processing, picking, sorting, dispatching, post-production configuration, installation of products at customer's site
Warehousing	Storage, receiving, cross-docking, (de)consolidation, perishable/hazardous goods
Inventory management	Forecasting, slotting/layout design, location analysis, storage/retrieval management
Packaging	Design, labelling, assembly and packaging, palletising
Reverse logistics	Pallet flow management, recycling, reusing, remanufacturing, disposal management, repair, testing and product serving, return shipment management

Source: Adapted from Bottani and Rizzi (2006), Farahani *et al.* (2011) and Capgemini Consulting (2016)

Figure 2.3 indicates that any service type delivered by the 3PL provider within a specific row signifies an apprentice service. The logistics processes and the activity delivered within that process will be an apprentice service, i.e. for the logistics process of distribution, an apprentice service delivery is that of picking.

The works of Bottani and Rizzi (2006), Farahani *et al.* (2011) and Capgemini Consulting (2016) were used to draw up a single source of reference for this study concerning the different logistics processes and associated activities (see Table 2.2). This standard list of logistics processes and associated activities served as a uniform assessment mechanism for the four permutation results to indicate the scope of each. For this example (see Table 2.2), the apprentice service SCSI1 is characterised by the logistics process of packaging. The activities associated with the apprentice services are design, labelling, assembly and packaging and palletising. However, the shipper opts for a single activity, i.e. labelling.

2.3.2 Service developer (permutation result two)

The *service developer* category of 3PL providers is an advancement on the *standard service provider* in terms of involvement, investment and the strategic alignment necessary. Elementary services are encapsulated when the shipper requires the 3PL provider to provide the whole range of activities within a specific logistics process, i.e. where the 3PL provider takes ownership of the whole function of warehousing activities. Elementary services are transactional in nature, and integration within the shipper organisation is limited. The price paid is driven by catalogue-based prices, rather than risk and reward sharing. The *service developer* relies on internal skills and expertise to create value and is primarily front-office orientated.

Table 2.3: Activities associated with 3PL providers – elementary services illustration

Logistics processes	Activities
Transportation	Road, rail, sea, intermodal management, shipping, forwarding, packaging, express carrier, custom brokering, deconsolidation, perishable/hazardous goods management, freight bill payment/audit
Distribution	Order fulfilment and processing, picking, sorting, dispatching, post-production configuration, installation of products at customer's site
Warehousing	Storage, receiving, cross-docking, (de)consolidation, perishable/hazardous goods
Inventory management	Forecasting, slotting/layout design, location analysis, storage/retrieval management
Packaging	Design, labelling, assembly and packaging, palletising
Reverse logistics	Pallet flow management, recycling, reusing, remanufacturing, disposal management, repair, testing and product serving, return shipment management

Source: Adapted from Bottani and Rizzi (2006), Farahani *et al.* (2011) and Capgemini Consulting (2016)

Table 2.3 indicates that, for the logistics process of warehousing, a range of activities are sourced, i.e. storage and receiving.

Figure 2.4 indicates the best suitable solution for elementary services as the *service developer*, encompassing slight investment requirements, and the degree of strategic alignment is limited.

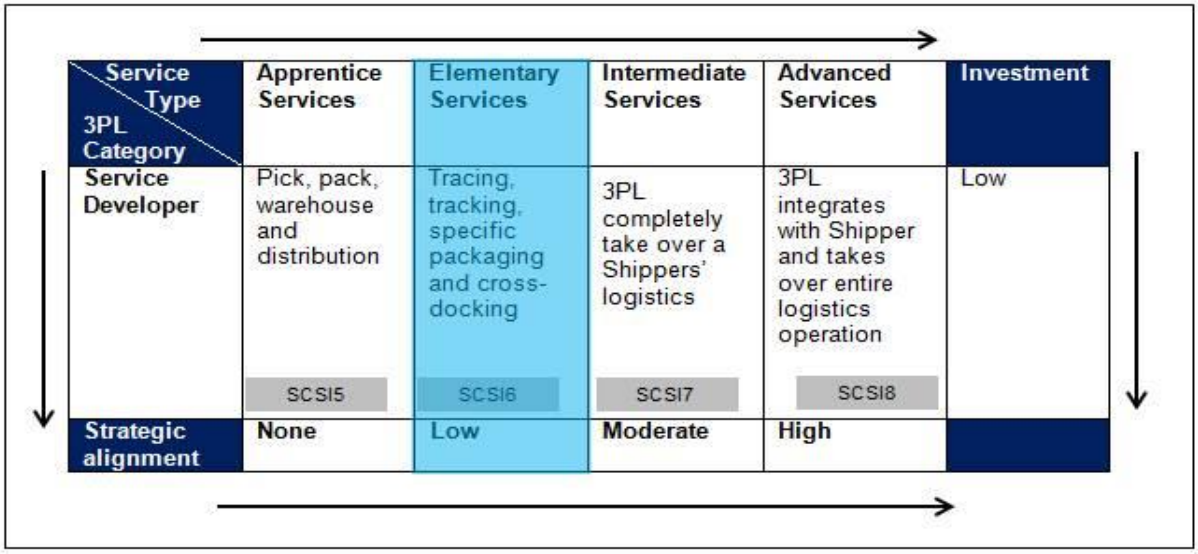

Figure 2.4: Services continuum – service developer / elementary services SCSI6

2.3.3 Customer adapter (permutation result three)

The *customer adapter* follows the *service developer* category. For this category of 3PL provider, the best-fitting service requirement represents intermediate services. A requirement of this category is that the shipper and the 3PL provider endeavour to commit to a moderate level of strategic alignment, as well as ensuring a moderate amount of investment. The intermediate service requirements manifest in the configuration of physical assets in the extended logistics network, meaning that the 3PL provider completely takes over the shipper's logistics (back-office-driven). Moderate sharing of risk is involved for both the shipper and 3PL provider. The services rendered are, to a large extent, not catalogue prices but are increasingly becoming a contracted rate negotiation. Noticeable of this category of 3PL provider, is the high degree of information sharing between shipper and 3PL provider, i.e. the 3PL provider will typically manage the whole logistics process involved, from distribution and inventory management. The 3PL provider is taking on relatively more responsibility in this

category and the shipper is becoming less of a purchaser of a catalogue service, but rather allowing the 3PL provider to become part and parcel of the shipper's operations. Table 2.4 indicates the activities associated with the *customer adapter* permutation result.

Table 2.4: Activities associated with 3PL providers – intermediate services illustration

Logistics processes	Activities
Transportation	Road, rail, sea, intermodal management, shipping, forwarding, packaging, express carrier, custom brokering, deconsolidation, perishable/hazardous goods management, freight bill payment/audit
Distribution	Order fulfilment and processing, picking, sorting, dispatching, post-production configuration, installation of products at customer's site
Warehousing	Storage, receiving, cross-docking, (de)consolidation, perishable/hazardous goods
Inventory management	Forecasting, slotting/layout design, location analysis, storage/retrieval management
Packaging	Design, labelling, assembly and packaging, palletising
Reverse logistics	Pallet flow management, recycling, reusing, remanufacturing, disposal management, repair, testing and product serving, return shipment management

Source: Adapted from Bottani and Rizzi (2006), Farahani *et al.* (2011) and Capgemini Consulting (2016)

Figure 2.5 indicates the optimal placement for intermediate services as the *customer adapter*, encompassing moderate investment and the degree of strategic alignment necessary.

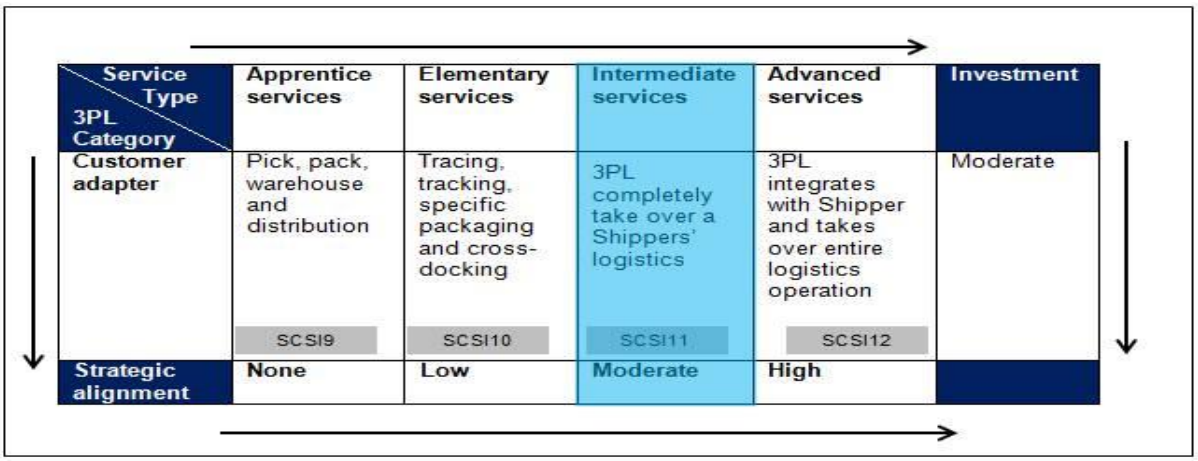

Figure 2.5: Services continuum – customer adapter / intermediate service SCSI11

2.3.4 Customer developer (permutation result four)

The *customer developer* 3PL provider category is the uppermost level of integration between shipper and 3PL provider. This requires a substantial amount of investment, as well as a clearly defined strategy (alignment is strategic in nature). The advanced service requirement refers to the 3PL provider taking over the entire logistics function, represented in Table 2.5.

Table 2.5: Activities associated with 3PL provider – advanced services illustration

Logistics processes	Activities
Transportation	Road, rail, sea, intermodal management, shipping, forwarding, packaging, express carrier, custom brokering, deconsolidation, perishable/hazardous goods management, freight bill payment/audit
Distribution	Order fulfilment and processing, picking, sorting, dispatching, post-production configuration, installation of products at customer's site
Warehousing	Storage, receiving, cross-docking, (de)consolidation, perishable/hazardous goods
Inventory management	Forecasting, slotting/layout design, location analysis, storage/retrieval management
Packaging	Design, labelling, assembly and packaging, palletising
Reverse logistics	Pallet flow management, recycling, reusing, remanufacturing, disposal management, repair, testing and product serving, return shipment management

Source: Adapted from Bottani and Rizzi (2006), Farahani *et al.* (2011) and Capgemini Consulting (2016)

Figure 2.6 indicates the optimal suitable solution for the *customer developer*, encompassing a high degree of investment and strategic alignment.

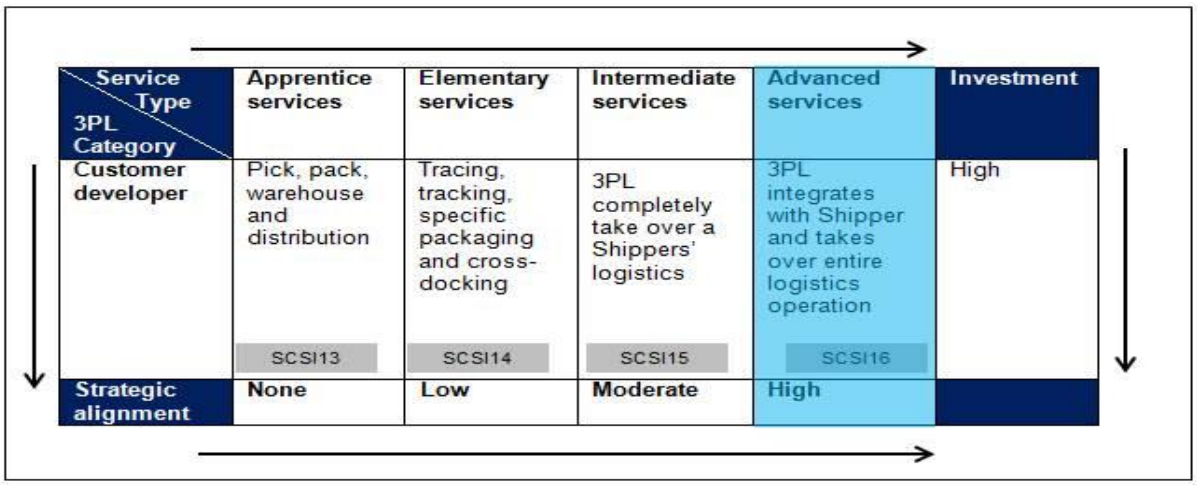

Figure 2.6: Services continuum – customer developer / advanced services SCSI16

The advanced service requires a 3PL provider that can integrate in totality with the shipper in order to provide a total logistics function. This is the most advanced form of the services continuum and requires the highest capital investment and strategic alignment. This type of relationship requires the utmost effort in order to be successful.

2.4 REVIEW AND CLASSIFICATION OF 3PL PROVIDER OUTSOURCING MODELS

Section 2.3 reflected the development of the services continuum with a mathematical foundation (permutation matrix), aimed at ensuring optimal alignment between shipper and 3PL provider. Four possible optimal results are achievable: SCSI1, SCSI6, SCSI11 and SCSI16. Section 2.4 is directed at the utilisation of the services continuum, as explained in Section 2.3, and classifies the reviewed 3PL provider outsourcing models into the appropriate optimal result.

Nine prominent outsourcing models were reviewed in a systematic approach, in which the core foundations of each model are discussed, followed by a model classification and placement on the services continuum. The nine outsourcing models form a comprehensive collection of the service types and categories of 3PL provider for application of the services continuum, starting from the first permutation result, right through to the fourth permutation result. The classification

of 3PL provider outsourcing models forms part of the first development of the dualistic approach with regard to the strategic decision-making model, namely the development of a services continuum.

The nine models discussed are those described by –

- Prockl *et al.* (2012), pioneers of, and well known for, the capabilities matrix;
- Bolumole (2003), who did extensive research into a framework for evaluating the supply chain role of 3PL providers;
- Perçin (2009), often cited for the classification of the outsourcing decision as a multi-criteria decision-making problem, which is solved mathematically;
- Monczka, Trent and Handfield (2005), who present a generic approach for supplier selection and evaluation;
- Hum (2000), in an extension of the Hayes–Wheelwright framework that sees collaboration of the outsourcing approach as stages of interaction between shipper and 3PL provider;
- Qureshi *et al.* (2008), well known within the 3PL provider research field for the development of a framework for service evaluation of 3PL providers;
- Hertz and Alfredsson (2003), frequently cited for the network approach utilised for the interconnected relationships and relationship development among 3PL providers, their customers and the customers' customers;
- Huo *et al.* (2008), utilising an estimated path model to indicate cost and service performance;
- Mellat-Parast and Spillan (2014), following a resourced-based view of competitive advantage and transaction cost theory in relation to integration.

These models are discussed in Subsections 2.4.1–2.4.9.

2.4.1 Prockl *et al*.'s (2012) capabilities matrix for 3PL provider services

Prockl *et al.* (2012) identified four value propositions for 3PL providers, namely:

- cost cutting – the ability of the 3PL provider to design and have processes that are more efficient than those the shipper has;
- improved quality – the ability of the 3PL provider to deliver improved quality through the processes deployed;
- transforming fixed costs into variable costs and enabling the shipper to focus on core activities; and
- expertise in the field – the shipper needs the specific expertise of the 3PL provider.

The capabilities matrix matches the needs and wants for sourcing of 3PL provider services with the structural settings in terms of resources and relationships. This is transformed into a unit of analysis, i.e. service offerings. The capabilities matrix distinguishes four generic stages of 3PL provider service offerings, namely 1a conventional plus, 2a cherry pickers, 1b service factory and 2b service lernstatt. Figure 2.7 indicates that each stage has a set of distinct characteristics.

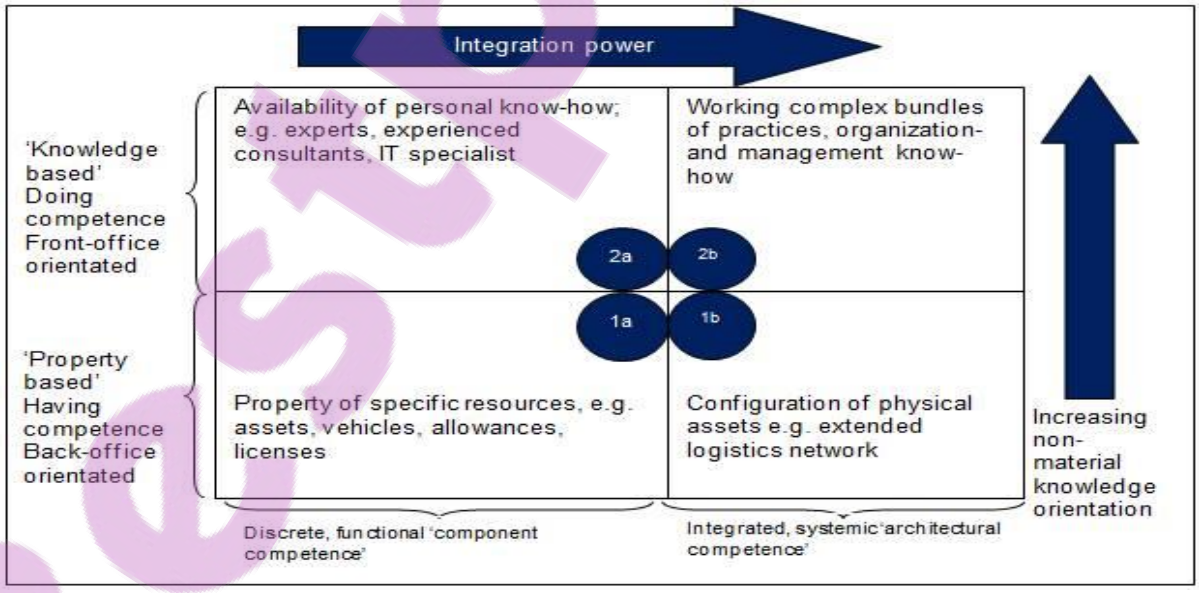

Figure 2.7: Capabilities matrix for 3PL provider services
Source: Prockl *et al*. (2012)

The convention plus quadrant (1a) indicates the most basic form of capabilities needed. The cherry pickers quadrant (2a) indicates an advancement on convention plus (1a); however, this is simply in terms of know-how specifics and not an advancement in integration between shipper and 3PL provider.

The service factory quadrant (1b) indicates advancement in integration between shipper and 3PL provider. This is typically an arrangement of a network (distribution). The final quadrant, service lernstatt (2b), is the most advanced form of integration in the matrix and indicates the highest level of integration power and involvement between a shipper and a 3PL provider.

Depending on the type of outsourcing decided upon, the level of integration will follow. When it is solely a once-off transactional type of outsourcing activity, integration will be limited in terms of systems and planning. Based on the capabilities matrix, Prockl *et al*. (2012) characterise quadrants where the number one appears as indicating the back office, and quadrants where the number two appears as indicating the front office.

The back office is characterised by limited customer interaction and value is created by process efficiency. The front office requires considerable amounts of customer involvement. The back office is, by nature, classified as a service factory. Efficiency is the primary focus of the back office and the service is relatively generic, enabling services to be replicated with ease. The front office is classified as ‘lernstatt’, requiring intervention and a custom-made service delivery system.

Table 2.6: Comparison of the generic business models for service factory and service lernstatt

Generic business model	3PL provider service factory	3PL provider service lernstatt
Basic value proposition	Promising value by effective and efficient processes of the service provider – 'one-stop shopping'	Promising value by providing know-how and impulses for innovation for the processes of the client – 'customised solutions'
Characteristics of the fulfilment structure ▪ Institutional layer ▪ Physical goods layer	Separated efficient domains with as few clearly defined interfaces as necessary ▪ Control of the own domain; designed for multiple users ▪ Efficient management of homogeneous networks	Set-up and further development of shared solutions ▪ Transfers of undertakings, joint ventures, other operating models: mutual linkages and overlaps dedicated to single user ▪ According to project, adaptive structures: agility, flexibility, customer orientation
Profit mechanism ▪ Relationship layer to the client ▪ Financial performance	Contribute to the margins by build-up and mobilisation of efficient operational systems ▪ Branding of performance capability ▪ Competitive prices based on utilisation (synergies) of the core business, transaction, volume-based	Participate in the development by close, reciprocal linkages ▪ Change management, trust relationship ▪ Cost coverage and participation on savings and improvements, open book, monitoring

Source: Prockl *et al*. (2012)

From the comparison in Table 2.6, it is evident that the service factory is utilised for generic-type service requirements, whereas the service lernstatt is utilised for complex and relationship-intense service requirements.

The capabilities matrix provides a framework that serves the spectrum of services within the services continuum – from basic services rendered, i.e. service factory, to advanced services required, i.e. service lernstatt. The capabilities matrix can be utilised for outsourcing from SCSI1 to SCSI16. The capabilities matrix has to assist the shipper with classifying the service type required. The capabilities per category should be utilised as a guideline to align with 3PL providers. The categories as set out by Prockl *et al.* (2012) are assigned to the optimum solution grouping of the services continuum reflected in Table 2.7.

Table 2.7: Groupings classification of Prockl *et al*. (2012) vs services continuum

Prockl *et al.* (2012) grouping	Corresponding services continuum grouping
Conventional plus	SCSI1
Cherry pickers	SCSI6
Service factory	SCSI11
Service lernstatt	SCSI16

The corresponding services continuum grouping is based on the most suitable grouping, following the investment and services required, and the integration necessary, to ensure that the outsourcing venture is successful. The four major categories on the services continuum (SCSI1, SCSI6, SCSI11 and SCSI16) represent the most suitable fit according to the categories of the capabilities matrix.

2.4.2 Bolumole's (2003) framework for evaluating the supply chain role of 3PL providers

This is a framework utilised to understand the effect of a single supply chain on the role players. Comprehensive supply chain relationships hold implications for the traditional 3PL provider, as logistics outsourcing becomes more complex (Bolumole, 2003). There are six dimensions for evaluating the role of the 3PL provider. The first is called the 'Operational-level functions + internal focus + transactional relationship + cost-based perceptions'. This combination represents the lowest form of contribution for which the 3PL provider provides a service, and it typically comprises operational-level activities, i.e. transport and warehousing. The 3PL provider delivers very little in terms of value-added services. This strategy is typically employed by shippers when purely focussing on costs. In this type of outsourcing, the shipper does not easily delegate strategic assets to the 3PL provider and there is a relatively high probability of poor relationships. The second dimension is called 'Operational-level functions + external focus + transactional relationships + resource-based perceptions'. This is found where the shipper orientates towards a cross-functional and external supply chain. The 3PL

provider involvement is still limited to operational silos. The third dimension is ‘Tactical-level functions + internal focus + bilateral relationships + cost-based perception’. This combination refers to shippers that increase involvement in their in-house activities, yet focus on internal profitability at the expense of the supply chain. The fourth 3PL provider evaluation dimension is ‘Tactical-level functions + external focus + bilateral relationship + resource-based perceptions’. This is typically a once-off, short-term relationship in periods of excessive market peaks that a shipper’s infrastructure is unable to handle. This dimension utilises transactional systems to manage day-to-day operations; however, as time progresses, informal information sharing becomes valuable to the venture. The fifth dimension for evaluating 3PL providers is ‘Strategic-level functions + internal focus + partnership-type relationship + cost-based perceptions’. This refers to the 3PL provider constantly attempting to organise and develop resources in order to achieve the shipper’s strategic objective. The shipper’s internal focus is, however, not matched with the 3PL provider to integrate total logistics, to the detriment of the supply chain. The venture is marked by a strategic, yet cost-based view. The sixth dimension is the ‘Strategic-level functions + external focus + partnership-type relationships + resource-based perceptions’. This dimension refers to adequate information sharing between shipper and 3PL provider. The shipper has an external approach to outsourcing and has a cross-functional focus with regard to supply chain profitability.

There are four functions that influence the supply chain role of 3PL providers, namely strategic orientation of the 3PL provider, perceptions of the role of 3PL providers within the logistics strategy, the nature of the shipper, and the extent to which logistics is outsourced, as depicted in Table 2.8.

Table 2.8: Range of descriptive attributes for factors influencing the supply chain role of 3PL providers

Factors influencing 3PL providers' supply chain role	Range of attributes with descriptive dimensions
Organisations' strategic orientations	Focus: Internal (silos) to external (cross-functional and supply chain)
Perception of 3PL provider's role within logistics strategy	Perceptions: Cost reduction to resource enablement to logistics integration in the supply chain
Nature of the client–3PL provider relationship	Relationships: Transactional (arms-length) contracts to bilateral strategic alliances to supply chain partners
The extent to which logistics is outsourced	Functional duties: Operational to tactical to strategic

Source: Bolumole (2003)

Depending on the collaboration required, different sets of integration and planning are needed, as is the case with performance measurement. Bolumole (2003) presents a framework for evaluating the supply chain role of 3PL providers. This model is indicated in Figure 2.8.

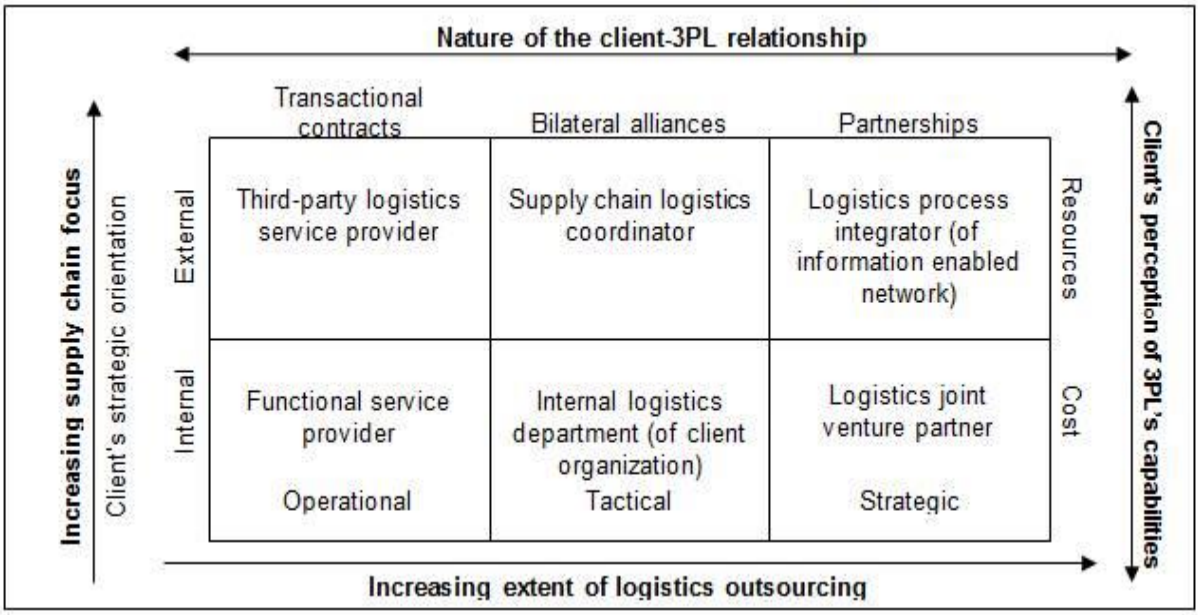

Figure 2.8: Evaluating the supply chain role of 3PL providers
Source: Bolumole (2003)

The framework depicted in Figure 2.8 follows a cause-and-effect pattern. The model has four principal constructs:

- client organisation's strategic orientation;
- perception of the 3PL provider's function;

- nature of the outsourcing relationship; and,
- extent of outsourcing.

The classification, as depicted in Figure 2.8, is not static and any or all of the groups could move in either direction on this framework.

Literature suggests that the nature of 3PL providers had not started out as being strategic or as partnerships (see far right in Figure 2.8). Rather, the process of outsourcing started at operational level (transactional contracts), which then cascaded to the next level (bilateral alliances and later followed by partnerships). This is illustrated by the forward progression in Figure 2.9, moving from left to right.

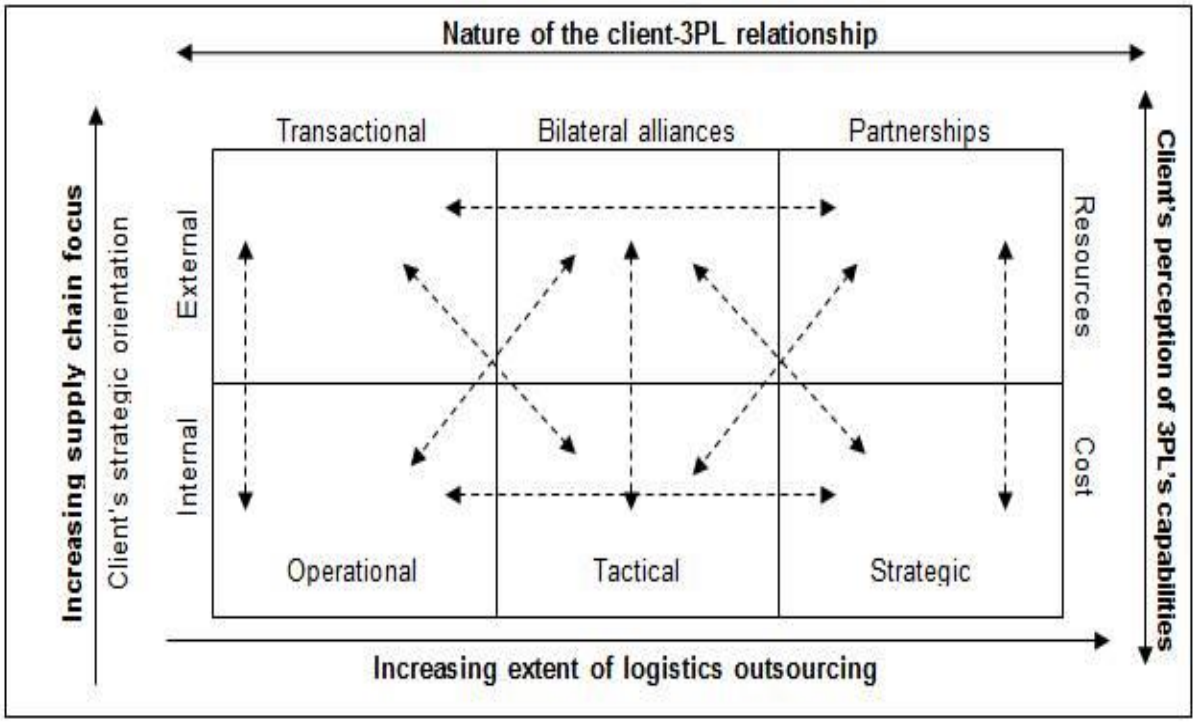

Figure 2.9: 3PL provider relationships over time
Source: Bolumole (2003)

Bolumole's (2003) classification provides a deeper level of detail to the four classifications by Prockl *et al.* (2012) (see Subsection 2.4.1). Bolumole (2003) has an internal vs external and resources vs costs approach. The nature of the 3PL provider relationship is based on the shipper's strategic orientation and the shipper's perception of the 3PL provider's capabilities. The increasing ambit of the

shipper and 3PL provider relationship is indicated as progressing from a cost-based approach to a resource-based view. There are, however, similarities between the work of Prockl *et al*. (2012) and Bolumole (2003), as both group 3PL providers into categories. These categories share similarities in terms of which the shipper and 3PL provider need to align in order to be successful in the outsourcing venture.

Table 2.9 indicates the grouping according to Bolumole (2003), together with the corresponding services continuum groupings. The groupings provide an understanding of the requirements for each level on the services continuum.

Table 2.9: Groupings classification of Bolumole (2003) vs services continuum

Bolumole's (2003) grouping	Corresponding services continuum grouping
Transactional grouping	SCSI1
Operational grouping	SCSI1, with more integration than the transactional grouping
Tactical grouping	SCSI6
Bilateral alliances grouping	SCSI6, with more integration than the tactical grouping
Strategic grouping	SCSI11
Partnerships grouping	SCSI16

2.4.3 Perçin's (2009) mathematical model

The outsourcing decision is deemed to be a multi-criteria decision-making (MCDM) problem. The reasoning for the classification as MCDM can be ascribed to the availability of information, both in terms of quantitative and qualitative data, coupled to the vast array of criteria that warrant consideration. A mathematical model for evaluating and selecting 3PL providers is presented by first following a modified Delphi method. The modified Delphi method is a structured approach whereby a panel of experts discuss and defend their knowledge and expertise up to the point whereby mutual consensus is achieved (Li, 2005).

Figure 2.10 indicates the process developed for the evaluation of 3PL providers.

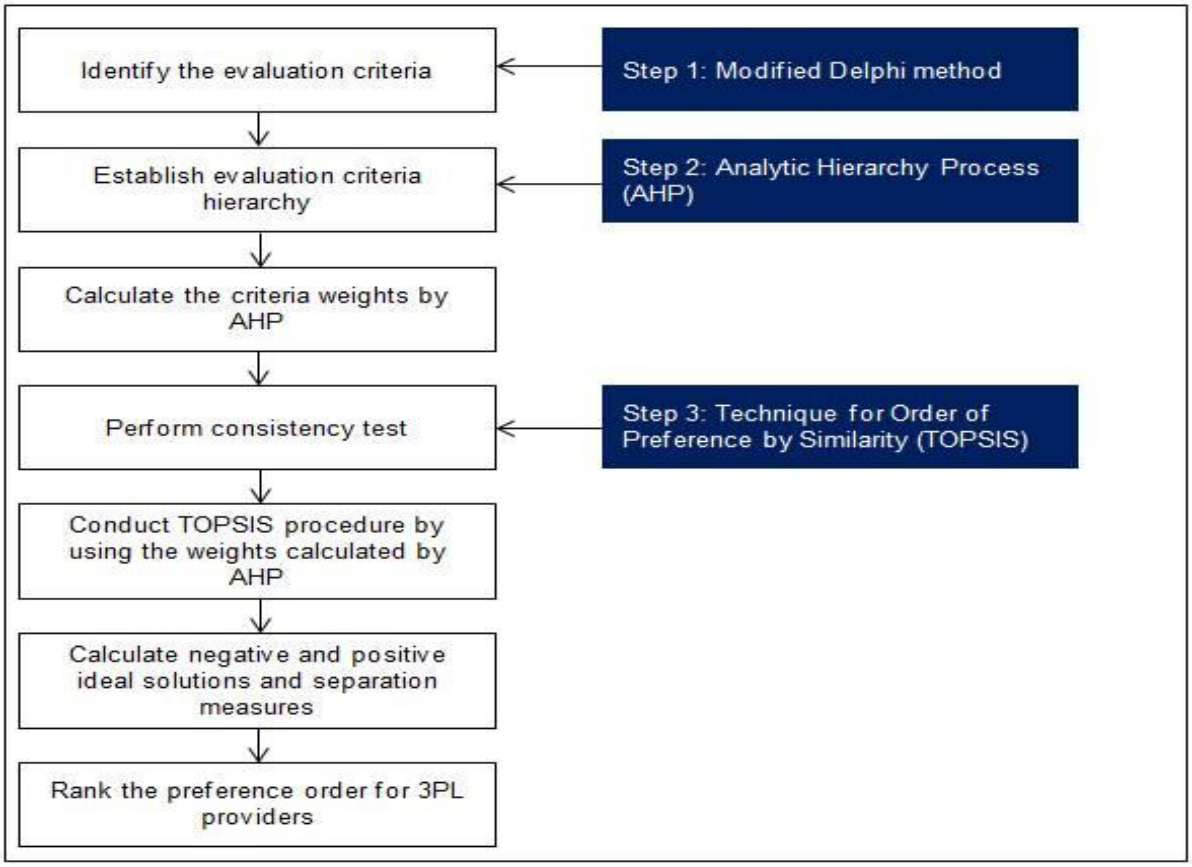

Figure 2.10: Evaluation of 3PL providers

Source: Perçin (2009)

The modified Delphi method consists of five steps: step one, select the experts; step two, conduct the first round of surveys; step three, conduct the second round of questionnaire surveys; step four, conduct the third round of questionnaire surveys; and step five, integrate a group of experts' opinions and reach consensus. From the modified Delphi, weights are calculated utilising an analytic hierarchy process (AHP). The AHP was developed to solve MCDM problems that involve multiple quantitative and qualitative criteria and allow for preference specification in terms of a 1–9 scale (Saaty, 1980; 1994). The purpose of AHP is to assign weights to each criterion, which requires three steps: step one, establishing evaluation criteria hierarchy; step two, assessing the decision-maker

evaluations by pairwise comparisons; and step three, using the eigenvector[4] method to derive weights for criteria. The AHP procedure comprised three steps: 1, establish a pairwise comparison decision matrix; 2, normalise the decision matrix and calculate the priorities of this matrix; and 3, do consistency checks. AHP is followed by implementing the technique for order of preference by similarity to ideal solution (TOPSIS). According to Hwang and Yoon (1981), TOPSIS is used to choose mathematically the shortest distance from the ideal solution and to indicate the furthest distance from the ideal solution. The TOPSIS model follows six steps:

- calculate the normalised decision matrix;
- calculate the weighted normalised decision matrix;
- determine the ideal and the negative ideal solutions;
- calculate the separation measures, using the *n*-dimensional Euclidean distance;
- calculate the relative closeness to the ideal solution; and
- rank the preference order.

4 Eigenvectors are a special set of vectors associated with a linear system of equations (matrix equation) with any non-zero vector whereby $V_1 = V_2$ solves the equation (Wolfram Mathworld, 2017).

The hierarchical structure of Perçin (2009) is displayed in Figure 2.11.

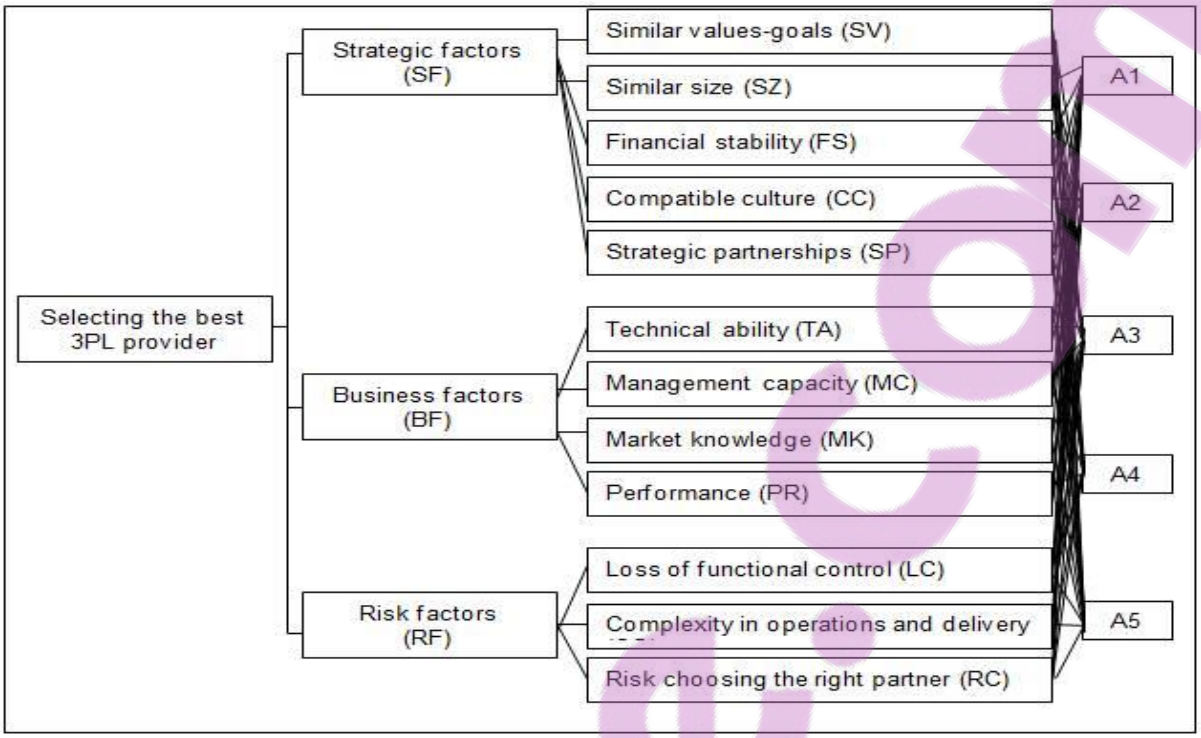

Figure 2.11: Hierarchical structure to select the best 3PL provider

Source: Perçin (2009)

From the criteria reflected in Figure 2.11, a pairwise comparison matrix was drawn up and normalised (see Table 2.10 and Table 2.11).

Table 2.10: Pairwise comparison matrix of listed criteria

Goal	Strategic factors (SFs)	Business factors (BFs)	Risk factors (RFs)
SF	1	0.689	1.651
BF	1.452	1	1.848
RF	0.606	0.541	1
Notes: λmax = 3.014; CI = 0.007; CR = 0.014			

Source: Perçin (2009)

Table 2.11: Normalised decision matrix

Criteria	Strategic factors				Business factors					Risk factors		
Sub-criteria	Values	Size	Finance	Culture	Partner	Technical	Management	Market	Performance	control	Operation	partner
Alternatives												
A1	0.699	0.754	0.621	0.730	0.790	0.414	0.680	0.507	0.691	0.741	0.384	0.647
A2	0.211	0.363	0.420	0.181	0.277	0.476	0.405	0.355	0.451	0.460	0.436	0.598
A3	0.379	0.460	0.491	0.361	0.293	0.331	0.127	0.438	0.311	0.404	0.305	0.325
A4	0.488	0.268	0.390	0.392	0.393	0.657	0.460	0.227	0.442	0.143	0.604	0.255
A5	0.292	0.128	0.211	0.388	0.241	0.246	0.382	0.611	0.163	0.234	0.452	0.230

Source: Perçin (2009)

Once the evaluation criteria have been established, the model is mathematically driven. It is therefore critical that the modified Delphi technique be executed with precision. The model can be utilised across all categories of the services continuum. The model is generic in nature, and the population of the evaluation criteria is dependent on the required deliverables of the outsourcing relationship. The weighing criteria are established per case, as different business deliverables will dictate different weight allocations.

2.4.4 Monczka *et al*.'s (2005) supplier selection and evaluation process

There are numerous areas where supplier evaluation and selection decisions might arise, i.e. "during outsourcing analyses, when consolidating volumes across a business, when conducting a reverse auction, when current supplier have insufficient capacity, when reducing the size of the supply base" (Monczka *et al.*, 2005: 210). Given the universality of the supplier selection and evaluation framework, the framework fits well into this discussion, whether it is outsourcing due to short-term capacity constraints or due to longer-term outsourcing requirements. The supplier is the 3PL provider and the principles of the supplier selection and evaluation framework can be applied. The supplier evaluation and

selection process are indicated in Figure 2.12.

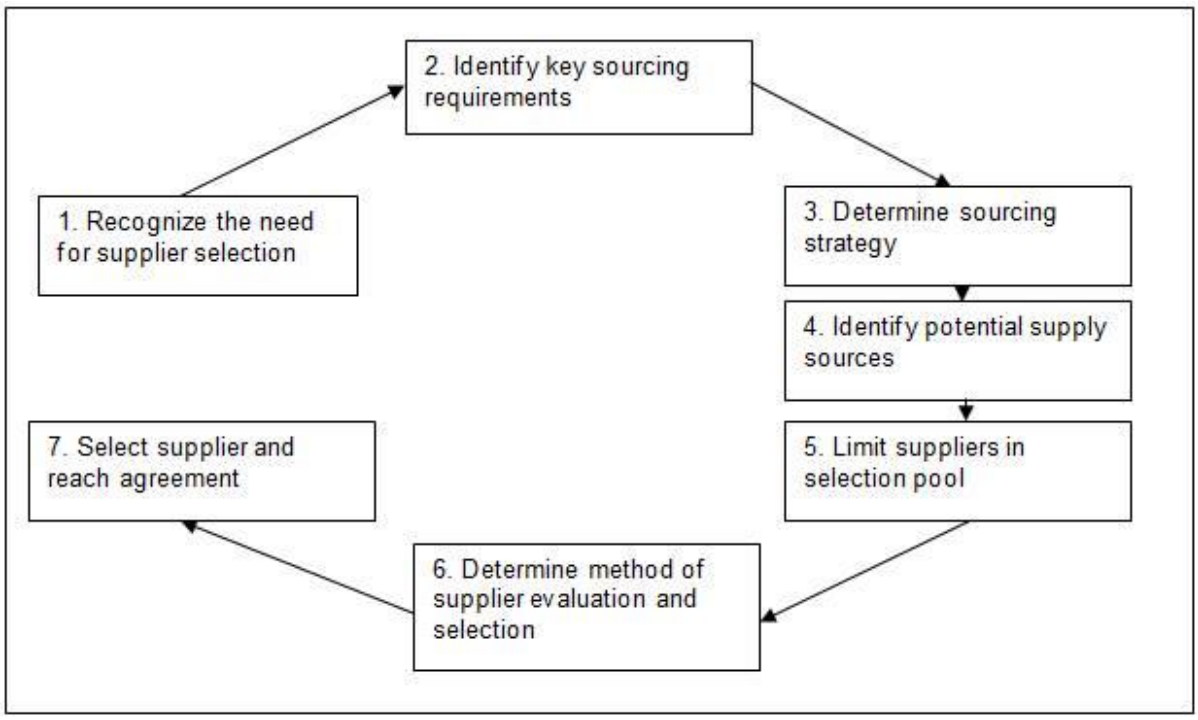

Figure 2.12: Supplier evaluation and selection process
Source: Monczka *et al*. (2005: 209)

Figure 2.12 displays the start of the supplier evaluation and selection process as being the recognition of a need for a supplier. The second step is to identify key sourcing requirements, i.e. requirements from the outsourcing process. During the second step, the authors denote key supplier evaluation criteria, i.e. supplier quality, cost, and delivery performance. This criterion is business-specific and forms the basis evaluation of a potential 3PL provider. Step three is to determine a sourcing strategy as the shipper needs to determine whether a single-source approach should be adopted for the outsourcing function or whether a multitude of specialised 3PL providers should be deployed. Monczka *et al*. (2005) indicate that there are six decisions that need clarification: single vs multiple supply sources; selecting suppliers that provide design support vs those that back design capability; full service vs non-full service suppliers; domestic vs foreign suppliers; and expectation of a close working relationship vs arm's-length purchasing. The fourth step is to identify potential supply sources, i.e. potential 3PL providers.

Following below are guidelines in terms of the effort and intensity of the search required to identify a potential supply source:

- high capability of current suppliers – high strategic importance of requirement: minor to moderate information search;
- high capability of current suppliers – low strategic importance of requirement: minor information search;
- low capability of current suppliers – high strategic importance of requirement: major information search; and
- low capability of current suppliers – low strategic importance required: minor to moderate information search.

Step five refers to delimiting the potential suppliers in the selection pool. The following criteria are referred to in support of narrowing the supplier list: financial risk analysis, evaluation of supplier performance, and evaluation of supplier-provided information. Step six is to determine the method of supplier evaluation and selection. Given the initial reduction of potential suppliers from step five, it is now possible to evaluate the remainder of potential suppliers more closely. In an attempt to reduce the remainder of the suppliers further, the following guidelines apply: evaluation of supplier-provided information, supplier visits, use of preferred suppliers, and external or third-party information. The last step is to select a supplier and to reach mutual agreement on deliverables. In this step, the supplier/3PL provider is chosen and agreement is reached on the deliverables.

As a final section of the supplier evaluation and selection process, the supplier evaluation and selection survey, compromising seven steps, should commence. The seven steps necessary to develop a supplier evaluation and selection survey (see Monczka *et al.*, 2005) are:

Step one: Identify supplier evaluation categories

Categories identified by the shipper are included. i.e. financial stability.

Step two: Assign a weight to each evaluation category

Assign a weight to all categories and the total of the combined weights must equal 1.0.

Step three: Identify and weigh subcategories

Step two assigned a weight to the broad categories. Step three assigns weights to subcategories within the broad categories.

Step four: Define the scoring system for categories and subcategories

The scoring system should be accurate to indicate precisely what is meant by each score. Monczka *et al*. (2005) refer to a four-point scale where each number clearly indicates what is meant by each point. Major non-conformance = 0, minor non-conformance = 1, conformity = 2, and lastly, adequacy = 3. In this scoring system, there is no ambiguity, and the scorer can clearly differentiate on the scoring scale.

Step five: Evaluate supplier directly

The shipper visits the site of the 3PL provider to conduct an evaluation on the shipper's facilities.

Step six: Review evaluation results and make selection decision

From the evaluation results, the shipper organisation needs to make a decision regarding the appointment of the 3PL provider. If there were shortcomings found by the evaluation, the nature of the shortcomings is evaluated in order to identify whether they can be overcome and whether they pose a threat to the shipper.

Step seven: Review and improve supplier performance continually

The 3PL provider needs to perform according to the agreement with the shipper. The shipper and 3PL provider need to work together to strive continually to improve performance.

Coupled to the seven steps, there are five characteristics necessary to implement an effective survey, namely:

- the survey should be comprehensive;
- the survey needs to be objective;

- the measurement scales of the survey should be reliable;
- the survey should be flexible; and lastly,
- the survey should be mathematically straightforward.

The approach of Monczka *et al*. (2005) concerning outsourcing follows a holistic and somewhat generic approach. The model and the approach are structured firmly, based on the selection criteria coupled to the requirements of the shipper. The evaluation criteria are dependent on the required deliverables of the outsourcing partnership. The model can be utilised for any category of the services continuum. Monczka *et al.* (2005) and Perçin (2009) utilised weighting criteria in order to assign importance to the criteria.

2.4.5 Hum's extension of the Hayes–Wheelwright framework

Collaboration is based on stages of interaction between shipper and 3PL provider. Hum (2000) proposed an extension of the Hayes–Wheelwright framework for the strategic management of 3PL provider services. The Hayes–Wheelwright framework is a strategic framework for measuring manufacturing effectiveness. According to the Hayes–Wheelwright framework, the degree of manufacturing effectiveness can be evaluated as a continuum from stage one to four. Stage 1 of effectiveness describes the role of the manufacturing function as 'internally neutral'. In this stage, the manufacturing function is neither proactive nor locked into any particular form of technology. The manufacturing function does not have a strategic role and is internally neutral. In the progression to Stage 2, 'externally neutral', the manufacturing function will seek and adopt industry practices and standards. Stage 3, 'internally supportive', is where the manufacturing function becomes internally supportive of the overall business objective. Stage 4 is where the manufacturing function becomes 'externally supportive'. This stage refers to the manufacturing function becoming so effective that it can provide a manufacturing-based strategy. According to Hum (2000), the Hayes–Wheelwright framework can be extended to the strategic management of the logistics function.

The 3PL provider should utilise this model to build its logistics capabilities in order to operate at the fourth stage of the Hayes–Wheelwright framework, providing logistics-based capabilities for its customers.

Four litmus tests are utilised in conjunction with the Hayes–Wheelwright framework in order to assist the manufacturing function to determine the level of effectiveness. The four litmus tests indicate what is required to be achieved per stage of the Hayes–Wheelwright framework and these requirements become the target per stage of the framework. The tests are described below.

- Test one: the amount of in-house improvement and innovation. This test is designed to ascertain the required amount of continual improvement as part of the total quality management system. The author argues that, for the 3PL provider, this translates into rallying the intellectual base of the 3PL provider's entire workforce to strive for the continual improvement of its logistics processes and capabilities.
- Test two: the extent to which the organisation should develop its own logistics systems. This test examines the development of internal resources and the primary reliance on such internal resources required for the development and use of the 3PL provider's logistics systems and technologies.
- Test three: the amount of attention devoted to logistics structure and infrastructure. This test requires equal attention to be given to large structural as well as small infrastructural logistics decisions.
- Test four: the link between product design and service delivery design. This test requires concurrent engineering work as well as concurrent logistics work.

The four stages of the Hayes–Wheelwright framework are broadly classified on the services continuum according to the categorisation of Prockl *et al.* (2012). The discussion by Hum (2000) indicates four tests to evaluate whether the 3PL provider is capable of performing to the required standard necessitated by the specific category of the services continuum. The four tests were adopted and utilised to work in accordance with the services continuum; however, the approach is limited in the amount of detail with regard to the services continuum classification. Table 2.12 indicates the grouping as suggested by Hum (2000), together the corresponding services continuum groupings. The groupings provide an understanding of the requirements for each level on the services continuum.

Table 2.12: Groupings classification of Hum (2000) vs services continuum

Hum (2000) grouping	Corresponding services continuum grouping
Stage 1: internally neutral	SCSI1
Stage 2: externally neutral	SCSI6
Stage 3: internally supportive	SCSI11
Stage 4: externally supportive	SCSI16

2.4.6 Qureshi *et al*.'s (2008) outsourcing variables differentiated model

This is a framework of criteria for evaluation of 3PL provider services (Qureshi *et al.*, 2008). The process starts by researching and obtaining data regarding the services required. In order to collect the necessary data, the service required needs to be refined. This information is utilised in the next step to develop the requirements for the 3PL provider. Once the requirements have been developed, potential 3PL providers are identified. The next step is to develop the request for proposal (RFP). A scientific approach is advocated for weighting and evaluating the criteria. The next stages are to evaluate the RFP responses received and to make a decision regarding which 3PL provider to select.

Figure 2.13 indicates the process for establishing key criteria in the selection process.

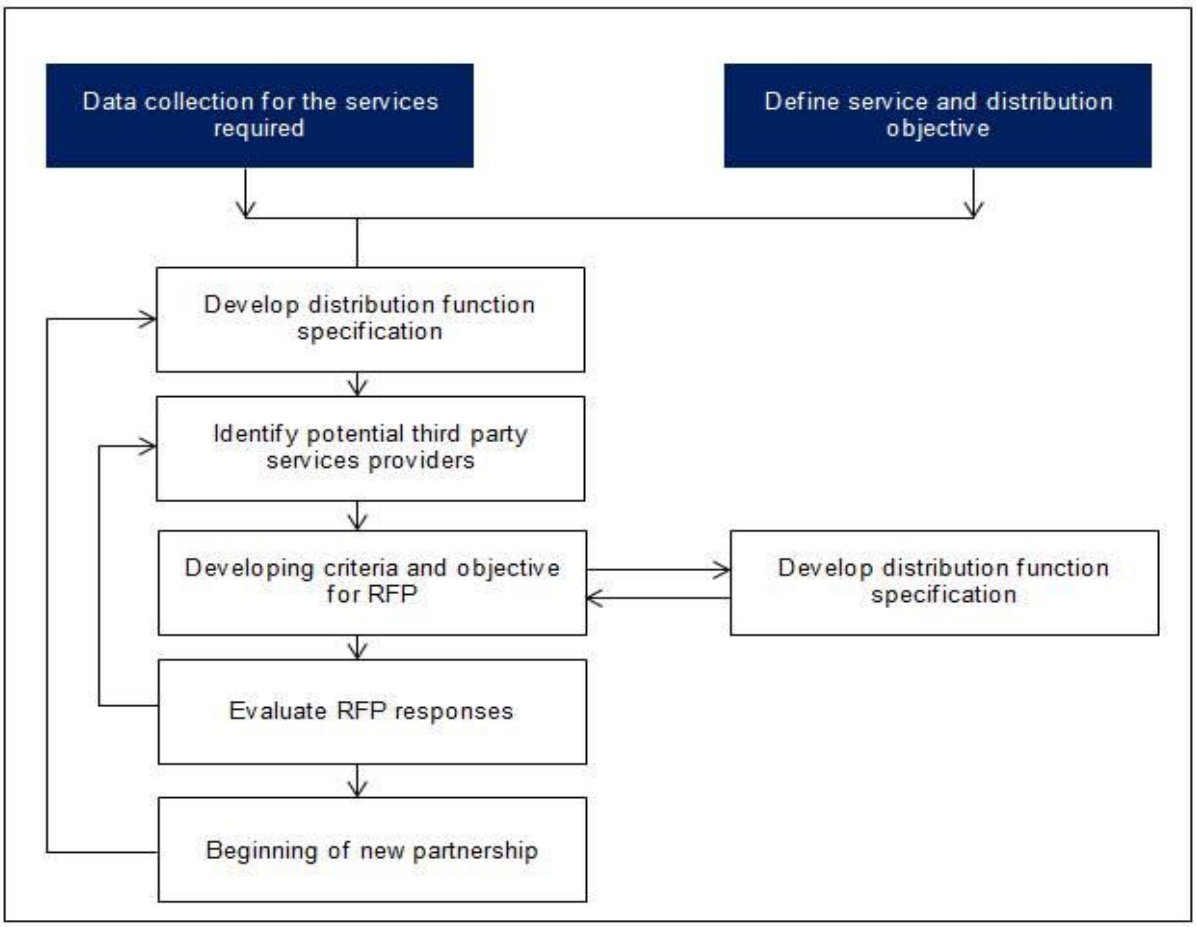

Figure 2.13: Role of key criteria in the selection 3PL providers
Source: Qureshi *et al*. (2008)

Enabling and outcome variables are utilised in interpretive structural modelling (ISM). ISM is utilised to form relationships between the different variables by means of a structural self-interaction matrix (SSIM). The enablers of the logistics outsourcing relationship are: commitment/trust, top management support, two-way information sharing, added distinctive value through total quality management and just-in-time (JIT) practice, coordination, involvement, evaluation of supplier performance, and long-term contracts. The outcome variables of the outsourcing relationship are defined as: customer satisfaction, dedicated resources, customer service levels, logistics costs saving, expanded outsourcing, enhanced value, productivity enhancement, and competitive advantage (Qureshi *et al.*, 2008).

The following are the key criteria for assessment of 3PL providers:

- quality of service;
- size and quality of fixed assets;
- quality of management;
- IT capability;
- delivery performance;
- information sharing and trust;
- operational performance;
- compatibility;
- financial stability;
- geographical spread and range of services;
- long-term relationships;
- reputation;
- optimum cost;
- surge capacity; and
- flexibility in operations.

The framework for 3PL provider evaluation criteria (see Qureshi *et al.*, 2008) indicates relevant evaluation criteria. The framework goes further and utilises ISM to form relationships between enabling and outcome variables in the SSIM in terms of model specifics. This model, based on mathematics, can be utilised for any category on the services continuum. The relationship between enabling and outcome variables is a characteristic of the framework and provides valuable insight per category across the services continuum.

2.4.7 Hertz and Alfredsson's (2003) four categories of 3PL providers model

A network approach is utilised for the interconnected relationships and relationship development among 3PL providers, their customers (shippers), and the customers' customers. The framework is divided into three parts:

- an overview of 3PL providers;
- 3PL provider adaption against general abilities and customer orientation; and
- relationship and network development.

Customer adaption and the general ability of problem-solving by the 3PL provider is utilised as dimensions in order to differentiate between 3PL providers (Hertz and Alfredsson, 2003). Figure 2.14 utilises the dimensions in order to differentiate 3PL providers. The top right-hand quadrant indicates 3PL provider industry activity.

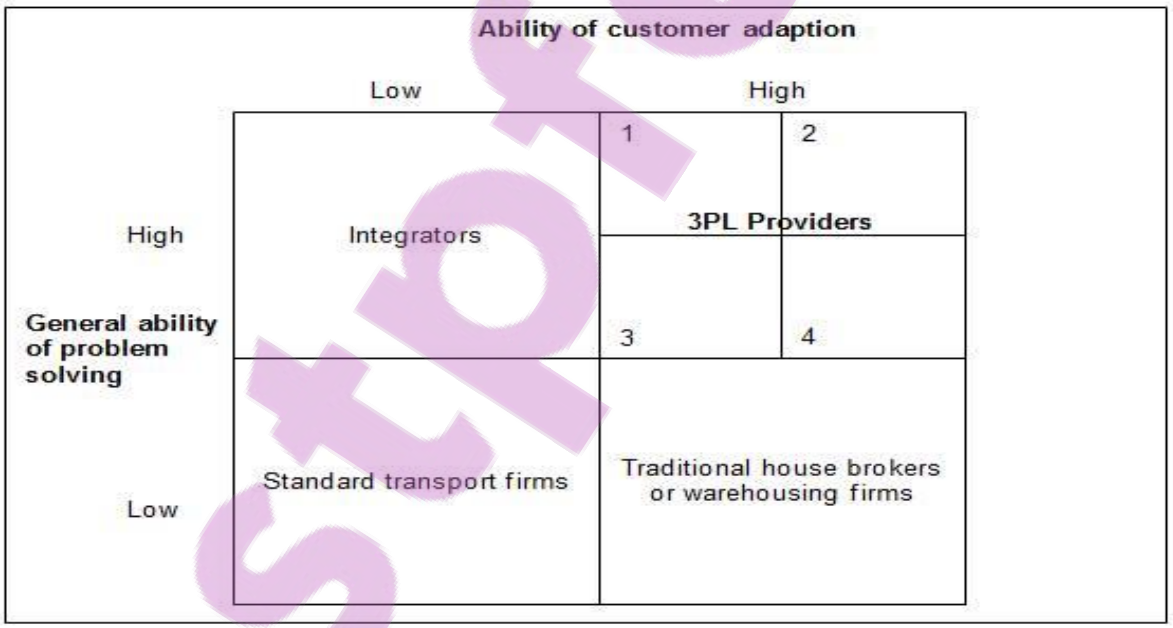

Figure 2.14: Problem-solving abilities – 3PL provider position
Source: Hertz and Alfredsson (2003)

The bottom left-hand quadrant indicates typical standard transportation firms, where general problem-solving ability is limited and customer adaption is low. The top left-hand quadrant indicates integrators where problem-solving ability is high,

but customer adaption low. The bottom right-hand quadrant indicates typical warehousing firms, where problem-solving ability is low, yet the level of customer adaption is high.

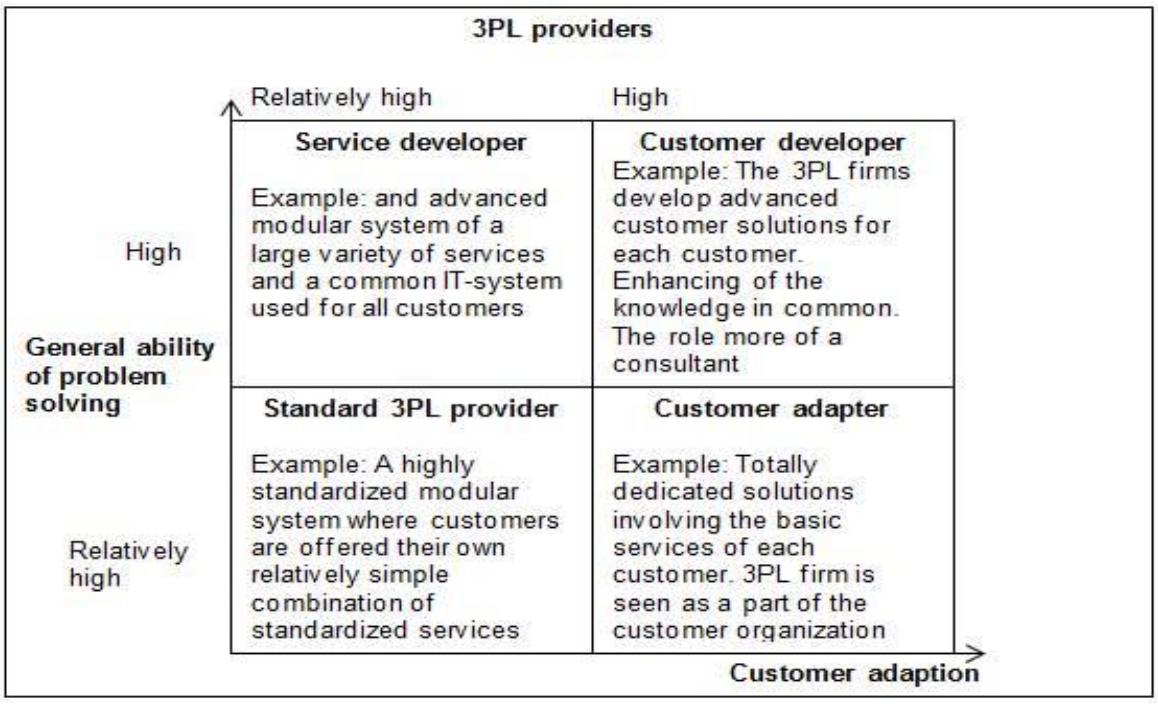

Figure 2.15: 3PL provider classification according to abilities of general problem-solving and customer adaption

Source: Hertz and Alfredsson (2003)

Figure 2.15 shows that there is differentiation between four types of 3PL providers, and these are now discussed in more detail below.

- **Standard 3PL providers**

  As indicated in the bottom left quadrant, the problem-solving ability, as well as customer adaption, is relatively high. This is the most basic form of 3PL provider and activities typically include pick and pack, warehousing, and distribution. For most of these firms, 3PL provider services are not their main activity.

- **Service developers**

  As indicated in the top left quadrant, the problem-solving ability is high, yet customer adaption is only relatively high. This 3PL provider offers value-

added services, such as tracking and tracing, cross-docking, specific packaging, and unique security systems. Moreover, the 3PL provider has a solid IT foundation and focus on economies of scale.

- **Customer adaptors**

As indicated in the bottom right quadrant, this 3PL provider's problem-solving ability is relatively high, and the customer adaption is high. The 3PL provider typically takes over the complete logistics activities of an organisation. The 3PL provider improves logistics substantially, but does not develop new services.

- **Customer developers**

As indicated in the top right quadrant, this 3PL provider's ability to solve problems, as well as customer adaption, is high. This is the highest level of 3PL provider. This type of provider has few customers and performs extensive logistics tasks for the shipper.

The groupings delineated by Hertz and Alfredsson (2003) form part of the permutation matrix on the services continuum, with the specific categorisation of standard 3PL providers through to *customer developers*. The classification is broadly the same as that of Prockl *et al*. (2012); yet, it provides for less detail from the framework of Bolumole (2003). Hertz and Alfredsson (2003) broadly follow the same categorisation as the Hayes–Wheelwright framework. Table 2.13 indicates the groupings classifications of Hertz and Alfredsson (2003), shown against the services continuum.

Table 2.13: Groupings classification of Hertz and Alfredsson (2003) vs services continuum

Hertz and Alfredsson (2003) grouping	Corresponding services continuum grouping
Standard 3PL providers	SCSI1
Service developers	SCSI6
Customer adaptors	SCSI11
Customer developers	SCSI16

Source: Hertz and Alfredsson (2003)

2.4.8 Huo *et al*.'s (2008) estimated path model

The estimated path model indicates that performance in cost and service is required to achieve financial performance. The estimated path model is indicated in Figure 2.16.

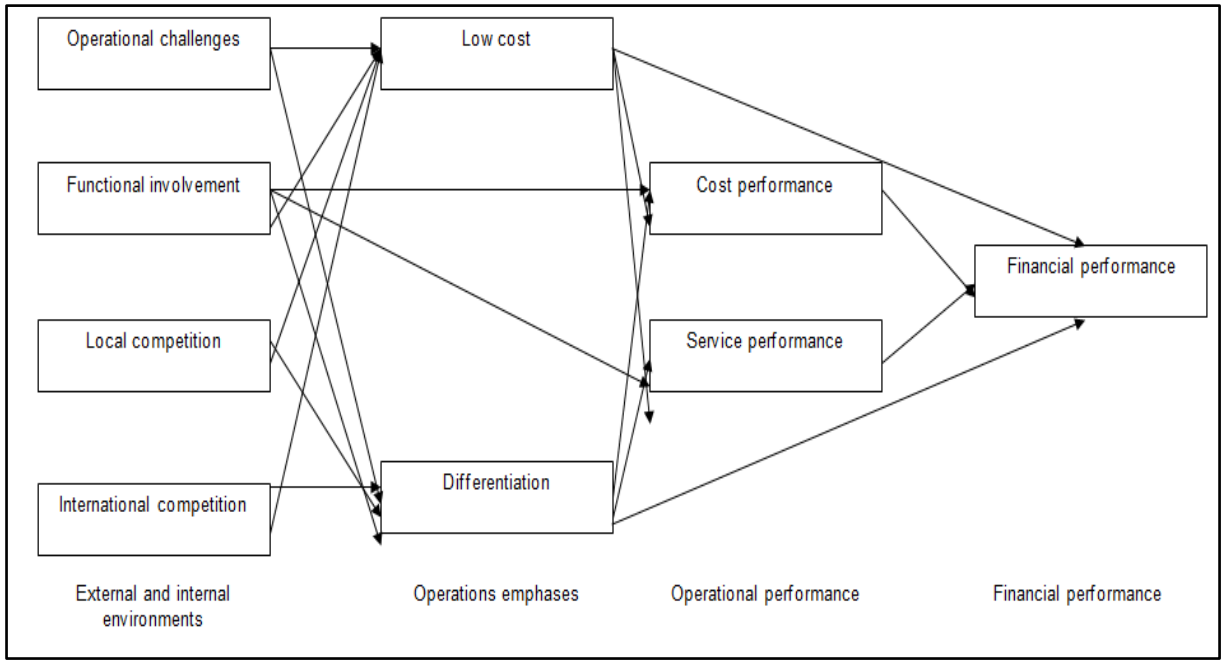

Figure 2.16: Estimated path model
Source: Huo *et al*. (2008)

Figure 2.16 indicates that there are there are four internal and external environments, namely operational challenges, functional involvement, local competition, and international competition.

Operational challenges are typically decided by the market in terms of quality expected, and could increase business costs. 'Local and international competition' refers to competition in the local and international markets, respectively. 'Functional involvement' refers to executive participation in the strategic formulation and planning of the organisation. Functional involvement encapsulates the role of each department in the strategic decision-making role. The internal and external environments are followed by two operational emphases, namely low cost and differentiation. A low-cost strategy primarily focusses on delivering the required product at the lowest possible cost, from manufacturing to distribution. A

strategy based on differentiation focusses on delivering custom-made services and items. The operational emphases are influenced by operational performance (cost and service performance), which ultimately determines financial performance.

The findings of the research by Huo *et al.* (2008) indicated that the impact of cost performance on financial performance is lower than the impact of service performance on financial performance is (Huo *et al.*, 2008). The key to the estimated path model is the point that the shipper first needs to ensure that its strategic intent is known, i.e. low-cost strategy or differentiation. Based on the strategy, the supply chain partners can be appropriately assigned. A low-cost strategy does not represent a more favourable result, as opposed to following a strategy based on differentiation.

The model by Huo *et al.* (2008) provides an overview to the shipper in terms of strategy formulation when deciding to outsource to 3PL providers. The utilisation of the estimated path model, based on mathematical modelling, could add significant value. The cause and effect could be modelled perfectly and utilised by the shipper organisation to decide on the approach to take for outsourcing, based on low cost or differentiation. Huo *et al*.'s (2008) model is, however, extremely limited, depending on the estimated path inputs, and is only relevant on SCSI1 or SCSI16, as indicated by Table 2.14.

Table 2.14: Groupings classification of Huo *et al*. (2008) vs services continuum

Huo *et al.* (2008) grouping	Corresponding services continuum grouping
Low cost	SCSI1
Differentiation	SCSI16

Source: Huo *et al.* (2008)

2.4.9 Mellat-Parast and Spillan's (2014) process integration via survey data collection model

A resource-based view is taken of competitive advantage and transaction cost theory (see Mellat-Parast and Spillan, 2014) to indicate the role of logistics strategy as the driver of integration. The resource-based view is that "superior firm performance is the result of the ability of firms to accumulate resources and capabilities that are rare, valuable, and difficult to imitate" (Mellat-Parast and Spillan, 2014: 290). With the process integration model, the knowledge-based view is described as a competitive advantage of intercompany linkages (Mellat-Parast and Spillan, 2014). In terms of this view, it is argued that competitive advantages arise from intercompany linkages, such as those internal to the organisation or those on the side of customers and suppliers of the organisation. The variables utilised to assess the effect that logistics strategy and logistics integration has on firm competitiveness are logistics strategy, logistics information integration, logistics process integration, logistics investment decisions, private warehousing decisions, and organisation competitiveness. A survey is utilised to test the hypothesis with regard to process integration. Once the surveys have been concluded, empirical validation is done of the survey data.

The resource-based view, which is extended to a knowledge-based view by Mellat-Parast and Spillan (2014), indicates that a high degree of co-operation is required, i.e. between shipper and 3PL provider. The resourced-based view corresponds to the range of SCSI1 to SCSI8 on the services continuum, whereas a knowledge-based view corresponds to the range SCSI9 to SCSI16, as shown in Table 2.15.

Table 2.15: Groupings classification of Mellat-Parast and Spillan (2014) vs services continuum

Mellat-Parast and Spillan (2014) grouping	Corresponding services continuum grouping
Resource-based view	SCSI1 to SCSI8
Knowledge-based view	SCSI9 to SCSI16

Source: Mellat-Parast and Spillan (2014)

2.4.10 Synthesising of groupings classifications of 3PL provider outsourcing models

Nine models were discussed and evaluated against the services continuum, for model applicability and optimum placement. The model specifics of Prockl *et al.* (2012), Bolumole (2003), Hum (2000), and Hertz and Alfredsson (2003) each have a corresponding model specific for each of the four optimum groupings of the services continuum. The models of Perçin (2009), Monczka *et al.* (2005), and Qureshi *et al.* (2008) each has the capability to align with any of the four optimum groupings of the services continuum. The model of Huo *et al.* (2008) is broadly defined and provides for only two optimum solutions on the services continuum – either SCSI1 or SCSI16. The model of Mellat-Parast and Spillan (2014) is divided into either resource-based or knowledge-based views. A resource-based view is capable of aligning with SCSI1 and SCSI6 of the services continuum, while a knowledge-based view aligns with SCSI9 and SCSI16.

The value of the services continuum lies in the classification of the models into an optimum placement or grouping. The optimum placement provides for four categories of importance to be brought together with every model analysed, i.e. service type, category of 3PL provider, strategic alignment, and investment. By gaining an understanding of the shipper's requirements, the shipper is enabled to analyse and assign the requirement or need on the services continuum and utilise the placement as basis for further analysis. The nine models above were analysed and assigned according to the optimal solution grouping of the services continuum. The classification by means of the services continuum enables both the shipper and the 3PL provider to utilise a scientific approach to model specifics and requirements. The essence of the nine models is summarised in Table 2.16 by indicating the author of the model and the model specifics, matched against optimum placement on the services continuum.

Table 2.16: Groupings classifications of authors vs services continuum placement

Author	Model specifics	Corresponding services continuum grouping
Prockl *et al.* (2012)	Conventional plus	SCSI1
	Cherry pickers	SCSI6
	Service factory	SCSI11
	Service lernstatt	SCSI16
Bolumole (2003)	Transactional	SCSI1
	Operational	SCSI1, with more integration than the transactional grouping
	Tactical	SCSI6
	Bilateral alliances	SCSI6, with more integration than the tactical grouping
	Strategic	SCSI11
	Partnerships	SCSI16
Perçin (2009)	Mathematical model	SCSI1–SCSI16
Monczka *et al.* (2005)	Selection process	SCSI1–SCSI16
Hum (2000)	Stage 1: internally neutral	SCSI1
	Stage 2: externally neutral	SCSI6
	Stage 3: internally supportive	SCSI11
	Stage 4: externally supportive	SCSI16
Qureshi *et al.* (2008)	Outsourcing variables	SCSI1 – SCSI16
Hertz and Alfredsson (2003)	Standard 3PL providers	SCSI1
	Service developers	SCSI6
	Customer adaptors	SCSI11
	Customer developers	SCSI16
Huo *et al.* (2008)	Low cost	SCSI1
	Differentiation	SCSI16
Mellat-Parast and Spillan (2014)	Resource-based view	SCSI1 to SCSI8
	Knowledge-based view	SCSI9 to SCSI16

2.5 CONCLUSION

This chapter established a definition of the 3PL provider concept that was utilised in the study for a situation where two parties are involved, namely the shipper organisation and the 3PL provider. The 3PL provider did not take ownership of the

product, but performed as a role player within the shipper's normal course of business to ensure delivery to customers of the shipper organisation.

This chapter set out to reflect the results of the literature review and a classification of 3PL provider outsourcing models, based on a services continuum, in order to follow through on the first and second secondary objectives of the study (see Subsection 1.3.2), i.e. to –

- develop a services continuum with the objective that it will be utilised as a mechanism that would provide detailed placement on the continuum, based on four aspects, namely services type required, category of 3PL providers, strategic alignment and investment required. The development of the services continuum is termed *development one*, and is a mathematical model, which allows for optimal results to be obtained (first secondary objective);

- review and classify outsourcing models by means of the services continuum (second secondary objective);

The services continuum brought four categories of importance together, namely service type required, category of 3PL provider, strategic alignment required, and lastly, the investment required. The services continuum was developed as a mathematical model (see Section 2.3), more specifically a permutation matrix. In the present research, the permutation matrix had as its objective to provide four optimal solutions, one per row, which was classified according to the need and output required. The services continuum functioned as the foundation for analysis into the differentiation of services rendered. The services continuum was introduced as the first development of the dualistic approach in relation to the strategic decision-making model. The outsourcing risk matrix formed the second development (discussed in Chapter 3). The permutation testing allowed for four optimum placements within the services continuum, allowing for the four categories of 3PL providers to be assigned appropriately. For each of the four permutation results, a category of 3PL provider was assigned, coupled with the corresponding level of service requirement, strategic alignment, and investment (see Table 2.16).

The services continuum served to classify research into functional categories for analysis, i.e. a literature review of the most prominent 3PL provider outsourcing models. Nine models were discussed in a systematic manner to allow the core of each model to be captured and assigned or classified according to the services continuum. The models discussed were suitable to be utilised from elementary outsourcing decisions to advanced outsourcing. The classification through the services continuum enabled a scientific approach to be taken to model specifics and requirements. The essence of the nine models was synthesised in Table 2.16, indicating which models had an optimum solution for each grouping of the services continuum. This analysis enabled the appropriate model specifics to be assigned to shipper requirements.

Chapter 3 follows, with the focus being placed on the third and fourth secondary objectives of the study (see Subsection 1.3.2), i.e. to –

- explain the unit of analysis in terms of collaboration and integrated planning, performance measurement, and the South African specific of B-BBEE (third secondary objective).

- review risk in relation to outsourcing and the creation of an outsourcing risk matrix. The creation of the outsourcing risk matrix is termed *development two* (fourth secondary objective).

CHAPTER 3
OUTSOURCING ELEMENTS DEFINED AND THE DEVELOPMENT OF THE OUTSOURCING RISK MATRIX

3.1 INTRODUCTION

This chapter reflects a literature review undertaken with the aim to determine the mechanisms available in terms of collaboration and integrated planning systems (see Subsection 3.2.1), performance measurement systems (see Subsection 3.2.2) as well as B-BBEE (see Subsection 3.2.3). The discussion is thereafter focussed on supply chain risk (see Section 3.3) as part of the outsourcing venture. The 'outsource risk matrix' (see Subsection 3.3.1) is discussed as the second development of the strategic decision-making model. Chapter 3 aligns with the third and fourth secondary research objectives (see Subsection 1.3.2), i.e. to –

- explain the unit of analysis in terms of collaboration and integrated planning, performance measurement, and the South African specific of broad-based black economic empowerment (B-BBEE) (third secondary objective); and
- review risk in relation to outsourcing and the creation of an outsourcing risk matrix. The outsourcing risk matrix was termed *development two* (fourth secondary objective).

3.2 Overview of the unit of analysis

Qureshi *et al*. (2007) indicate that, in order for a shipper to outsource, there are two categories of elements of the outsourcing relationship: enabling elements and outcome elements. The enabling elements of logistics outsourcing are two-way information sharing, commitment and trust, top management support, direct assistance or participation, total quality management and just in time, supplier added value, evaluation of supplier performance, coordination, and long-term contracts. The outcome elements are customer satisfaction, dedicated resources,

customer service level, logistics costs savings, expanded outsourcing, enhanced value, productivity enhancement, and competitive advantage. Enabling and outcome elements, relating to the outsourcing relationship, are classified in terms of the unit of analysis (performance, collaboration and integrated planning and systems). The classification allowed for a systematic approach to the unit of analysis measurement discussion. Table 3.1 indicates the elements of the outsourcing relationship, coupled with the unit of measurement classification.

Table 3.1: Elements of the outsourcing relationship classified according to unit of analysis

Elements related to the outsourcing relationship	
Enablers of logistics outsourcing	**Unit of analysis classification**
Two-way information sharing	Collaboration and integrated planning and systems
Commitment or trust	Collaboration
Top management support	Collaboration
Direct assistance or participation	Collaboration
Total quality management and JIT supplier added distinctive value	Collaboration and integrated planning and systems
Evaluation of supplier performance	Performance measurement
Coordination	Collaboration
Long-term contract	Collaboration
Outcome elements resulting from logistics outsourcing relationships	**Unit of analysis classification**
Customer satisfaction	Performance measurement
Dedicated resources	Collaboration and integrated planning and systems
Customer service level	Performance measurement
Logistics costs saving	Performance measurement
Expanded outsourcing	Performance measurement and collaboration
Enhanced value	Performance measurement
Productivity enhancement and competitive advantage	Performance measurement

Source: Adapted from Qureshi *et al*. (2007)

Adding to the elements of the outsourcing relationship in Table 3.1, Qureshi *et al*. (2008) indicate the following as being important elements with regard to outsourcing: quality of service, size and quality of fixed assets, quality of management, information technology capability, delivery performance, information sharing and trust, operational performance, compatibility, financial stability, geographical spread and range of services, the long-term relationship, reputation, optimum cost, surge capacity, flexibility in operation and delivery.

Arroyo *et al*. (2006) list the elements viewed as critical by Mexican, European and American firms as being:

- financial stability;
- capacity to fulfil demand;
- demonstrated ability to attend to customer's request;
- price charged for the service;
- joint problem-solving ability;
- general reputation;
- compatibility with the buying firm's culture;
- international scope;
- 3PL provider has a continuous improvement policy;
- technological compatibility with the buying firm;
- wish to develop a reciprocal 'gain-gain' relationship; and
- the 3PL provider has a quality certification and offers service guarantees.

Karrapan, Sishange, Swanepoel and Kilbourn (2017) list the elements viewed as critical by South African firms as being:

- cost and pricing structure of 3PL provider;

- service delivery of 3PL provider;
- potential relationship with 3PL provider;
- credentials of the 3PL provider;
- scope of services offered by the 3PL provider;
- quality of 3PL service provider; and
- 3PL resources technical capability.

The various elements deemed necessary by shippers are assigned to varying degrees of importance, based on the type of outsourcing required, i.e. transactional-, tactical- or strategic-level outsourcing.

The following subsections (3.2.1 to 3.2.3) review collaboration and integrated planning systems as well as performance management as unit of analysis.

3.2.1 Collaboration and integrated planning systems (outsourcing)

Outsourcing is determined by strategic, operational and/or financial motivation (Ordoobadi, 2009).

i. strategic motivation is found where the shipper focusses on the core value proposition or when the shipper wants to access new markets or technology;

ii. operational motivation is found when the shipper does not have the necessary skills or knowledge to manage the specific logistics activity; and

iii. financial motivation for the shipper implies avoiding capital investments, tapping into economies of scale and reducing operational expenditure (i.e. employee-based cost).

The elements of successful relationships are grounded in attachment, communication, dependence, investment, opportunistic behaviour, reciprocity,

reputation, satisfactory prior outcomes, and trust (Knemeyer and Murphy, 2005). Four relationship marketing elements are fundamental for the successful alignment of a shipper and a 3PL provider, and these elements are customer referrals, customer retention, performance improvements, and service recovery. The relationship marketing arena forms part of the process of attaining the outsourced business and forming a relationship with the shipper. This will culminate in understanding and managing the expectation with regard to performance management, and finally in ensuring business success for both the shipper and 3PL provider. Selviaridis and Spring (2007) confirm that the selection criteria of 3PL providers are constructed on a set of key business strategies. The authors also identify the strategies utilised by 3PL providers to attract and retain buyers as being differentiation, mergers, acquisitions, joint ventures, strategic alliances, and vertical and horizontal integration. The difference between non-integrated/transactional outsourcing and integrated outsourcing is explained by means of Figure 3.1.

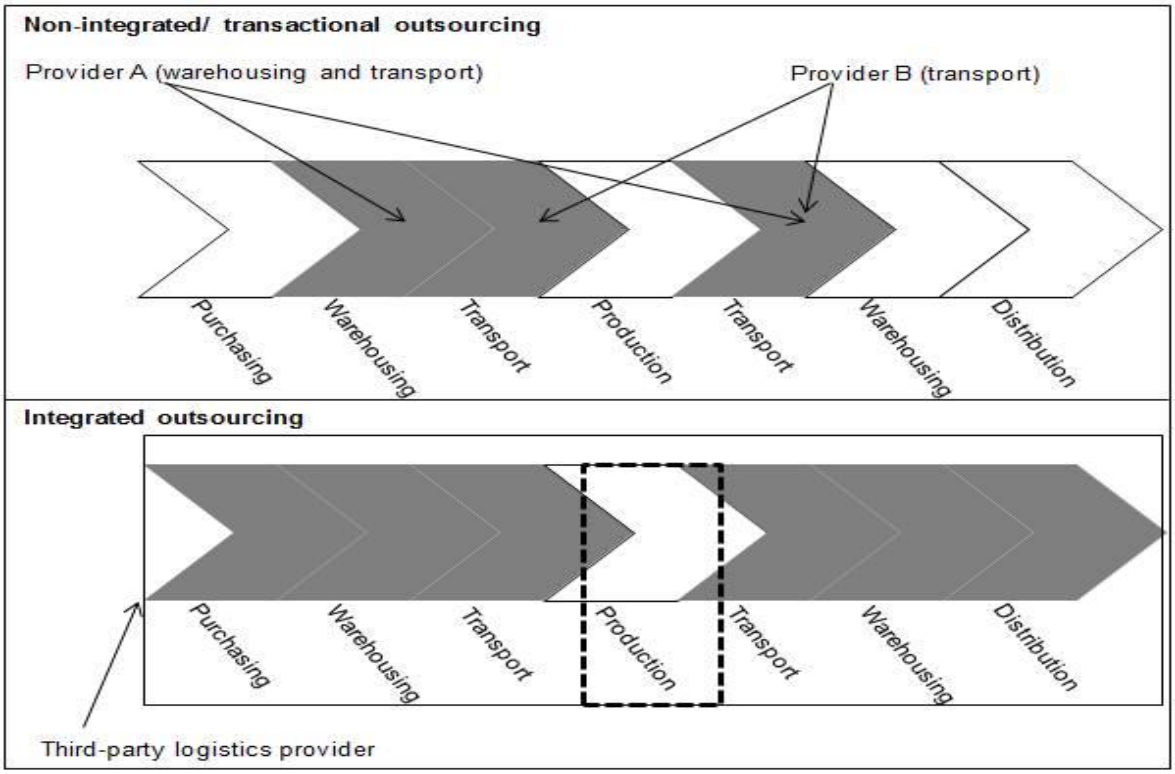

Figure 3.1: Non-integrated and integrated 3PL providers

Source: Adapted from Núñez-Carballosa and Guitart-Tarrés (2011)

Figure 3.1 indicates that a transactional 3PL provider service is provided in the form of warehousing or transportation. This is typically presented by a catalogue price for 'services rendered', i.e. a price is paid per specific transport route (distance/weight/volume). An integrated 3PL provider is indicated for managing all supply-chain-related activities, i.e. purchasing, warehousing, transport and distribution (not a catalogue price for services rendered). The 3PL provider is integrated into the shipper's operation in the form of integrated planning and systems. Joint planning occurs by means of upstream and downstream logistics, to the point of close working relations.

Large *et al*. (2011) argue that an influence is exerted on the success of the outsourced venture by the shipper accepting the 3PL provider. Large *et al*. (2011) further highlighted the point that loyalty is positively influenced by the degree of customer-specific acceptance, as well as the level of satisfaction. Aguezzoul (2014) argues that it is becoming increasingly difficult to do business where there is no close collaboration between supply chain partners. Collaborative systems are deemed necessary for achieving outsourcing success as these systems enable the shipper and 3PL provider to conduct business transactions based on a single platform. Transport World Africa (2013) named this type of system as 'Software as a System' (SaaS) – Enterprise Resource Planning (ERP) System integration. Such a system has at its core the ability to be a single point of entry between shipper and 3PL provider for conducting transactional-type business, but also has the capability to do longer-term joint planning. This system also provides accurate and up-to-date information to the relevant parties.

In a South African study, it was found that convergence in planning and execution will lead to cost-efficiency (primarily) as well as improved planning and business simplification (secondly) (D'amato, Kgoedi, Swanepoel, Walters, Drotskie & Kilbourn, 2015). Strategic partnering organisations have to be aligned in terms of their strategic goals, relationships, service offerings and requirements. Strategic partnering leads to joint planning and collaboration in order to best serve market requirements. Given the various requirements in terms of collaboration and integrated planning systems, a list was compiled to indicate the elements required for this specific unit of analysis. The elements listed (see Table 3.2) indicate both

enabling and outcome elements. The elements are to be reviewed in light of the undertaking of the outsourcing partnership, based on the type of outsourcing required, i.e. strategic, tactical or transactional. Table 3.2 displays the elements listed for collaboration and integrated planning systems.

Table 3.2: Elements for collaboration and integrated planning systems

Elements related to the outsourcing venture
Enablers of logistics outsourcing
Two-way information sharing, communication, ERP system integration
Commitment or trust, dependence, service recovery
Top management support, reputation, customer referrals
Direct assistance or participation, opportunistic behaviour
Total quality management and JIT supplier added distinctive value, investment, customer retention
Coordination, system platform integration
Long-term contract, satisfactory prior outcomes
Outcome elements resulting from logistics outsourcing relationships
Dedicated resources, investment
Expanded outsourcing, trust

Source: Adapted from Qureshi *et al*. (2007)

Enabling elements, such as two-way information sharing and ERP system integration, are fundamental for ensuring seamless integration between shipper and 3PL provider when attempting to outsource. This will also be a barrier to success if access to the ERP system is limited. Commitment and trust, dependence and service recovery, top management support, reputation, customer referrals, direct assistance, opportunistic behaviour, total quality management, just in time, investment, customer retention, coordination, system platform integration, long-term contracts, and satisfactory prior outcomes are enablers to the outsourcing venture. Should any of these aspects not be aligned, the outsourcing venture is at risk of failing. The outcomes of the outsourcing venture, based on collaboration and integrated planning systems, are dedicated resources, appropriate investment, possible expanded outsourcing and, at the core, trust between shipper and 3PL provider.

The benefits of outsourcing are to enable the shipper organisation “to concentrate

on the core competence, increase the efficiency, improve the service, reduce the transportation cost, restructuring the supply chains, and establish the marketplace legitimacy" (Datta *et al.*, 2013: 538). The enabling elements function to assist in achieving outsourcing success for the shipper and 3PL provider. The elements listed are utilised in the study and link directly with the level of outsourcing required, i.e. SCSI1 through to SCSI16. These elements represent the detail of investment and integration required, i.e. for SCSI1 outsourcing, there would be transactional system integration (processing a goods receipt on the system); however, for SCSI16 outsourcing, there would be strategic-level integration (sales forecast planning).

3.2.2 Performance measurement

Outsourcing supports positive shipper-organisation performance, as outsourcing prompts the shipper to focus its full attention on the core value proposition (Gilley and Rasheed, 2000; Rodriguez and Robaina, 2006; Thompson, 2007). These authors argue that outsourcing supports increased performance for the shipper as it keeps the shipper focussed on its core value proposition activities, while the 3PL provider focusses on the shipper's non-core activities. In a Kenyan study, Awino and Mutua (2014) focussed on business process outsourcing performance. In that study, it was confirmed that the traditional method to outsource, i.e. secondary activities outsourcing, is beneficial to the shipper. However, the study also found that it is beneficial to outsource non-critical primary activities to the benefit of the shipper and 3PL provider (Awino and Mutua, 2014).

Performance measurement is done in accordance with a set of key performance indicators (KPIs). KPIs are built on the foundation of measures that are deemed essential for the outsourcing relationship. Rossi, Colicchia, Cozzolino and Christopher (2013) indicate the logistics and learning capabilities of Esper, Fugate and Davis-Sramek (2007) as comprising a scientific underscore to a measurement system. These capabilities are displayed in Table 3.3, together with the description of each capability.

Table 3.3: Logistics and learning capabilities

Capability	Description
Customer focus	Provides product or service differentiation and service enhancement for continuous distinctiveness to customers by targeting a given customer base and meeting or exceeding their expectations by providing unique, value-added activities
Supply management	Involves total cost minimisation, effective management of time, response to demand fluctuations, postponement, modularisation, and standardisation
Integration	Internal – communication aspects associated with interdepartmental activities External – joint effort to create a different business model
Measurement	Translation of business objectives into measurement-specific and operational and financial targets
Information exchange	Acquire, analyse, store and distribute tactical and strategic information, both inside and outside the firm
Learning – cultural	Open-mindedness, shared vision, commitment to learning
Learning – structural	Learning systems, practices, learning rewards, and technology to support learning
Learning – relational	Similarities in objectives
Learning – temporal	Ability to implement change rapidly

Source: Rossi *et al*. (2013)

Table 3.3 indicates five logistics and four learning capabilities. Together, these nine capabilities form a measurement system. Depending on the type of outsourcing opted for, according to the services continuum, the effect and the importance of the different elements are measured differently. The role that the 3PL provider has to fulfil is encapsulated by the value proposition of the 3PL provider, namely service variety, information availability, timeliness and continuous improvement – as displayed in Figure 3.2.

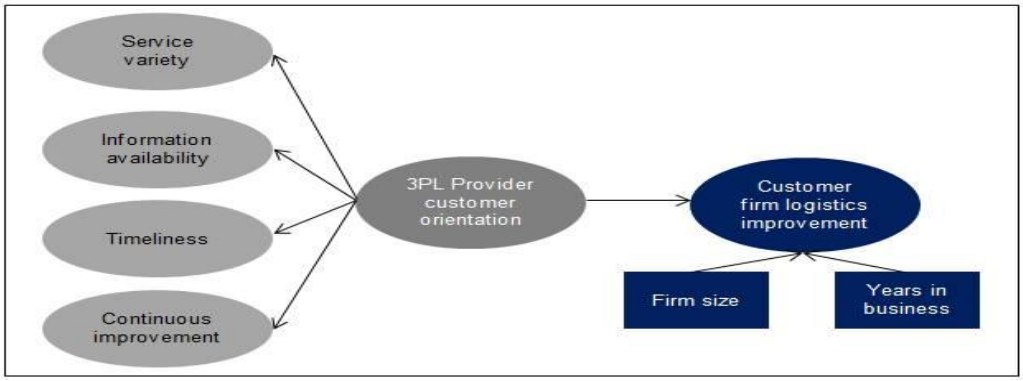

Figure 3.2: Role of the 3PL provider in shipper success

Source: Tian *et al*. (2010)

Service variety would not be deemed imperative to a shipper who solely wants to procure a standard warehouse service for short, peak volume compensation. A shipper who values service variety is a shipper who would collaborate on a long-term strategic venture, capitalising on the skills and scope of the 3PL provider. Availability of information is important for all types of shipper. Availability of information also speaks to real-time information sharing. The typical measurement would be the updating of transactional information immediately or within 24 hours. A key measurement in the outsourced relationship is timeliness in order transacting, which is closely aligned to the aspect of availability of information, and execution of transactions, within agreed parameters.

To varying degrees, continual improvement is present in any type of outsourcing, i.e. in transactional type relationships, it might not seem apparent at first; however, to stay competitive from a catalogue service point of view, continual improvement creates the cornerstone for profitability in the marketplace. This would typically not be a KPI for a short-term transactional type of outsourcing relationship; however, it is a qualifier to obtain the shipper's business.

Jothimani and Sarmah (2014) used the supply chain operations reference (SCOR) model to identify KPIs for a 3PL provider. The measurement perspective is taken from a shipper's point of view in order to establish the KPIs as the measuring basis for the service delivery by the 3PL provider. Jothimani and Sarmah (2014) explain their model by means of five performance attributes: reliability, responsiveness, flexibility, cost measures, and asset management efficiency.

Each of the performance attributes is summarised in Table 3.4 by means of a description and the level 1 metrics.

Table 3.4: Performance attributes/metrics (SCOR version 5)

Performance attribute	Description	Level I metrics
Reliability	The performance of the supply chain in delivering the correct product, to the correct place, at the correct time, in the correct condition and packaging, in the correct quantity, with the correct documentation, to the correct customer	Delivery performance, fill rates, perfect-order fulfilment
Responsiveness	The velocity at which the supply chain provides products to the customer	Order fulfilment lead time
Flexibility	The agility of a supply chain in responding to marketplace changes to gain or maintain a competitive advantage	Supply chain response time, production flexibility
Cost measures	The costs associated with the operation of a supply chain	Cost of goods sold, total supply chain management costs, value-added productivity, warranty and returns processing costs
Asset management efficiency	The effectiveness of an organisation in managing assets to support demand satisfaction, which includes the management of all assets – fixed and working capital	Cash-to-cash cycle time, inventory days of supply, asset turns

Source: Stephens (2001, cited in Jothimani and Sarmah, 2014)

A system has been developed in the United Kingdom to indicate performance measurement based on levels as first-, second- and third-generation performance measurements (Neely, Mills, Platts, Gregory & Richards, 1994). The scope and comprehensiveness progress from the first to the second and third generations of measurement systems. Different measurement systems are deployed, based on the type of outsourcing decided upon, i.e. a first-generation measurement is applicable to an apprentice service, whereas a third-generation performance measurement system would be deployed with an advanced service offering.

The development services continuum, as discussed in Chapter 2, enables the classification of model application, following through to enabling and outcome elements. Table 3.5 indicates the performance measurement systems, coupled with an overview of the key features applicable to each performance measurement system, as well as the services continuum application.

Table 3.5: Performance measurement system

Performance system	Features	Services continuum application
First-generation performance measurement	▪ To provide a framework for supplementing the traditional measures with non-financial measures in the performance measurement system of the organisation ▪ Includes balanced scorecard (BSC) ▪ Fails to illustrate the linkages between different performance measures adequately	SCSI1 & SCSI6
Second-generation performance measurement	▪ Aids in the dynamics of decision-making and provides linkage between intangible assets and business values/market valuation ▪ Includes strategy map and performance prism ▪ Fails to link the business-orientated methodology and real cash flow, which is the cornerstone of a business	SCSI11
Third-generation performance measurement	▪ Links the non-financial and intangible dimensions of organisational performance and extends the measurement of cash flow ▪ Information adequacy and organisational alignment ▪ Emphasises the need for right information, at the right time, and integration of the performance model with the process	SCSI16

Source: Adapted from Neely *et al*. (1994)

The applicable measurement system needs, at its core, to ensure business success, and to ensure that no effort is wasted, i.e. deploying a second-generation measurement on an apprentice service delivery. Measurement system and services continuum alignment is vital for successful outsourcing and for guaranteed continual thriving relationships.

An estimated path model, which indicates that both cost and service performance are drivers for achieving financial performance, has been developed in Hong Kong (Huo *et al.*, 2008). This estimated path model (see Subsection 2.4.8) indicates how a business undertakes to go about its activities, i.e. low cost vs differentiation. The crux of the model is to ensure that the strategic intent of an organisation is known. Based on the strategic intent, the supply chain partners are able to be measured accurately to increase the opportunity of optimal alignment. Table 3.6 indicates the elements for performance measurement. While these elements are

to be reviewed with the undertaking of the outsourcing partnership, the level of detail is determined by the type of outsourcing required, i.e. SCSI1, SCSI6, SCSI11 or SCSI16.

Table 3.6: Elements related to the outsourcing venture

Elements related to the outsourcing venture	
Enablers of logistics outsourcing	**Classification**
Evaluation of supplier performance	Performance measurement
Outcome elements resulting from logistics outsourcing relationships	**Classification**
Customer satisfaction	Performance measurement
Customer service level	Performance measurement
Logistics costs saving	Performance measurement
Expanded outsourcing	Performance measurement and collaboration
Enhanced value	Performance measurement
Productivity enhancement and competitive advantage	Performance measurement
Service variety, availability of information, timelines and continuous improvement	Performance measurement, dependent on outsourcing category
Operational challenges, local competition, international competition, functional involvement, low costs, differentiation, cost performance, service performance, financial performance (Huo *et al*., 2008)	Performance measurement, dependent on outsourcing category

Source: Adapted from Qureshi *et al*. (2007)

The enabler element of the outsourcing venture is the evaluation of supplier performance. The outcome elements of the outsourcing venture culminate in customer satisfaction, customer service level, logistics costs saving, expanded outsourcing, enhanced value, productivity enhancement and competitive advantage, service variety, availability of information, timelines, continuous improvement, operational challenges experienced, degree of local completion, low costs, differentiation, cost performance, service performance, and financial performance. Both enabling and outcome elements are of importance to the outsourcing venture for measuring success. The level of alignment and the definition of the enabling and outcome elements will progressively increase in the success required with the progression of SCSI1 through to SCSI16 classifications based on the services continuum.

3.2.3 Broad-based black economic empowerment (South Africa-specific)

Broad-based black economic empowerment (B-BBEE) is an overarching element to the development of a strategic decision-making model for optimal alignment between shipper and 3PL provider in South Africa. B-BBEE has the potential to be a motivational factor, aside from cost reduction, capital investment reduction and enhanced operational flexibility due to the socio-economic climate of South Africa. The B-BBEE Act 53 of 2003 is legislation –

> [T]o establish a legislative framework for the promotion of black economic empowerment; to empower the Minister to issue codes of good practice and to publish transformation charters; to establish the Black Economic Empowerment Advisory Council; and to provide for matters connected therewith (Republic of South Africa [RSA], 2003).

Business Partners Ltd. (2016) explains that B-BBEE constitutes a code of good practice, gazetted in February 2007, which stipulates and measures all organisations operating within South Africa's B-BBEE compliance levels. There are three types of organisation classifications for the purpose of measuring B-BBEE compliance, namely:

i. Exempted micro-enterprise

   An organisation with an annual turnover of less than R5 000 000.00, including any organisation starting up, i.e. in its first year of formation.

ii. Qualifying small enterprise

   An organisation with an annual turnover between R5 000 000.00 and R35 000 000.00.

iii. Generic enterprise

   An organisation with an annual turnover of more than R35 000 000.00.

Measurement takes place based on either of the two available scorecards, depending on categorisation of the organisation as generic and adjusted qualifying

small enterprise scorecard. The score achieved is converted into a B-BBEE status, i.e. from a level one contributor to a non-contributor. Each status has a B-BBEE recognition level percentage, ranging from 135% to 0%. The B-BBEE status and recognition level percentages, coupled with the specific score, are displayed in Table 3.7.

Table 3.7: B-BBEE status

B-BBEE status	B-BBEE score/qualification	2013 B-BBEE score/qualification (dti)	B-BBEE recognition level %
Level one contributor	≥ 100	≥ 100 points on generic scorecard	135%
Level two contributor	≥ 85 and ≤ 100	≥95 and ≤100 points on generic scorecard	125%
Level three contributor	≥ 75 and ≤ 85	≥ 90 and ≤ 95 points on generic scorecard	110%
Level four contributor	≥ 65 and ≤ 75	≥ 80 and ≤ 90 points on generic scorecard	100%
Level five contributor	≥ 55 and ≤ 65	≥ 75 and ≤ 80 points on generic scorecard	80%
Level six contributor	≥ 45 and ≤ 55	≥ 55 and ≤ 70 points on generic scorecard	60%
Level seven contributor	≥ 40 and ≤ 45	≥ 55 and ≤ 70 points on generic scorecard	50%
Level eight contributor	≥ 30 and ≤ 40	≥ 40 and ≤ 55 points on generic scorecard	10%
Non-contributor	< 30	< 40 points on generic scorecard	0%

Source: BEE Scorecard (2016) and Department of Trade and Industry [dti] (2013)

The recognition level percentage translates into the preferential procurement spent calculation, i.e. a level one contributor at 135% renders every R1 spent at R1.35 calculated value on the preferential procurement calculation. B-BBEE is an element for consideration by South African businesses for both shippers and 3PL providers. A 3PL provider with a high B-BBEE status will increase the shipper's preferential procurement spent, in a South African context, to a favourable position and will assist with the overall organisation positioning as it relates to B-BBEE status.

The outsourcing decision carries an inherent risk, which requires to be managed appropriately (Rousseau *et al.*, 2015). Managing the risk is deemed to be among the most important process by Manotas-Duque, Osorio-Gomez and Rivera (2016). The elements discussed (see Subsection 3.2.1 – 3.2.3) comprise the risk to which consideration is required when deciding on the outsourcing venture. Risk is in various forms, i.e. monetary value, environment, community, sales and marketing (customers), government relations (B-BBEE recognition), reputation, legislative measures, human resources, operations and information management (Husdal, 2011; Adelante SCM, 2016; Marttonen and Karri, 2012). Section 3.3 follows with a review of supply chain risk with the objective to establish development two, namely the outsource risk matrix.

3.3 SUPPLY CHAIN RISK

The International Organization for Standardization (ISO) defines risk as the "effect of uncertainty on objectives" (ISO, 2015: 13). ISO (2015: 13) expands and explains the definition by means of the following five notes:

> Note One: An effect is a deviation from the expected – positive and/or negative. Note Two: Objective can have different aspects (such as financial, health and safety, and environmental goals) and can apply at different levels (such as strategic, organization-wide, project, product and process). Note Three: Risk is often characterized by reference to potential events and consequences or a combination of these. Note Four: Risk is often expressed in terms of a combination of the consequences of an event (including changes in circumstances) and the associated likelihood of occurrence. Note Five: Uncertainty is the state, even partial, of deficiency of information related to, understanding or knowledge of an event, its consequences or likelihood.

Hillson (2004) made a study of what are termed negative, neutral and broad definitions of risk. The first category is negative definitions. Risk is viewed as having a negative influence on the set objective. The second category is neutral definitions, meaning that risk is viewed as having neither a positive nor a negative influence on the set objective; however, it recognises that the risk event will have

an effect on the objective. The third category is broad definitions, and indicates that the risk will have either a positive or a negative influence on the set objective. For the purpose of this study, a neutral definition of risk was utilised, which was representative of an unknown event with the potential to affect the achievement of a set objective.

The ISO 31000: 2009 risk management process is adopted within the strategic decision-making model, as displayed in Figure 3.3.

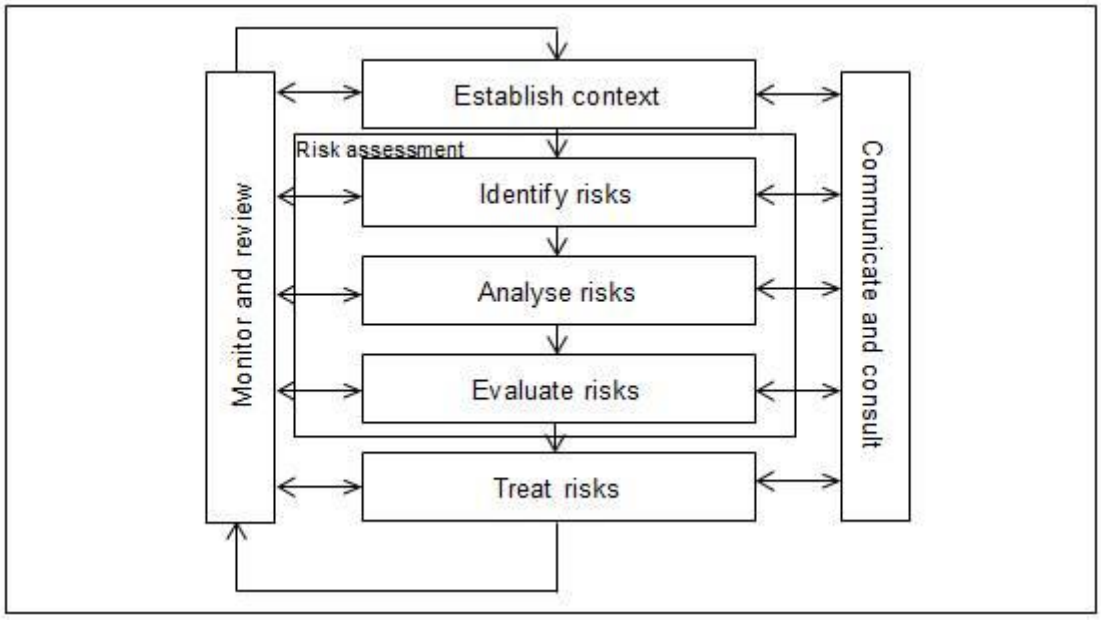

Figure 3.3: ISO 31000: 2009 risk management process
Source: ISO (2015)

Figure 3.3 shows the risk management process as continuous:

i. establish context, i.e. what the business is setting out to achieve;

ii. identify the risks involved to achieve what the business is setting out to accomplish;

iii. analyse risk in order to understand what the risks represent and possible consequences, should the risk realise;

iv. evaluate the risks, i.e. classify the risks as major or minor;

v. once the risks have been evaluated, the risks can be treated. The treatment

of the risk is to assign an accountable employee and process in order to mitigate or eliminate the risk.

The risk management process is continually reviewed (ISO, 2015), meaning it is an iterative process. The outcome of the process is to communicate the possible risks and to review the risk and decision-making process, to either eliminate the negative effect of the risk or to capitalise on the risk presented. The strategic decision-making model includes the utilisation of an 'outsource risk matrix'[5] that aligns with the principles of the ISO 31000: 2009 risk management process in order to ensure successful and optimal alignment between 3PL provider and shipper.

3.3.1 Outsource risk matrix

The outsourcing decision bears inherent risk (McIvor and Humphreys, 2000; Reitz, 2016). The purpose of the outsource risk matrix is to evaluate the outsource decision, based on the elements (as discussed in Section 3.2) and the services continuum aspects (Chapter 2), in terms of whether the correct assignment has occurred, given the risk presented. The outsource risk matrix further assigns accountability within the organisation for both the initial decision and continuous management of the outsourcing venture.

The researcher had found it imperative that the placement on the services continuum had to be tested, thus necessitating the formulation of the second development, namely the outsourcing risk matrix. The outsource risk matrix has the objectives to 1) test the outsourcing decision as obtained from the optimal placement on the services continuum, and 2) to operationalise the outsourcing decision in a business context. These two objectives are achieved through the output of the outsource risk matrix (see Table 3.8) by assigning the risk to appropriately deemed management levels within the organisation (see Table 3.9).

5 The outsource risk matrix is utilised within the study, specifically phase two, step two (see Figure 4.3, page 112). The generic application of the strategic decision-making model is indicated in Section 4.4 of this thesis.

Perceived risk elements are coupled with severity or impact criteria when occurring. Each risk element and severity/impact criterion is matched against the probability of its occurring. Tables 3.8 and 3.9 reflect the following aspects of the outsource risk matrix:

- Table 3.8 indicates the perceived risk elements, coupled with a probability of them occurring, the outcome of such an occurrence as well as the probabilities of risk realising (abbreviated as P1 to P7), increasing from P1 to P7, together the severity should the risk occur (abbreviated as I1 to I7), increasing in severity level from I1 to I7.

- Table 3.9 indicates the reporting levels of outsource risk in the organisation as a result of the combination of plotting the perceived risks against probability and severity.

The application of the outsource risk matrix starts with Table 3.8, indicating the impact of the risk according to the risk element, should the risk materialise. The risk elements are: Rand value, environment, community, sales and marketing, government relations, reputation, legislative, human resources, operations and upstream/downstream operations and information management.

The outsource risk matrix makes provision for seven impact levels per risk element, i.e. Rand value:

- impact 1 – represents an impact up to R3 million;

- impact 2 – represents an impact more than R3 million but less than R30 million;

- impact 3 – represents an impact more than R30 million but less than R150 million;

- impact 4 – represents an impact more than R150 million but less than R300 million;

- impact 5 – represents an impact of more than R300 million but less than R1 500 million;

- impact 6 – represents an impact more than R1 500 million but less than R4 500 million; and
- impact 7 – represents an impact of more than R4 500 million.

The seven levels of impact are assigned according to each level of the risk criteria (see Table 3.8), and each risk is reviewed in accordance with the probability of it occurring. The outsource risk matrix makes provision for seven levels probability, which consist of both the probability of frequency and the probability of likelihood of occurrence, namely:

- probability 1 – likelihood is unforeseen and frequency is to occur less than once in 20 years;
- probability 2 – likelihood is highly unlikely and frequency is to occur once in every 20 years;
- probability 3 – likelihood is very unlikely and frequency is to occur once in every 20 years;
- probability 4 – likelihood is low and frequency is to occur once every 5 – 10 years;
- probability 5 – likelihood is possible and frequency is to occur within 2 – 5 years;
- probability 6 – likelihood is likely and frequency is to occur once within 1 – 2 years; and
- probability 7 – likelihood is almost certain and frequency is to occur every year or is already occurring.

Table 3.8 presents an abridged version of the outsource risk matrix to indicate the working of the matrix. The full version is provided in Appendix D.

Table 3.8: Abridged version of the outsource risk matrix

Outsource risk matrix (probability and severity)							Impact	Risk element i.e. R-value
4	3	3	2	1	1	1	I7	> R4 500m
4	3	3	2	2	1	1	I6	R4 500m
5	4	3	3	2	2	2	I5	R1 500m
6	5	4	4	3	3	3	I4	R300m
6	5	5	4	4	3	3	I3	R150m
6	6	6	5	5	4	4	I2	R30m
6	6	6	6	6	6	6	I1	R3m
P1	P2	P3	P4	P5	P6	P7		
Unforeseen	Highly unlikely	Very unlikely	Low	Possible	Likely	Almost certain	Likely-hood	
The event may occur less than once in 20 years	The event may occur once every 20 years	The event may occur once in every 10–20	The event may occur once in every 5–10 years	The event may occur within next 2–5 years	The event may occur within next 1–2 years	The event may occur at least once a year or is already occurring	Frequency	

The application of the impact criterion result, i.e. I6 and the probability result of P1, will be placed in Table 3.8 as I6P1, which provides a result of 4. These matrix numbers indicate the level of where risk is managed within the organisation, from levels 1 to 6. Level 1 is an organisation's board of director risk, cascading down to level 6, which is first-line supervisor risk. The example of I6P1 provides a level 4 risk, which is divisional manager risk. There are six levels of risk (see Table 3.9). Each level of risk is addressed through a specific level in the organisation that is responsible for managing the risk accordingly. The six levels of risk are:

- level one – organisation's board of directors;
- level two – applicable executive forum;

- level three – executive manager risk;
- level four – divisional manager;
- level five – operations manager; and
- level six – first-line manager/supervisor risk.

Table 3.9 indicates the outsource risk reporting levels in the organisation.

Table 3.9: Outsource risk reporting levels

Reporting levels		
Level 1	Organisation board of directors risk	
Level 2	Applicable executive forum risk	
Level 3	Executive manager risk	
Level 4	Divisional manager risk	
Level 5	Operations manager risk	
Level 6	First-line supervisor risk	

The outsource risk matrix is utilised in conjunction with the services continuum. The outsource risk matrix utilises the placement of the services continuum and evaluates the risk involved with the specific placement by understanding the business impact as well as the probability of occurring. Given the probability matched with the impact, a severity level is attained. This severity level is assigned mitigation action to the appropriate level within the shipper organisation. The outsource risk matrix has to ensure the soundness of the placement on the services continuum, while taking full cognisance of the various degrees of business risk in order to mitigate and assign management accountability. Should the risk profile not satisfy the deliverables of the services continuum specifics, it warrants a redesign, i.e. placement on the services continuum or alternative risk mitigation actions. The purpose of the services continuum is to arrive at minimum risks to the shipper organisation by outsourcing to the appropriate 3PL provider, based on the specifics of the services continuum: service type required, category of 3PL provider, and strategic alignment required an investment required (SCSI).

3.4 CONCLUSION

This chapter continued the literature review and utilised the services continuum (see Chapter 2) by focussing on the elements per category of the continuum of services offered. This aspect aligns with the third and fourth secondary objective (see Subsection 1.3.2), i.e. to –

- explain the unit of analysis in terms of collaboration and integrated planning, performance measurement, and the South African specific of B-BBEE (third secondary objective); and
- review risk in relation to outsourcing and the creation of an outsourcing risk matrix. The outsourcing risk matrix is termed *development two* (fourth secondary objective).

Elements have been classified according to enablers or outcome elements according to the unit of analysis, collaboration and integrated planning, performance measurement, and B-BBEE.

Collaboration and integrated planning were confirmed to be varying in degree of alignment, based on the type of outsourcing required. It was further confirmed that the points of alignment, i.e. two-way information sharing, commitment, trust, dependence, service recovery, top management support, reputation, customer referrals, direct assistance, opportunistic behaviour, total quality management, just in time, investment customer retention, coordination, system platform integration, long-term contracts, and satisfactory prior outcomes are deemed critical for collaboration and integrated planning.

Performance measurement was discussed (see Subsection 3.2.2) and it was found that logistics and learning capabilities are important for the performance measurement of the 3PL provider outsourcing venture. The performance attributes were discussed in the form of reliability, responsiveness, flexibility, cost measures, and asset management efficiency. It was further found that there are different types of performance measurement systems, namely first-, second- and third-generation performance measurement systems. The first-generation performance system is applicable to the SCSI1 and SCSI6 services continuum placement

requirement. The second-generation performance measurement system is applicable to SCSI11 on the services continuum placement, and the third-generation performance measurement is applicable to the SCSI16 services continuum placement.

The final aspect discussed as the unit of analysis was the South African perspective on B-BBEE. The important aspect for South African organisations resides with the level of B-BBEE contributors. This means that the socio-economic landscape of South Africa promotes preferential procurement, spent as a percentage advantage to the shipper.

The chapter further continued the literature review with a focus on risk management processes. This aspect aligns with the fourth secondary objective (see Subsection 1.3.2) to review risk in relation to outsourcing and the establishment of an outsourcing risk matrix (termed *development two*).

Supply chain risk was discussed (see Section 3.3) and defined for the study as an unknown event with the potential to affect the achievement of a set objective. The study conformed to the iterative ISO 31000: 2009 risk management process, which continually monitors and adjusts operations, based on risks identified for the purpose, to ensure that risk is continually monitored in order to adjust the outsourcing venture as the internal and external environments change. To this effect, the second development of the dualistic nature of the strategic decision-making model was established – the outsourcing risk matrix.

The outsourcing risk matrix is extensive and utilises perceived risk elements and assigns both impact and probability criteria (in sliding-scale format) to arrive at a matrix indication of risk level (Table 3.8 and Table 3.9). This risk level is assigned to a level of authority within the organisation to manage. Should the output of the risk matrix indicate a result that is not favourable, the services continuum placement should be re-assigned.

Chapter 4 follows and focusses on the fifth and sixth secondary objectives of the study (see Subsection1.3.2), i.e. to –

- establish a generic application of the services continuum with the objective

to arrive at an abridged reference table for each of the four permutation results (fifth secondary objective) ;

- define a strategic decision-making methodology process path, specifically for application in relation to Sasol's outbound final packaged product supply chain (sixth secondary objective).

CHAPTER 4
APPLICATION OF THE UNIVERSAL STRATEGIC DECISION-MAKING MODEL

4.1 INTRODUCTION

This chapter synthesises Chapters 2 and 3 by reporting on the strategic decision-making model, in a format that is universally applicable, with its focus on the services continuum permutation results, namely the abridged reference tables[6]. A strategic decision-making model path was established as an overarching approach to the application of the model. Once the abridged reference tables and the strategic decision-making model path have been discussed, a generic application of the strategic decision-making model is described. Chapter 4 specifically aligns with the fifth and sixth secondary objectives of the study (see Subsection 1.3.2), i.e. to –

- establish a generic application of the services continuum with the objective to arrive at an abridged reference table for each of the four permutation results (fifth secondary objective);
- define a strategic decision-making methodology process path, specifically for application in relation to Sasol's outbound final packaged product supply chain (sixth secondary objective).

4.2 SERVICES CONTINUUM APPLICATION

This section focusses on the creation of an abridged reference table, per category of the services continuum, based on the four optimal permutation result solutions (see Subsections 4.2.1 – 4.2.4). The purpose of the abridged reference table is to indicate the risk level assigned when the correct model is utilised with the category

6 The abridged reference tables indicate the risk assigned to an outsourcing model, matched to the appropriate category of 3PL provider.

of service provider. The specific risk rating indicates whether the placement on the services continuum is acceptable to the shipper or whether the decision needs to be reconsidered. The abridged reference table indicates the applicable risk owners. Included in the services continuum abridged reference table is a proposed service price offering. There are three types of 3PL provider service price offerings, namely outsourcing with a unit-rate cost model, outsourcing with a fixed and a variable cost model, and outsourcing with a percentage of sales value charge model (Bloem and Bean, 2015).

- Outsourcing with a unit rate cost model:

  The 3PL provider charges a standard rate according to an agreed service offering. The unit rate cost model is applicable to the *standard service provider* category and, to a large extent, to the *service developer* category.

- Outsourcing with a fixed and variable cost component model:

  A fixed rate is charged per month, plus an additional variable rate for other services, i.e. a fixed monthly fee is paid for warehousing and a variable rate is paid for the kilometres travelled for the distribution function. The fixed and variable cost component model is, to some extent, applicable to the *service developer* category, but largely to the *customer adapter* category.

- Outsourcing with a percentage of sales value charge model:

  The 3PL provider charges a percentage of the value of goods sold, i.e. 10% of sales value. This pricing model is applicable to the *customer developer* category of the 3PL providers.

Subsections 4.2.1 to 4.2.4 discuss the abridged reference guide in terms of the four optimal results (permutation results) of the services continuum.

4.2.1 Standard service provider (permutation result one)

An abridged reference table was developed per category of 3PL provider, which indicates the risk level assigned to the relevant model utilised, coupled to the category of 3PL provider. For example, the conventional plus model should be

utilised with the *standard service provider* for a typical apprentice service, i.e. SCSI1. However, should a *standard service provider* be utilised for a more advanced service requiring the risk profile to change, i.e. advanced service required but a *standard service provider* is utilised, the risk will move from I1P1 to I7P7, risk level 1, with the risk owner being the shipper organisation's board of directors. This is an immediate indication that the risk profile is not acceptable and the decision should be reviewed. This methodology is applied to the remainder of the models most appropriate to the *standard service provider* category. Table 4.1 indicates the abridged reference table for the *standard service provider*.

Table 4.1: Standard service provider abridged reference

	Model applicable	Risk level and risk owner	Pricing model most appropriate
Standard service provider	▪ Conventional plus (Prockl *et al*., 2012) SCSI1. ▪ Bolumole (2003) – transactional grouping SCSI1. ▪ Bolumole (2003) – operational grouping SCSI2. ▪ Hum (2000) – internally neutral SCSI1. ▪ Hertz and Alfredsson (2003) – standard 3PL provider SCSI1. ▪ Huo *et al*. (2008) – operational intent SCSI1. ▪ Mellat-Parast and Spillan (2014) – resource-based view SCSI1-8.	I1P1, level 6 risk, first-line supervisor	Outsourcing with a unit rate cost model

4.2.2 Service developer (permutation result two)

This, for example, refers to the cherry picker model, which should be utilised with the elementary services requirement, i.e. SCSI6. However, should a *standard service provider* be utilised for the elementary service requirement, the risk profile would change, meaning the risk profile would increase from an I1P1 risk rating to either I2P4/5 or I3P4/5 risk rating (dependent on shipper organisation specifics). The risk level will change from level 1 to either level 4 (operations manager risk) or level 5 (divisional manager risk). This is an indication that the risk profile is not

acceptable and the decision should be reviewed. The same methodology is applied to the remainder of models most related to the *service developer* category.

Table 4.2 indicates the risk level assigned when the correct model is utilised for the *service developer* 3PL provider type.

Table 4.2: Service developer abridged reference

	Models applicable	Risk level and risk owner	Pricing model most appropriate
Service developer	▪ Cherry pickers (Prockl *et al*., 2012) SCSI6. ▪ Bolumole (2003) – tactical grouping SCSI6. ▪ Bolumole (2003) – bilateral alliances SCSI6/7. ▪ Hum (2000) – externally neutral SCSI6. ▪ Hertz and Alfredsson (2003) – *service developers* SCSI6. ▪ Mellat-Parast and Spillan (2014) – resource-based view SCSI5-8.	I3P1, Level 6 risk, first-line supervisor	▪ Primarily outsourcing with a unit rate cost model ▪ Possible to utilise outsourcing with a fixed and variable cost component model

4.2.3 Customer adapter (permutation result three)

This is, for example, where the service factory model should be utilised with the intermediate services requirement, i.e. SCSI11. However, should a *customer developer* be utilised for the intermediate service requirement, the risk profile will change, meaning the risk profile will increase. The risk in the example will manifest in the shipper organisation paying a higher premium for the service than what is needed, translating into lost opportunities for the shipper organisation. This scenario on the outsource risk matrix renders a risk profile of I2P5/6, with risk level 4 (divisional manager risk) or level 5 (operations manager risk). This is an indication that the risk profile is not acceptable, and the decision should be reviewed. The opposite can also be a result of incorrect 3PL provider model assignment, i.e. a *standard service provider* is utilised and expected to deliver on intermediate service requirements.

Table 4.3 indicates the risk level assigned when the correct model is utilised with the category '*customer adapter*'.

Table 4.3: Customer adapter abridged reference

	Models applicable	Risk level and risk owner	Pricing model most appropriate
Customer adapter	▪ Service factory (Prockl *et al*., 2012) SCSI11. ▪ Bolumole (2003) – strategic grouping SCSI11. ▪ Hum (2000) – internally supportive SCSI 11. ▪ Hertz and Alfredsson (2003) – *customer adapter* SCSI11. ▪ Mellat-Parast and Spillan (2014) – knowledge-based view SCSI9–12.	I1P1, Level 6 risk, first-line supervisor	▪ Primarily utilise outsourcing with a fixed and variable cost component model ▪ Possible to utilise outsourcing with a percentage of sales value charge model

4.2.4 Customer developer (permutation result four)

Table 4.4 indicates the risk level assigned when the correct model is utilised within the category *customer developer*. It could be expected that the risk of outsourcing the total logistics package would be higher than, say, for a single transactional process. However, when done in accordance with the correct model guiding the decision, the risk profile will be that of I1P1.

Table 4.4: Customer developer abridged reference

	Models applicable	Risk level and risk owner	Pricing model most appropriate
Customer developer	▪ Service lernstatt (Prockl *et al*., 2012) SCSI16. ▪ Bolumole (2003) – partnerships SCSI16. ▪ Hum (2000) – externally supportive SCSI16. ▪ Hertz and Alfredsson (2003) – *customer developer* SCSI16. ▪ Huo et al. (2008) – operational intent SCSI16. ▪ Mellat-Parast and Spillan (2014) – knowledge-based view SCSI13-16.	I1P1, Level 6 risk, first-line supervisor	▪ Primarily utilise outsourcing with a percentage of sales value charge model ▪ Possible to utilise outsourcing with a fixed and variable cost component model

4.2.5 Synthesising of universality of permutation results

The permutation results indicate four optimal solutions from the services continuum. The four permutation results, with the models (as discussed in Chapter 2) and the risk (discussed in Chapter 3), coupled with the pricing model (discussed in Section 4.2) and combined per-permutation result, are portrayed in Table 4.5. Table 4.5 combines Subsections 4.2.1 to 4.2.4 in an easy-to-compare format and enables ease-of-use when considering the decision to outsource.

Table 4.5: Permutation results abridged reference

Permutation result	Model applicable	Risk level and risk owner	Pricing model most appropriate
1 **Standard service provider**	i. Conventional plus (Prockl *et al*., 2012) SCSI1. ii. Bolumole (2003) – transactional grouping SCSI1. iii. Bolumole (2003) – operational grouping SCSI2. iv. Hum (2000) – internally neutral SCSI1. v. Hertz and Alfredsson (2003) – standard 3PL provider SCSI1. vi. Huo *et al*. (2008) – operational intent SCSI1. vii. Mellat-Parast and Spillan (2014) – resource-based view SCSI1-8.	I1P1, Level 6 risk, first-line supervisor	Outsourcing with a unit rate cost model
2 **Service developer**	▪ Cherry pickers (Prockl *et al*., 2012) SCSI6. ▪ Bolumole (2003) – tactical grouping SCSI6. ▪ Bolumole (2003) – bilateral alliances SCSI6/7. ▪ Hum (2000) – externally neutral SCSI6. ▪ Hertz and Alfredsson (2003) – *service developers* SCSI6. ▪ Mellat-Parast and Spillan (2014) – resource-based view SCSI5-8.	I1P1, Level 6 risk, first-line supervisor	▪ Primarily outsourcing with a unit rate cost model ▪ Possible to utilise outsourcing with a fixed and variable cost component model

3 **Customer adapter**	▪ Service factory (Prockl *et al*., 2012) SCSI11. ▪ Bolumole (2003) – strategic grouping SCSI11. ▪ Hum (2000) – internally supportive SCSI 11. ▪ Hertz and Alfredsson (2003) – *customer adapter* SCSI11. ▪ Mellat-Parast and Spillan (2014) – knowledge-based view SCSI9-12.	I1P1, Level 6 risk, first-line supervisor	▪ Primarily utilise outsourcing with a fixed and variable cost component model ▪ Possible to utilise outsourcing with a percentage of sales value charge model
4 **Customer Developer**	▪ Service lernstatt (Prockl *et al*., 2012) SCSI16. ▪ Bolumole (2003) – partnerships SCSI16. ▪ Hum (2000) – externally supportive grouping SCSI16. ▪ Hertz and Alfredsson (2003) – *customer developer* SCSI16. ▪ Huo *et al*. (2008) – operational intent SCSI16. ▪ Mellat-Parast and Spillan (2014) – knowledge-based view SCSI13-16.	I1P1, Level 6 risk, first-line supervisor	▪ Primarily utilise outsourcing with a percentage of sales value charge model ▪ Possible to utilise outsourcing with a fixed and variable cost component model

The services continuum, coupled to the applicable outsourcing model and risk profile, was developed in order to ensure a formal method for the evaluation of the outsourcing decision. The following section discusses the strategic decision-making methodology process path, which is the vehicle for consolidating and operationalising the various aspects into a whole for the application of the strategic decision-making model.

4.3 STRATEGIC DECISION-MAKING METHODOLOGY PROCESS PATH

This section reports on renowned frameworks as they relate to the outsourcing process, as a whole. The work of Mahmoodzadeh, Jalalinia and Yazdi (2009), Schoenherr, Tummala and Harrison (2008), and Momme (2002) were reviewed and are reported on here. These models were chosen because of the extensive nature of study within the field of research (Duan, Grover & Balakrishnan, 2009;

Krstic and Kahrovic, 2015). The purpose of reviewing these methodology process paths was to derive a model path to be followed for the strategic decision-making methodology.

4.3.1 Mahmoodzadeh *et al*. (2009) – outsourcing framework

Mahmoodzadeh *et al.* (2009) are frequently cited and are well known for their outsourcing framework. The outsourcing framework consists of the following steps: a definition of core competencies, an understanding of the current business processes and designing the 'to-be' business processes, modelling and assessing the business processes before implementation, implementation of the new business process and measuring the results as attained from the implementation of the new business processes. This model is concerned with the processes within the business that relates to the outsourcing decision. The outsourcing framework of Mahmoodzadeh *et al.* (2009) is presented in Figure 4.1.

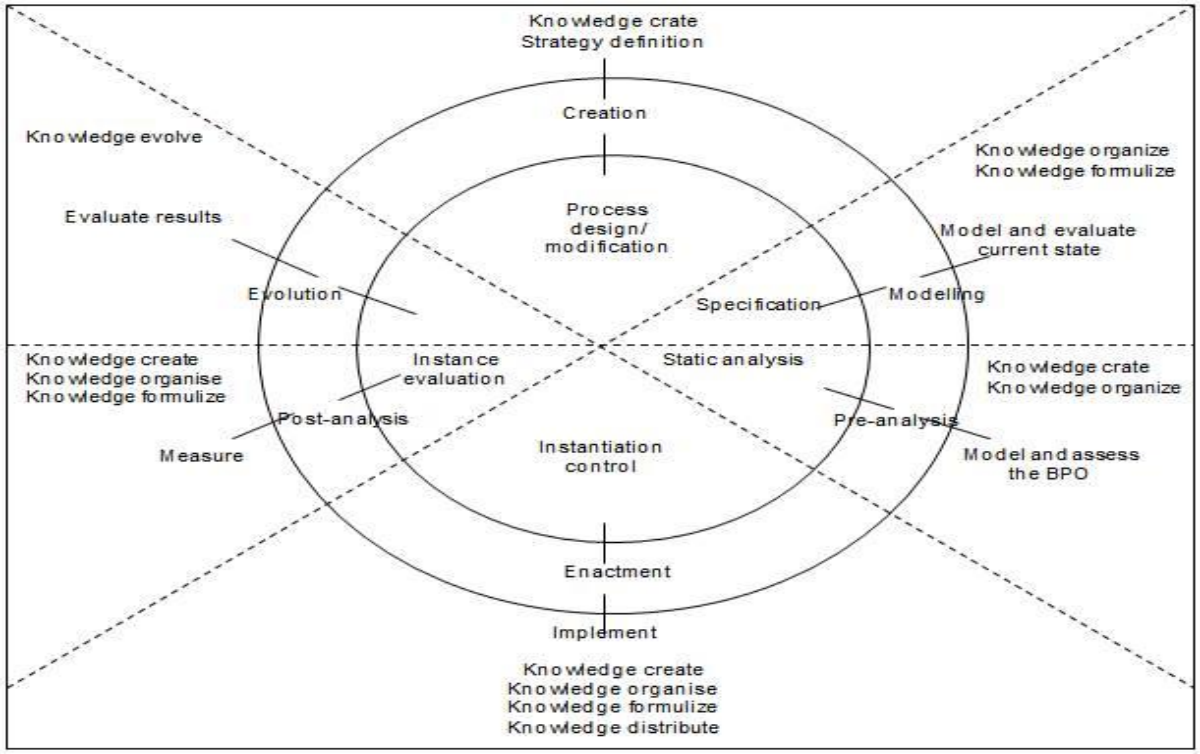

Figure 4.1: Outsourcing framework

Source: Mahmoodzadeh *et al*. (2009)

From the outsourcing framework of Mahmoodzadeh *et al.* (2009), the following elements became evident:

- upfront understanding of the business and formulation of strategy;
- designing of the outsourcing arrangement between shipper and 3PL provider; and
- the recurrent administration of the outsourcing arrangement, up to termination of the outsourcing arrangement, is within the scope of the outsourcing framework.

4.3.2 Schoenherr *et al*. (2008) – outsourcing assessment framework

Schoenherr *et al.* (2008) are known for their outsourcing assessment framework. The framework by Schoenherr *et al.* (2008) graphically illustrates three areas of concern, namely product, partner, and environment. Thereafter, 17 aspects related to outsourcing are defined. These 17 aspects are grouped into sub-categories that filter back to the main objective of the outsourcing decision. This framework is task-specific and the filtering approach adds value to the whole of the outsourcing decision. The framework of Schoenherr *et al.* (2008) is shown in Figure 4.2.

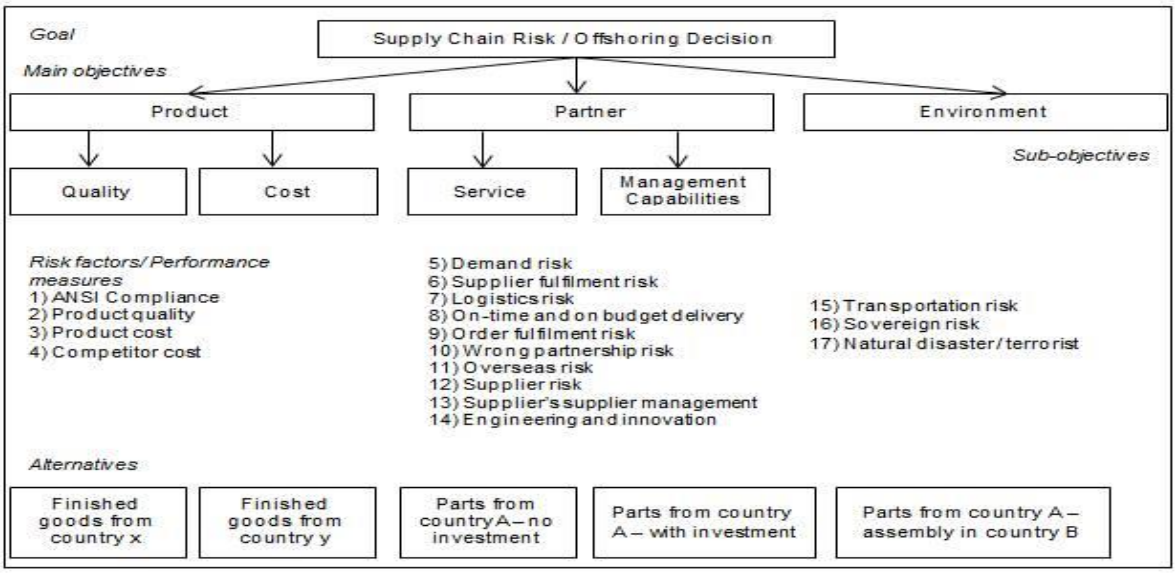

Figure 4.2: Framework for assessing outsourcing

Source: Schoenherr *et al*. (2008)

From the framework for assessing outsourcing of Schoenherr *et al.* (2008), the following elements became evident, as reiterations of the findings from the outsourcing framework of Mahmoodzadeh *et al.* (2009):

- upfront understanding of the business and formulation of strategy;
- designing of the outsourcing arrangement between shipper and 3PL provider; and
- the recurrent administration of the outsourcing arrangement, up to termination of the outsourcing arrangement, is within the scope of the outsourcing framework.

4.3.3 Momme (2002) – outsourcing framework

Momme (2002) reviewed the entire process being outsourced with the view of assigning KPIs with required outcomes per aspect. The framework of Momme (2002) highlights the aspects needed for the outsourcing venture. It lists the entire outsourcing process, coupled to the key activities in each phase, key performance measurements, and the expected outcome per phase. This framework reviews the entire outsourcing process in terms of competence analysis, assessment and approval, contract negotiations, project execution and transfer, managing of the relationship, and contract terminations (see Table 4.6). Each of these areas is reviewed in terms of the key activities, performance measures, and the expected output. The entire outsourcing framework is classified in terms of competence analysis, assessment and approval, contract negotiations, project execution and transfer, managing relationships, and contract termination. This model is a high-level view of the entire outsourcing process and is indeed a good roadmap to follow.

Table 4.6: Outsourcing framework of Momme (2002)

The entire outsourcing process	Competence analysis	Assessment and approval	Contract negotiations	Project execution and transfer	Managing relationship	Contract termination
Key activities	1) Strategic analysis 2) SWOT analysis 3) Core/non-core competence mapping	1) Defining critical assessment criteria 2) Detailed audit at supplier premises 3) Supplier in-house performance comparison	1) Defining legal / commercial terms and conditions 2) Negotiating scope of delivery and contract period 3) Determining mutual commitments	1) Establishing basis for supplier integration 2) Defining workflow interfaces 3) Adapting organisation to supplier performanc e	1) Establishing communicati on, information and monitoring systems 2) Joint development projects 3) Continuous performance assessments	1) Assessing alternatives of prolonged relationship, replacing supplier or insourcing 2) Establishing basis for reviewing core competence strategy
Performance measures	1) Ability to visualise core competencies 2) Validity of market and in-house information 3) Degree of commitment to outsourcing in organisation	1) Practicability of assessment criteria 2) Number of approved suppliers 3) Geographic location of suppliers compared to customer sites	1) Degree of unanimity in terms of legal/ commercial terms and conditions 2) Ability to specify baseline scope of delivery 3) Openness and collaborative effort of supplier during contract negotiation	1) Ability to implement change 2) Degree of capacity utilisation and flexibility 3) Ability to determine transaction cost	1) Ability to measure bottom-line effect 2) Life cycles and time to market, innovativene ss and customisatio n 3) Cost structure, ability to delivery and quality of final product	1) Degree of contact with outsourced competence area 2) Ability to ensure a smooth phase-out period 3) Ability to replace supplier or insource
Expected output	1) Proper strategic direction 2) Better knowledge about competitivene ss and profitability 3) Common understandin g of procedural incentives and pitfalls	1) Reduced risk of supplier selection 2) Better overview of and access to critical production capabilities 3) Better understandin g of supplier and in-house performance level	1) Close, intimate and long-term relationship 2) Mutual agreement on contract specifications 3) Mutual ambition to aim for win-win situation and open-book principle	1) Capital funds and resource availability 2) Accelerated re-engineering benefits 3) Rational balance between in-house manufacturi ng and outsourcing	1) Percentage improvement of the bottom line 2) Reduced or better controlled operating costs 3) Better timing of new product introductions	1) Awareness of when to prolong, replace or insource 2) Reduce phase-out costs 3) Better link to strategic planning

Source: Momme (2002)

From the outsourcing framework of Momme (2002), the following elements became evident, as reiterations of the findings from the outsourcing framework of Mahmoodzadeh *et al.* (2009) and of the framework for assessing outsourcing of Schoenherr *et al.* (2008):

- upfront understanding of the business and formulation of strategy;
- designing of the outsourcing arrangement between shipper and 3PL provider; and
- the recurrent administration of the outsourcing arrangement, up to termination of the outsourcing arrangement, is within the scope of the outsourcing framework.

4.3.4 Strategic decision-making methodology process path defined

Subsections 4.3.1 to 4.3.3 reflected the frameworks of Mahmoodzadeh *et al.* (2009), Schoenherr *et al.* (2008), and Momme (2002). The objective was to review the aforementioned frameworks and develop a framework for the strategic decision-making methodology process path that was utilised in the present study. From the models reviewed, three broad phases were identified, namely:

- upfront understanding of the business and formulation of strategy;
- designing of the outsourcing arrangement; and
- recurrent administration of the outsourcing arrangement, up to termination of the outsourcing arrangement.

For the strategic decision-making model, it was deemed appropriate that there would be three phases, as identified from the models reviewed, which once executed, had the objective to address and ensure alignment:

- Phase one – serves as input to the strategic decision-making model;
- Phase two – consists partly of input elements and design elements; and

- Phase three – is the design phase for continual management of the 3PL provider and shipper relationship.

Alignment was needed in terms of: supplier selection, integrated performance measurement programme, unified systems requirement, the basis for relationship management, coordinated communication, strategy selection and costing methodology. The strategic decision-making methodology process path is the blueprint designed to ensure optimal alignment between the 3PL provider and the shipper organisation. The methodology framework resides in a three-phased approach as indicated in Figure 4.3. Figure 4.3 shows the strategic decision-making methodology process path developed for the study.

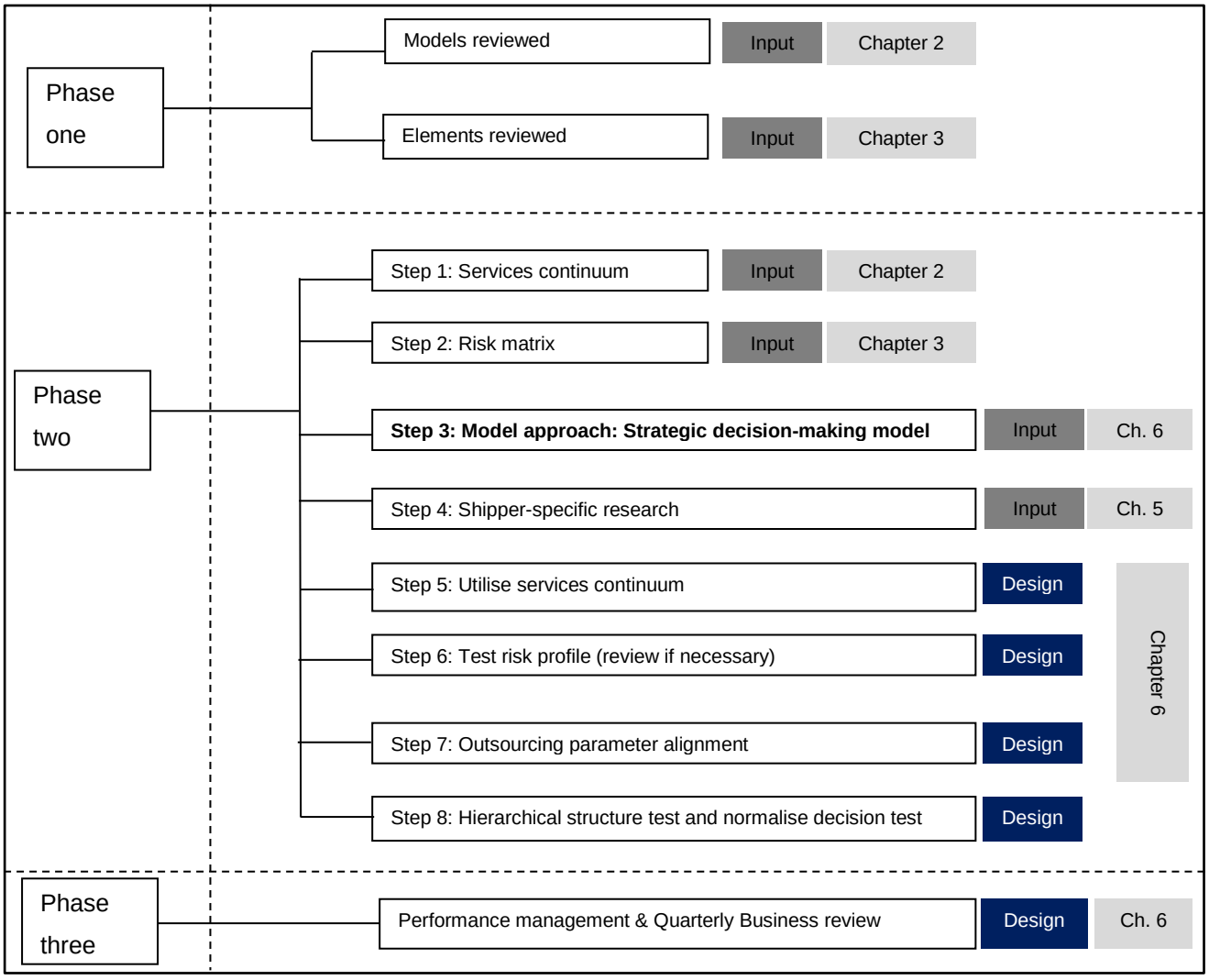

Figure 4.3: Strategic decision-making methodology process path

Phase one: constitutes a review outsourcing models and elements as part of the outsourcing venture. The models reviewed were –

- the capabilities matrix for 3PL provider service (Prockl *et al.*, 2012);
- the framework for evaluating the supply chain role of 3PL providers (Bolumole, 2003);
- Perçin's (2009) mathematical model;
- supplier selection and evaluation process (Monczka *et al.*, 2005);
- the Hayes–Wheelwright framework (Hum, 2000);
- differentiated outsourcing variables;
- the four categories of 3PL providers (Hertz and Alfredsson, 2003);
- the estimated path model (Huo *et al.*, 2008); and
- the process integration via survey data collection model (Mellat-Parast and Spillan, 2014).

The elements reviewed were classified into three categories: collaboration and integrated planning systems, performance measurement, and B-BBEE. The whole of phase one served as input to the strategic decision-making methodology.

Phase two: consisted of eight steps, with the purpose to design the solution of the outsourced venture. The eight steps were as follows:

1. establish a services continuum for classification of 3PL provider models and elements;
2. compile a risk matrix for assessing whether the correct placement was done on the services continuum;
3. adopt a model approach to the strategic decision-making methodology, the needs analysis of Sasol's outbound final packaged product supply chain

(strategic vs transactional approach);

4. analyse the components of the Sasol outbound final packaged product supply chain;

5. utilise the services continuum, following the research into Sasol's outbound final packaged product supply chain and confirm placement;

6. test the risk profile of the proposed outsourcing against the outsource risk matrix and ensure that the applicable guidelines and processes for both 3PL provider and shipper organisation line management are in place;

7. outsource parameter alignment between 3PL provider and shipper; and

8. conduct hierarchical structure tests and normalise the outsourcing decision.

Steps one to four of phase two served as input to the strategic decision-making methodology, and steps five through to eight served as the design elements.

Phase three: this was the final phase of the strategic decision-making methodology and represents a design element of a continuous review of performance, inclusive of a quarterly business review. The quarterly business review aligned with the ISO 31000: 2009 standard with regard to risk management processes to review the risk involved with the outsourcing venture continuously.

The most applicable frameworks were reviewed with the objective of utilising them to enable the establishment of the strategic decision-making methodology process path for application of Sasol's outbound final packaged product supply chain, which is reported in Chapter 6. The framework by Mahmoodzadeh *et al.* (2009) could be utilised for strategic decision-making by following five steps, whereas the framework of Schoenherr *et al.* (2008) follows a three-part approach of product, partner, and environment, each delving into more detail and then filtering back to the main objective. The final framework of Momme (2002) lists the whole of the outsourcing process with key activities in each phase, key performance measurement, and the expected outcome per phase.

4.4 APPLICATION OF THE UNIVERSAL STRATEGIC DECISION-MAKING MODEL

The development of the strategic decision-making methodology process path comprised three phases (see Figure 4.3). The strategic decision-making model has as its objective to ensure optimal alignment between shipper and prospective 3PL providers.

4.4.1 Strategic decision-making model – phase one

The starting point of the strategic decision-making model is encapsulated in the secondary research data concerned with theoretical outsourcing models and elements required – as discussed in Chapters 2 and 3, respectively.

The phase one methodology is displayed in Figure 4.4. This phase served as an input into the strategic decision-making model.

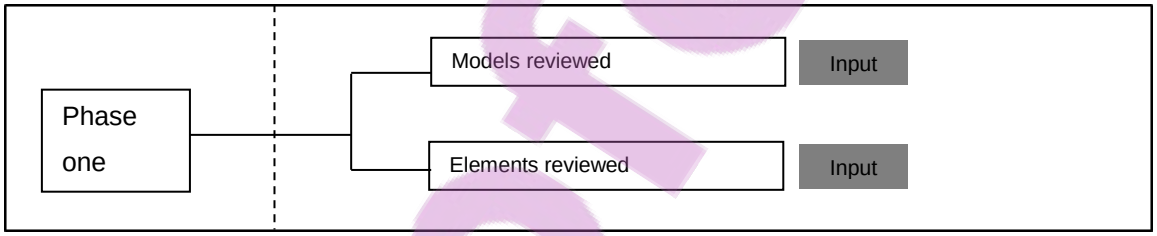

Figure 4.4: Phase one of the strategic decision-making model

The inputs of phase one served as enablement in terms of the development of the strategic decision-making model. The following subsection discusses the second phase of the strategic decision-making model methodology process path.

4.4.2 Strategic decision-making model – phase two

This phase utilised the literature review conducted for phase one and organised the 3PL provider outsourcing models and elements through the services continuum. The services continuum is utilised together with the outsourcing risk matrix, i.e. dualistic development approach in order to enable the strategic

decision-making model. Phase two comprises eight steps: steps one to four serve as input to the strategic decision-making methodology and steps five through to eight serve as the design elements. Phase two is graphically displayed in Figure 4.5.

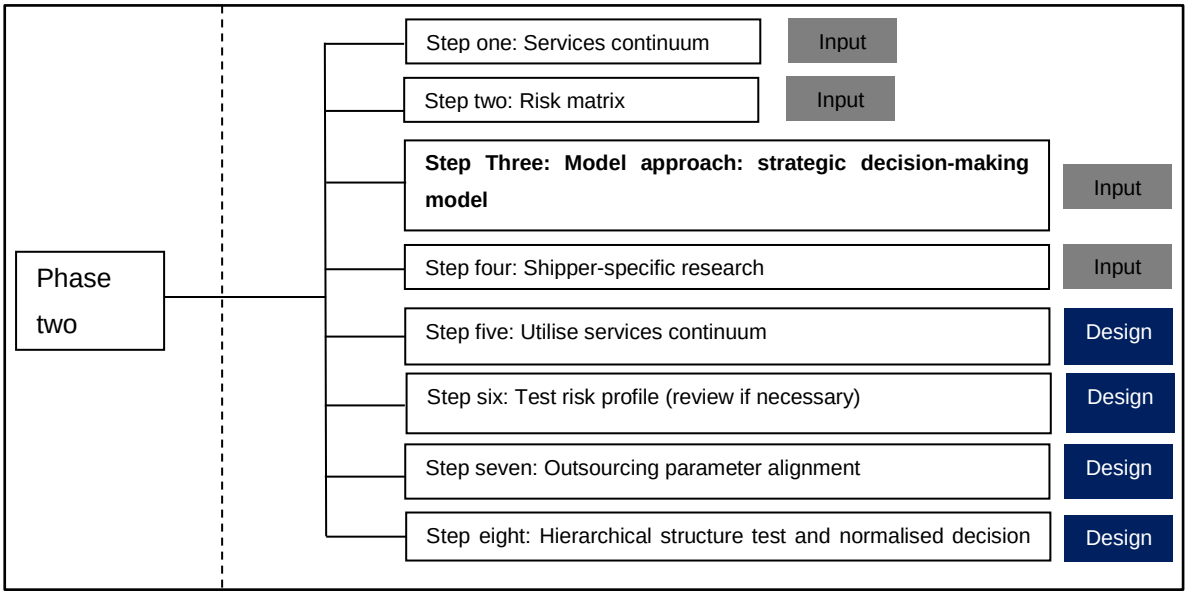

Figure 4.5: Phase two of the strategic decision-making model

Step one, the services continuum, has been developed to categorise 3PL provider models and elements into four categories of importance (see Section 2.3 for a detailed discussion). The secondary research data details reported in Chapters 2, 3 and 4 were aligned with the services continuum and form a conglomeration of models, each categorised according to an optimal permutation result, according to the category of the services continuum.

Step two comprised the outsource risk matrix, which serves as a verification of optimal alignment between shipper and 3PL provider, coupled to appropriate risk identification and mitigating management controls. Chapter 3 provided a detailed discussion on the development and utilisation of the outsource risk matrix.

Step three is positioned in relation to the model approach for the strategic decision-making model (input), i.e. strategic partnership vs transactional arms-length outsourcing.

Step four focusses on shipper-organisation-specific research with the purpose to

gain an understanding of design specifics and interphase requirements, inclusive of potential 3PL providers available to the shipper.

Step five reflects the utilisation and application of the services continuum. This forms part of the design of the strategic decision-making model. Given the scope and requirements necessary for the input established in the preceding steps, plotting on the services continuum is reached.

Step six is intended to test the risk profile. In terms of the shipper and 3PL provider research in the preceding steps, potential risk for the outsourcing venture is established. The potential risk follows the outsourcing risk matrix protocol to identify potential risks, as well as the risk mitigation actions required, to ensure minimal risk to the outsourcing venture.

The potential risk is given a rating as well as a post-mitigation rating. Table 4.7 indicates the format for testing of the risk profile.

Table 4.7: Potential risk and mitigation action

Potential risks	Outsourcing risk matrix rating	Risk mitigation	Outsourcing risk matrix rating
▪ Successful identification of and engaging with a potential partner	I1P1 to I7P7, level 1 to 6 risk possible	▪ Mitigated through the strategic decision-making model	I1P1 to I7P7, level 1 to 6 risk possible
▪ Anticipated efficiencies and enhanced execution/ optimisations not realised	I1P1 to I7P7, level 1 to 6 risk possible	▪ Official parameter alignment and sign-off through contract. Critical that the correct 3PL provider be chosen according to placement capabilities on the services continuum ▪ Continual process of performance management on monthly basis	I1P1 to I7P7, level 1 to 6 risk possible
▪ Poor management of the new entity	I1P1 to I7P7, level 1 to 6 risk possible	▪ Official parameter alignment and sign-off through contract. Critical that the correct 3PL provider be chosen according to placement capabilities on the services continuum	I1P1 to I7P7, level 1 to 6 risk possible
▪ Influence on workforce (number of employees affected) – Labour Relations Act (No. 66 of 1995) section 197 (transfer of employees) and section 189 (retrenchment based	I1P1 to I7P7, level 1 to 6 risk possible	▪ The board of directors are involved with the decision regarding outsourcing placement on the services continuum. The number of employees directly affected warrants engagement with employee relations experts for successful execution of section 197 or 189	I1P1 to I7P7, level 1 to 6 risk possible

on operational requirements)			
▪ The impact of processes or systems could be significant after completion of detailed design ▪ Initial costing can potentially only be reduced in a phased approach due to complexity to implement	I1P1 to I7P7, level 1 to 6 risk possible	▪ Ensure outsourcing parameter alignment according to the strategic decision-making model	I1P1 to I7P7, level 1 to 6 risk possible
▪ Supplier fails to be aligned with B-BBEE specifications	I1P1 to I7P7, level 1 to 6 risk possible	▪ Aim is to ensure a 3PL provider is chosen in order for the shipper to gain maximum preferential procurement spent	I1P1 to I7P7, level 1 to 6 risk possible
▪ Delays and additional costs due to ineffective management at execution	I1P1 to I7P7, level 1 to 6 risk possible	▪ Official parameter alignment and sign-off through contract. Critical that the correct 3PL provider be chosen according to placement capabilities on the services continuum ▪ Continual process of performance management on monthly basis	I1P1 to I7P7, level 1 to 6 risk possible
▪ Customer relations negatively affected	I1P1 to I7P7, level 1 to 6 risk possible	▪ Official parameter alignment and sign-off through contract. Critical that the correct 3PL provider be chosen according to placement capabilities on the services continuum ▪ Continual process of performance management on monthly basis	I1P1 to I7P7, level 1 to 6 risk possible
▪ Safety, health and environment (SHE) standards and quality governance to be adhered to. Risk mitigated by the 3PL provider selection process of independent distribution transporters	I1P1 to I7P7, level 1 to 6 risk possible	▪ Official parameter alignment and sign-off through contract. Critical that the correct 3PL provider be chosen according to placement capabilities on the services continuum ▪ Continual process of performance management on monthly basis	I1P1 to I7P7, level 1 to 6 risk possible
▪ Ineffective change management	I1P1 to I7P7, level 1 to 6 risk possible	▪ The strategic decision-making model is designed for optimum alignment between 3PL provider and Sasol. Change management is of the essence and the overarching steering committee should ensure a functional stream for change management. Change management will not be left for line management	I1P1 to I7P7, level 1 to 6 risk possible

		to conduct or conclude	
▪ Existing assets largely depreciated and 3PL provider will have a replacement spike in the first three years. Assets nearing the end of their useful life that could affect the market value and 'buy-in' price negotiations negatively	I1P1 to I7P7, level 1 to 6 risk possible	▪ Official parameter alignment and sign-off through contract. Critical that the correct 3PL provider be chosen according to placement capabilities on the services continuum ▪ Continual process of performance management on monthly basis ▪ Assets will not be transferred to the 3PL provider	I1P1 to I7P7, level 1 to 6 risk possible

Step seven refers to outsourcing parameter alignment. This is done by a process indicating the elements required via collaboration and integrated planning systems, performance measurement and B-BBEE (see Chapter 3). The shipper requirements are based on the following parameters:

- business continuity and no bottlenecks or insufficient delivery;
- customer experience should be the same or improved, based on current customer experience;
- integrated interface management, including systems, contract to guard against unrealistic price increases, and clear process indication and understanding; and
- safe operations to be adhered to at all times.

These indicate the factors for outsourcing as financially advantageous, capability building, flexibility, and the possibility of access to new technology and reduced risk.

Step eight reflects the hierarchical structure test and normalising of the outsourcing decision. McIvor and Humphreys (2000) indicate that organisations traditionally outsource without adopting a formal method for evaluating the outsourcing decision; however, according to Perçin (2009), there is a hierarchical structure for selecting the best 3PL provider. Based on the hierarchical

arrangement by Perçin (2009), the structure and elements are utilised in conjunction with the services continuum after the category type has been established and a list of specific suppliers has been compiled that conforms to the specific category of 3PL. The hierarchical structure utilises different elements, grouped into three factor categories:

- Strategic factors

  Elements are similar values, similar size, financial stability, compatible culture and strategic partners.

- Business factors

  Elements are technical ability, management capacity, market knowledge and performance.

- Risk factors

  Elements are loss of functional control, complexity in operations and delivery, and risk in choosing the right partner.

The hierarchical structure test and normalisation of the decision ensure the 3PL provider and shipper are aligned in terms of the business parameters and objectives so as to enable the success of the outsourcing venture.

4.4.3 Strategic decision-making model – phase three

Phase three is the final phase of the strategic decision-making model and is a design element of continuous performance review, inclusive of business review. The business review aligns with the ISO 31000: 2009 standard with regard to risk management processes to continuously review the risk involved with the outsourcing venture. Figure 4.6 indicates an extract of phase three of the strategic decision-making model.

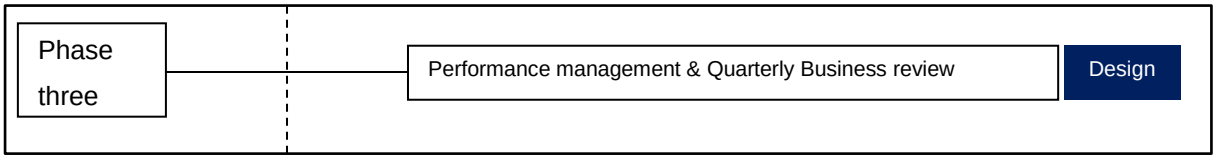

Figure 4.6: Phase three of the strategic decision-making model

Performance measurement is executed by means of agreed KPIs between shipper and 3PL provider (see Subsection 3.2.2 for detailed performance measurement). Given the nature of the outsourcing venture between shipper and 3PL provider, the utilisation of either first-, second- or third-generation performance measurement is instituted. Various process KPIs are established and agreed between shipper and 3PL provider indicating the activity required, followed by frequency of the required activity, the responsible entity and the KPI for the specific activity. The purpose of such performance review is to ensure functional execution success and financial viability in line with the strategic decision-making model.

4.5 CONCLUSION

This chapter focussed on the fifth and sixth secondary objectives of the study (detailed in Subsection 1.3.2), i.e. to –

- establish a generic application of the services continuum with the objective to arrive at an abridged reference table for each of the four permutation results (fifth secondary objective); and,
- define a strategic decision-making methodology process path, specifically for application in relation to Sasol's outbound final packaged product supply chain (sixth secondary objective).

Abridged reference tables were established in terms of the four permutation results possible on the services continuum (see Tables 4.1 – 4.4). A strategic decision-making model path was established (see Figure 4.3) following research into the outsourcing methodology process paths of Mahmoodzadeh *et al.* (2009) (see Subsection 4.3.1), Schoenherr *et al.* (2008) (see Subsection 4.3.2), and Momme (2002) (see Subsection 4.3.3). The methodology process path was established as having three phases, which comprised an overarching approach to the application of the strategic decision-making model. The three phases are –

- Phase one, consisting of two steps – reviewing outsourcing models and

elements as deemed necessary for the outsourcing venture;

- Phase two, consisting of eight steps – reflecting the purpose to utilise the inputs to design the outsourcing solution between shipper and 3PL provider; and

- Phase three, a single-step phase with the objective to confirm continuous performance management between shipper and 3PL provider by ensuring KPIs are qualified and quantified.

The methodology process path serves to consolidate the various aspects into a unified whole for operationalising the application of the strategic decision-making model.

Chapter 5 follows with focus on the seventh and eighth secondary objective (see Subsection 1.3.2), i.e. to –

- confirm parameter alignment with Sasol's outbound final packaged product supply chain by means of structured interviews (seventh secondary objective); and

- conduct a value analysis of prospective 3PL providers in relation to establishing the most applicable 3PL provider based on Sasol's outbound final packaged product requirement (eighth secondary objective).

CHAPTER 5
RESEARCH METHODOLOGY AND FINDINGS

5.1 INTRODUCTION

The research process 'onion' (see Figure 5.1) indicates graphically the research design for the study, adapted from Saunders, Lewis and Thornhill (2003: 83).

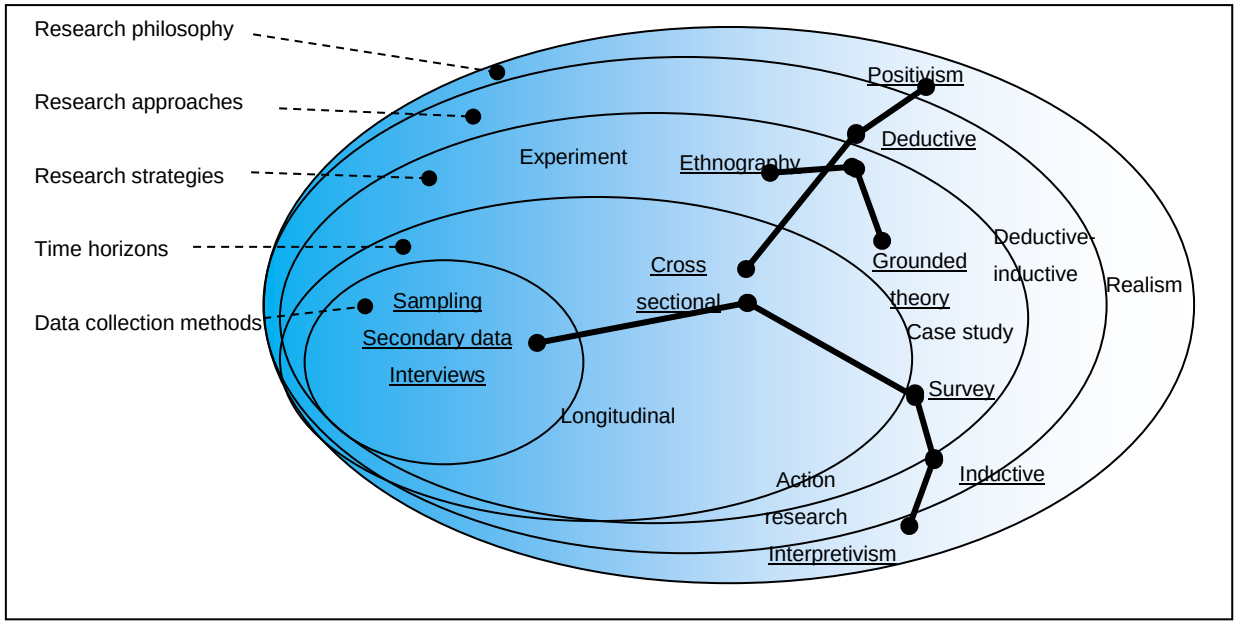

Figure 5.1: Adapted research process 'onion'
Source: Saunders *et al*. (2003: 83)

From Figure 5.1, it is clear that two streams of research philosophy were followed, namely positivism[7] and interpretivism.[8] Positivism utilises a deductive research approach, while interpretivism utilises an inductive research approach. In the present study, the research strategies were those of ethnography, grounded theory, and surveying. The time horizon for the research was cross-sectional and the data collection methods were those of sampling in order to conduct interviews and secondary data reviews.

7 Positivist research is concerned with gaining knowledge in a world which is objective, using scientific methods of enquiry (University of West England, 2017).

8 Interpretivist research requires of researchers to interpret elements of the study (Research Methodology, 2016).

Chapter 5 focus on the seventh and eighth secondary objective (see Subsection 1.3.2), i.e. to –

- confirm parameter alignment with Sasol's outbound final packaged product supply chain by means of structured interviews (seventh secondary objective); and
- conduct a value analysis of prospective 3PL providers in relation to establishing the most applicable 3PL provider based on Sasol's outbound final packaged product requirement (eighth secondary objective).

5.2 DEVELOPING THE SAMPLE PLAN

Developing the sample plan has the objective to satisfy the aim of the study as stated in Subsections 1.3.1 and 1.3.2, with the focus on the 'what', 'when', 'where', 'how', and 'why' of the research being conducted. The 'what' and the 'where' elements of the research for Sasol were confined to the outbound supply chain under the functional control of Sasol Base Chemicals. The following entities were included in the scope: Explosives, Fertilisers, Polypropylenes, Wax, Solvents and Polyvinyl Chloride, Supply Chain Shared Services. The 'what' of the 3PL providers was limited to 3PL provider organisations –

- who had rendered a service to Sasol before, namely SACD; or
- who were doing so at the time of this research, namely Katoen Natie, Sammar Investments, and GTWLS; or
- who were regarded as best in their class, namely Barloworld Logistics and Imperial Logistics (African Decisions, 2017).

Subject matter experts were included as part of the sampling, given the limited potential sample with knowledge of Sasol's outbound final packaged product supply chain. The research was conducted during the latter half of 2016. The spread of information ranged between operational, tactical and strategic business experiences. There is limited knowledge and narrow understanding available concerning Sasol's outbound final packaged product supply chain. It is for this reason that non-probability judgement sampling ('how') was utilised for the selection of participants for the structured interviews. The model application, as discussed in Chapter 6, is for Sasol's outbound final packaged product supply chain, based on the inputs confirmed through the primary research conducted. There is a requirement for an investigation to be made into what is necessary to achieve optimal alignment between 3PL providers and Sasol's final packaged product supply chain in order to form a successful outsourcing venture, as measured by variable cost reduction, inventory reduction, fixed cost reduction and improved service delivery. The non-probability judgement sampling deployed a sampling procedure defining the exact scope requirements for primary and secondary data research, as shown in Table 5.1.

In this study, primary data research, as reflected in Table 5.1, had the objective to validate and refine design requirements, while gauging Sasol's perception with regard to key role players within the Sasol 3PL provider sphere, serving as input into the application of the strategic decision-making model, reflected in Chapter 6. The reliability of the results was assured by including a range of management levels within the interview process. Direct involvement observation (time series-based) included on-site participation in the design process for optimising the outbound final packaged product supply chain within Sasol.

Table 5.1: Sampling procedure protocol

Research type	Sampling procedure protocol
Primary research data	▪ Contained to individuals knowledgeable in the specific field of 3PL provider service rendering to Sasol, ranging from executive and senior to junior management. Interview-based ▪ Sample size (N) was ten ▪ This is representative of the study as the parameter was established to include only knowledgeable employees within the Sasol context
Secondary research data	▪ General theoretical outsourcing models (literature review) ▪ Elements deemed important to business (literature review) ▪ Organisations which have rendered a typical 3PL provider service to Sasol before ▪ Organisations that were rendering a similar 3PL provider service to Sasol at the time of this research ▪ Organisations regarded by industry peers as leaders in the field of 3PL provider service rendering ▪ Total sample size (N) was six organisations ▪ The sample size was representative of past and present utilisation, coupled to best in industry comparisons

Secondary research data, as shown in Table 5.1, was focussed on historical data analysis. Extensive historical data analysis was done regarding both the literature review (as noted in Chapters 2 and 3) and the relevant 3PL provider organisations (N = 6). The relevant 3PL provider organisations were chosen by means of the sampling procedure protocol, as reflected Table 5.1. Besides the 3PL provider organisations being subjected to secondary research, this research was also directed at Sasol's outbound final packaged product supply chain, in the form of the enterprise resource planning system, operations reports and project reports. Secondary research was conducted at Sasol to gain an understanding with regard to current operational expenditures, numbers of employees, management of sites and facilities, processes and procedures, marketing strategy, and production planning and operating strategies. The six 3PL provider organisations that satisfied the sampling procedure protocols are shown in Table 5.2.

Table 5.2: Sampling design 3PL providers

#	3PL provider	Reason for including in non-probability judgement sample	Overview
1	Katoen Natie	Currently serving Sasol in polymer activities. Important to understand scope and deliverables experienced.	'Katoen Natie is suppliers of logistics and semi-industrial services' (Katoen Natie, 2016: para 1).
2	South African Container Depots (SACD)	Have been utilised for more than a decade, however, no business was directed to SACD at the time of this research. It is important to understand the scope that was given to SACD and why SACD was not being utilised anymore.	'SACD is an import and export management company the offers customers a complete, end-to-end, supply chain management solution' (SACD, 2016: para 1).
3	Barloworld Logistics	Regarded as best in class (African Decisions, 2017) and therefore included to draw important conclusions.	Barloworld Logistics is a supplier of integrated strategic warehousing and distribution solutions (Barloworld Logistics, 2016).
4	Imperial Logistics	Regarded as best in class (African Decisions, 2017) and therefore included to draw important conclusions.	'Imperial Logistics provides fit-for-purpose and client specific warehouse storage solutions by managing and operating customised storage space' (Imperial Logistics, 2016: para 6).
5	Sammar Investments	Was being utilised by Sasol as 3PL provider at the time of this research.	Sammar Investments is a 3PL provider that provides service for Sasol for the wax final packaged product supply chain, which is warehoused at Durban, South Africa.
6	GTWLS	Was serving Sasol for polymer and fertiliser 3PL provider activities at the time of this research. It is important to understand the scope and deliverables experienced.	GTWLS was being utilised as 3PL provider for the fertiliser overflow warehouse needs as well as polymer overflow warehouse needs at the time of this research.

Table 5.2 shows the 3PL provider coupled to the protocol satisfied to be included in the secondary research, as well as an overview of the 3PL provider organisation. For example, the 3PL provider, Katoen Natie, was included as part of the non-probability judgement sample because the 3PL provider was servicing the final packaged product stream of Sasol Polymers at the time of this research. Inclusion was therefore warranted on the basis of understanding the 3PL provider's scope and deliverables, matched to experience at the time of this research. Katoen Natie is marketed as a supplier of logistics and semi-industrial services (Katoen Natie, 2016).

Non-probability judgement sampling is utilised for both primary and secondary research. A sampling protocol was developed for primary research to ensure that only knowledgeable employees within the Sasol outbound final packaged product

supply chain were included. The sampling protocol was extended to secondary research to include relevant 3PL providers, while satisfying the requirement to gain insight into 3PL providers who are viewed as best in class. The next section discusses the design of the research instrument.

5.3 DESIGN OF THE RESEARCH INSTRUMENT

The research instrument enables the set requirements to be investigated from the sample. In the present study, it related to the input and design element testing for application of the strategic decision-making model (see Chapter 6). The structured interview process consisted of four sections. The first section collected background information to gain an understanding of the candidates' knowledge and experience. Section two was concerned with the Sasol outbound final packaged product supply chain scope. Section three was focussed on 3PL providers as it pertained to the Sasol sample. The final section, Section four, referred to testing factors deemed important to subject matter experts.

Table 5.3 indicates the research instrument overview as it relates to the structured interview. Appendix E consists of the detail pertaining to Sections one to four.

Table 5.3: Research instrument overview in terms of the structured interviews

Section	Overview	Questions per section	Relevance
1	Qualifiers (background information)	▪ 2 questions, including subsections	▪ Gain understanding of candidates' knowledge and experience in order to add valuable insight to the research conducted
2	Sasol scope	▪ 12 questions, including subsections	▪ Gain understanding of the Sasol outbound final packaged product supply chain in order to refine the strategic decision-making model for optimal alignment
3	3PL provider requirement	▪ 5 questions, including subsections	▪ Gain understanding from a Sasol point of view of the 3PL provider requirements to ensure successful outsourcing.
4	Important model requirements	▪ 2 questions, including subsections	▪ Subject matter expert view on what is deemed important to the strategic decision-making model

Secondary research was undertaken in this study in order to complete the literature review as well as to gain an understanding of 3PL providers that satisfy the sample plan protocol. In the present study, secondary research focussed on document analysis, inclusive of operational reports, financial statements, historical data, and publications and journal reviews. As reflected in Table 5.2, the research aspects applicable were:

- organisation profile (size, turnover, geographical spread of operation); and
- reviewing the organisations' operations in terms of 3PL provider services; and
- reviewing the organisations' operations against the elements categorised in terms of collaboration and integrated planning systems, performance measurement, and B-BBEE status.

These research aspects were utilised to conduct a value analysis of the six 3PL providers. The value analysis was conducted in order to differentiate the prospective 3PL providers according to the deliverable of optimal alignment between Sasol and 3PL provider.

The final aspect relating to the design of the research instrument was a quality control and record management system. The quality control system culminated in proper demarcation of participant involvement, coupled with a summary of key interviewee results, and the records were filed in a secure cabinet. The results obtained were reviewed for completeness, and stored for further analysis and interpretation.

5.4 RESEARCH INSTRUMENT FINDINGS

Structured interviews were conducted on a face-to-face basis as well as via Microsoft Office Lync™ during August 2016. Face-to-face interviews were done with candidates who were within a 50-kilometre radius of Sasol Secunda with whom meetings could be arranged for both researcher and candidate to meet at Sasol Secunda. Where participants did not have sufficient time to travel to Sasol

Secunda, Microsoft Office Lync™ meetings were set up. The structured interview process was scheduled for one hour. The purpose of the research instrument was to obtain and confirm design specifications, and to confirm alignment specifications of Sasol for the application of the strategic decision-making model for Sasol's outbound final packaged product supply chain.

5.4.1 Findings from the primary research

Primary research findings from the structured interviews are discussed in sections one to four of the research instrument. Appendix E indicates the structured interview designed for the study. All of prospective participants (n = 10) approached according to the research instrument design to participate in the structured interview accepted. Of the participants, 80% (n = 10) who had been accepted to participate did actually participate. This was principally due to operational responsibilities, which limited the availability of participants. The research took place during August 2016.

5.4.1.1 Research findings – section one

This subsection of the research instrument was required to measure the participants' experience so as to gain an understanding of why the participant was regarded as a subject matter expert. This provided clarity on the approach of the individual pertaining to participating in the structured interview.

Question 01: What is your involvement within the supply chain and specifically the outbound final packaged product supply chain? The involvement of the participants ranged from operational to marketing, senior, and executive management levels within the Sasol supply chain. The majority of the participants (n = 8) were senior management (37.5%, n = 8), followed jointly by executive and operational management (25%, n = 8), and lastly marketing management (12.5%, n = 8).

A follow-up question requested details of the participant's years of experience. It

was found that all the participants had more than 15 years of experience, while the majority of the participants (62.5%, n = 8) had experience of more than 20 years.

A further follow-up question enquired about the participant's qualification level. It was found that all executive management had master's degrees, while 12.5% (n = 8) of senior management had master's degrees. The remainder of senior management (25%, n = 8) had degrees, while operational and marketing management had post-matric/diploma qualifications.

Figure 5.2 graphically indicates the participants' levels of qualification.

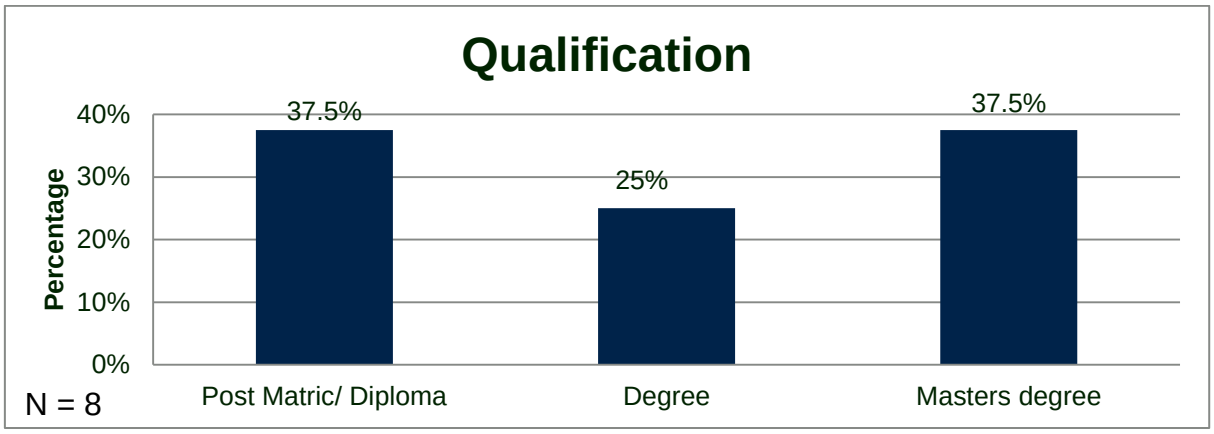

Figure 5.2: Participant qualification level

The following sub-question enquired about the participant's level of decision-making authority within Sasol (i.e. executive, senior or junior management). It was found that the levels of decision-making (appointed level), when compared with the levels of involvement experienced, differed. This difference was attributable to the organisation design. Typically, an employee was appointed at senior management level, although the employee's responsibility in relation to the outbound final packaged product supply chain was strategic in nature. The level of decision-making strongly leaned towards executive-level decision-making (50%, n = 8), followed by equal share of senior and junior levels of decision-making.

The final section of question one was to enquire about the expert status of participants as it pertained to current subject matter. The result obtained was that all participants were regarded as subject-matter experts

Question 02: What is your understanding of the outbound final packaged product

supply chain (processes and design)? It was found that there were two mainstream views in relation to the activities that were associated with the final packaged product supply chain. The first view was that it related to including the packaging activity to allow for differentiation closer to the market need, i.e. postponing packaging so that it was done at the source to allow for a differentiation of product requirement closer to market (make to order). The second view was to exclude packaging, and suggested that the final packaged product supply chain only starts the moment the product is in final packaging, ready for dispatch to the customer (pick-and-ship to stock). The participants' views primarily (75%, n = 8) leaned towards the outbound final packaged product supply chain starting after the point of packaging.

The purpose of questions one and two, which comprised the first section of the research instrument, was to establish whether the participants chosen to participate in the research could contribute to the required level of output in terms of specific knowledge of the Sasol outbound supply chain, their academic backgrounds, and their levels of decision-making within Sasol. The participants were primarily senior to executive management, although they also represented an operational and marketing perspective. There was a definitive indication that the sample protocol was achieved, which enabled the parameter alignment required in the study for application of the Sasol-specific strategic decision-making model.

5.4.1.2 Research findings – section two

The aim of section two of the research instrument was to validate the design requirements of the strategic decision-making model to ensure optimal alignment between Sasol and the 3PL provider, which could be utilised with the application of the strategic decision-making model.

Question 01: What is the strategy employed per final packaged product supply chain for (low cost or differentiation)? A categorical result was obtained whereby all participants indicated that the Sasol outbound final packaged product supply chain followed a low-cost strategy.

Question 02: Given the strategy per final packaged product supply chain, what are the design specifics for each supply chain i.e. product to cash cycle – how is it achieved? The participants had opposing views to one another concerning the current practice relating to explosives, fertilisers, polypropylenes, wax, solvents and polyvinyl chloride. Half of the participants indicated that, due to the long lead times to reach markets, the payment terms were longer than 30 days. The other half of the participants indicated terms of sale were for cash or 30 days. The researcher has knowledge about the Sasol outbound final packaged product supply chain, and needs to highlight the point that the participants failed to mention that both strategies were indeed being implemented at the time of this research: terms for selling for cash or 30 days terms were utilised for local, i.e. South African, markets, while selling on payment terms longer than 30 days was utilised for the export portion of the business.

Question 03: What is the market for each product supply chain (annual volumes, geographical spread of customers)? Participants had opposing views and the response was split, 25% and 75%. The majority of respondents (75%, n = 8) indicated that production and marketing were not aligned. The reason for this misalignment was that, at the time of this research, the chemicals manufacturing business was a downstream function of Sasol Synfuels. Sasol Synfuels is the primary consumer of coal used in the Fischer–Tropsch process (Sasol, 2015) to convert coal to liquid (Sasol, 2017). All subsequent by-products become the feedstock to the chemicals business. As a result of this feedstock scenario, production of chemicals is directly influenced by the production rate of Sasol Synfuels. It is therefore the understanding that the chemicals business operates on a typical commodity strategy. The commodity is taken up by the market once available, with little to no product differentiation. The only exception to production, given feedstock availability, is fertilisers because of seasonal requirements. Of the participants, 25% (n = 8) indicated that, because of the seasonality of fertilisers, production and marketing are aligned.

Question 04: What are the high-level processes involved with the final packaged product supply chain i.e. what do you classify as the final packaged product supply chain? The participants indicated that, at the time of this research, there

were two main streams of operations: where packaging was included in the outbound final packaged product supply chain (37.5%, n = 8); and where packaging was not included in the outbound final packaged product supply chain (62.5%, n = 8). This difference was attributable to the previous business model applied by Sasol where each business unit deployed its own strategy and the subsequent lack of coordinated approaches.

Question 05: The Sasol outbound final packaged product supply chain as a whole; please specify the geographical spread of facilities coupled to market integrations. It was confirmed that the geographical spread of facilities comprised Sasolburg, Ekandustria and Secunda. The geographical spread of facilities was the result of the siting of Sasol production facilities. At the time of this research, the utilisation of 3PL providers was limited to Germiston and Durban, and to some extent, Secunda. The geographical spread of the Secunda cluster included Leandra, Standerton and Bethal. All participants indicated that, at the time of the research, market integration was not defined and that Sasol was primarily production driven and operated on a commodity market principle, which resulted in Sasol not focussing on market integration.

Question 06: How do you view the production entity proximity to markets and how is production schedules aligned with market needs? All participants indicated that production schedules were not optimised. This is due to the uncertainty of feedstock received by Sasol from Sasol Synfuels. At the time of this research, production schedules were under further threat as a result of complex production runs. These two major contributing factors led to poor market satisfaction. The participants viewed Sasol as operating on a commodity market, meaning that what Sasol Chemicals produces, it will sell, irrespective of the niche market needs, which were omitted from the Sasol strategy, i.e. lowest cost of production is set off against commodity market needs.

Question 07: Is there any special characteristics pertaining to market supply i.e. prolonged plant shutdowns, seasonal demand? The participants indicated three broad categories of special characteristics, which pertained to:

- fertiliser demand, which is seasonal;

- plant complexity for all Sasol chemical operations, in terms of which grade is possible to produce, given plant cycle runs. Plant complexity is related to the grade of product that can be produced, i.e. melting point cycles: a specific grade can only be produced at a very high melting point; however, the plant needs to progress through the various lower melting points before reaching that high melting point capability. Once the specific melting point is reached, several thousand tons of lower melting point grades would have been produced; and

- Sasol's chemical operations are dependent on feedstock availability from Sasol Synfuels, and feedstock availability is dependent on the upstream production of Sasol Synfuels.

Question 08: What are the capacities per production entity? It was indicated and confirmed that, at the time of this research, each production entity operated at approximately 1 000 tons per day.

Question 09: What activities do you suggest outsourcing to 3PL provider? A varied response was received on the activities to outsource to 3PL providers, including no outsourcing at all. The response received that indicated no outsourcing at all (12.5%) (n = 8) was the result of the participant indicating that Sasol first needed to optimise the outbound final packaged product supply chain. The reason was that the participant felt that a 3PL provider would capitalise on the inefficiency in the system, at the time of the research, to the detriment to Sasol. Of the participants, 12.5% (n = 8) indicated outsourcing of the outbound final packaged product supply chain to include order capturing, warehousing and dispatch. Of the participants, 25% (n = 8) indicated that outsourcing should include the whole of the outbound final packaged product supply chain, from the moment the granular product is produced. Another 12.5% (n = 8) indicated outsourcing of distribution of the outbound final packaged product supply chain only. Another 12.5% (n = 8) indicated outsourcing of warehousing and distribution activities, while 12.5% (n = 8) indicated outsourcing of all outbound final packaged product supply chain activities of a side-stream operation such as fertilisers. Another 12.5% (n = 8) indicated outsourcing of the fleet maintenance activities.

Question 10: What type of outsourcing need do you believe exist at anyone of the final packaged product supply chain and why (based on the services continuum of 3PL service type; apprentice-, elementary-, intermediate-, or advanced service)? Based on the services continuum, participants indicated the following: 50% outsourcing based on SCSI16, 25% outsourcing based on SCSI01, 12.5% outsourcing based on SCSI11, and 12.5 outsourcing based on SCSI06.

A subsection of this question requested: What type of pricing strategy will you suggest per the given service type outsourcing? The participants indicated that, for SCSI16 and SCSI11, fixed and variable rate pricing would suffice. Fixed and performance incentive pricing were proposed for SCSI06 outsourcing and fixed rate pricing was proposed for SCSI01 outsourcing.

Table 5.4 indicates the services continuum strategy, matched to the proposed pricing strategy.

Table 5.4: Services continuum vs pricing strategy

Services continuum strategy	Participant response	Pricing strategy – participant response
SCSI16	50%	Fixed and variable rate 62.5%
SCSI11	12.5%	
SCSI06	12.5%	Fixed and performance incentive 12.5%
SCSI01	25%	Fixed rate 25%

The findings indicated primarily a fixed and variable rate. This compared well with the services continuum, which has on the utmost right-hand end of the continuum, inclusive of SCSI16 and SCSI11, a fixed and variable rate. Overall, there existed a one-to-one (1:1) relationship between the services continuum strategy and the pricing strategy recommended by the participants.

Question 11: Do you recommend a phased approach to outsourcing to 3PL provider i.e. starting from elementary service outsourcing progressing from a s*tandard service provider* to a *customer developer* provider i.e. advanced service offering? Table 5.5 presents a summary of the results obtained.

Table 5.5: Participants' recommendation on a phased approach to outsourcing

Phased approach recommended	Number	Percentage
Yes	5	62.5%
No	3	37.5%

Of the participants, 62.5% (n = 8) preferred a phased approach to implementation, i.e. progressing from SCSI01 to SCSI06, followed by SCSI11 and finally SCSI16. A further 62.5% (n = 8) of the participants indicated that the reason for this is Sasol's maturity level with regard to the outsourced relationship. Of the participants, 37.5% (n = 8) indicated that outsourcing to a 3PL provider should take place at the desired services continuum category of requirement, i.e. advanced services, without having to progress through the various categories. Another 37.5% (n = 8) of the participants indicated the reason for this approach to be a solidified strategy in which the necessary maturity is provided for in terms of alignment and relationship management between the 3PL provider and Sasol.

Question 12: What do you perceive the risk in terms of outsourcing to a 3PL provider? It was indicated by the participants (87.5%, n = 8) that the risk would decrease, even though the capital investment and strategic alignment increased. The remaining 12.5% (n = 8) indicated an increase in the risk, in line with the progression from SCSI01 to SCSI16. The researcher had expected the participants to indicate an inverse of the results obtained due to the advanced nature of service requirements in terms of the movement to the right of the services continuum, i.e. increased capital and alignment required. The participants explained that, given the increased capital investment and alignment required, a reputable 3PL provider could be engaged who would place the required focus on the outbound final packaged product supply chain of Sasol. According to the participants, the detailed and extensive scope of work, coupled to priority, according to the services continuum permutation result of SCSI16, enabled a mutually beneficial relationship. The participants explained that, as a SCSI01 service, the scope of work was considerably smaller, when compared with a SCSI16 service. It further did not constitute the same level of alignment

(relationship management) between 3PL provider and Sasol, thus creating a gap, which could lead to greater harm for Sasol's ultimate customer than would a concern picked up within the SCSI16 relationship, which was solved jointly.

A section of the question enquired: What do you believe the best approach to managing risk between 3PL provider and Sasol? Of the participants, 25% (n = 8) indicated anticipating and mitigating risk before engaging in the 3PL provider agreement. The mitigation of risk could be in the form of designing the risk out or by indicating the risk to the 3PL provider in order to mitigate the known risk. Another 12.5% of participants (n = 8) indicated a 'cradle-to-grave' approach to risk, which implied that the risk remains with Sasol and should not be transferred to the 3PL provider. All risk that arose would be for the account of Sasol (i.e. all unforeseen risk). This would include, for example, the 3PL provider experiencing labour unrest, as the participants explained that labour unrest at the 3PL provider carries the possibility of upsetting the Sasol outbound final packaged product supply to market and also the possibility of halting production due to storage space availability. Of the participants, 37.5% (n = 8) indicated a 'joint risk and mitigation' process. In such instances, the 3PL provider and Sasol are seen as comprising one entity, delivering on the stated objectives and working together to eliminate such risk to the benefit of the undertaking. Another 12.5% (n = 8) of the participants indicated focussing purely on 'legal compliance' to mitigate risk in terms of the contractual agreement. The 3PL provider is typically held legally accountable for any disruptions caused, i.e. such as labour unrest causing delayed delivery to the market, in which case the 3PL provider will be accountable to compensate customers who had been affected negatively by such unrest, financially. Another 12.5% (n = 8) of participants indicated that the 3PL provider should 'integrate risk into the risk model of the organisation in order to mitigate risks'. This means that the 3PL provider should have a risk management model in place which should be extended to the Sasol outbound final packaged product supply chain. This risk model is reviewed before the agreement commences and is signed off as an official risk management protocol to be followed by the 3PL provider in the event of unforeseen risks arising. Figure 5.3 graphically reflects the results obtained from the participants.

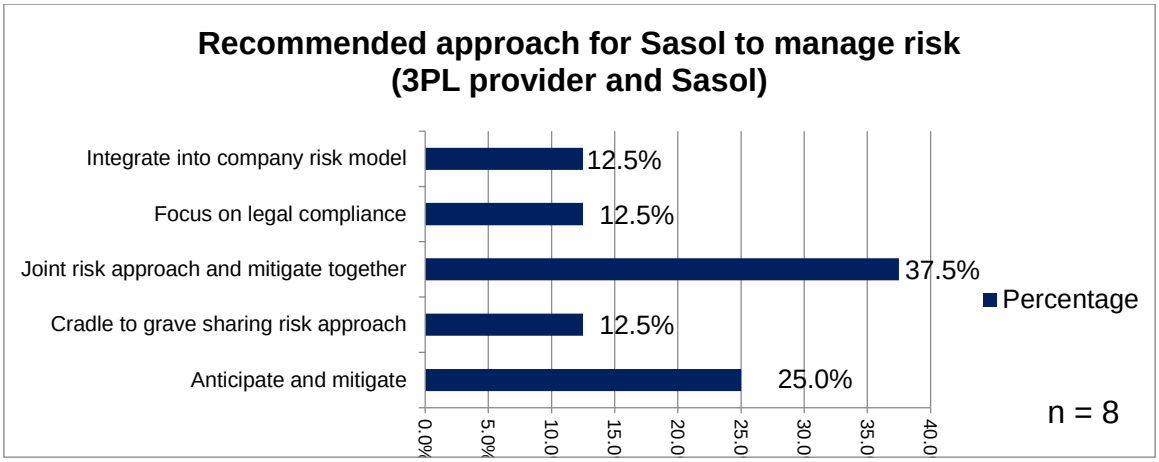

Figure 5.3: Participant risk approach recommendation

5.4.1.3 Research findings – section three

This subsection focusses on 3PL provider requirements for the Sasol outbound final packaged product supply chain. This subsection reports on the effort to gain information as it relates to the Sasol environment in order to ensure optimal alignment between Sasol and the prospective 3PL provider in the application of the strategic decision-making model.

Question 01: What are the current alignment models utilised by Sasol for 3PL alignment? All participants indicated that there were no such alignment models in practice at the time of this research. Alignment was mitigated through legal contracts and, to some extent, service level agreements (SLAs) were instituted. The SLAs were not aligned to a set standard or deliverable. All participants indicated that there was a necessity for such an alignment model to be used.

Question 02: What do you believe to be the appropriate factors to consider for supplier accreditation i.e. what qualify a supplier to be rendering a service to Sasol? The participants each indicated a different factor as deemed important for consideration. These factors are indicated in Figure 5.4.

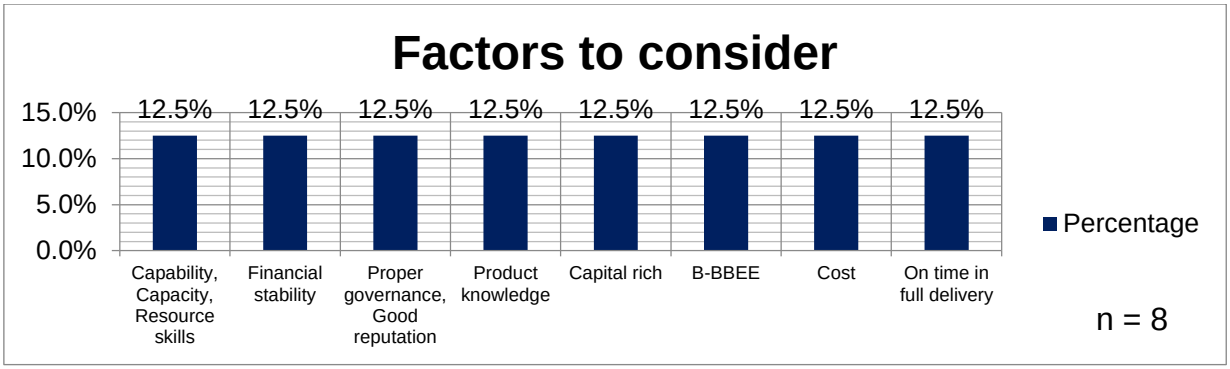

Figure 5.4: Participant-specific factor considerations for potential 3PL provider outsourcing

Question 03: Requested the participant to rate each of the elements, according to the strategic decision-making model, as important or not important.

All participants indicated that each of these elements was important:

- collaboration and integrated planning systems;
- ERP system integration;
- commitment or trust;
- service recovery;
- top management support;
- reputation;
- customer referrals;
- customer retention;
- direct assistance;
- opportunistic behaviour;
- total quality management;
- Just in time;
- investment;
- long-term contracts;
- dedicated resources;

- expanded outsourcing;
- customer satisfaction;
- performance of service;
- level of customer service;
- cost savings in terms of logistics;
- cost performance;
- financial performance;
- expanded outsourcing;
- enhanced value;
- service variety;
- availability of information; and
- functional involvement.

There is only one element that not all the participants deemed to be important – the South African perspective of B-BBEE. Of the participants, 50% (n = 8) indicated that B-BBEE was ‘somewhat important’, 25% (n = 8) indicated this element as ‘important’, and 25% (n = 8) indicated that this element is ‘not important’.

Question 04: What is the current approach to outsourcing (short term vs long term) and the results of each? The results indicated that there is no set practice for long- or short-term outsourcing practices. Of the participants, 37.5% (n = 8) indicated short-term outsourcing, 25% (n = 8), long-term outsourcing, and 37.5% (n = 8) indicated a mixed-term outsourcing approach. This is attributable to outsourcing not having been defined for the chemical business of Sasol.

The second part of the question enquired about the results obtained from the different outsourcing approaches/practices. All participants confirmed poor results from the current outsourcing approach/practices.

Question 05: What do you view as common practice with regards to outsourcing that is Sasol specific? The following common practices were found within the outbound final packaged product supply chain:

- low cost;
- outsourcing to several 3PL providers (which are limited in scope);
- no common practice identified;
- focussing on B-BBEE;
- good contracts however, the end-user does not understand the contracts; and
- outsourcing to 3PL providers on a purely contractual basis.

This Subsection has discussed the 3PL provider requirements for the Sasol outbound final packaged product supply chain. It was, therefore, confirmed that the current alignment between Sasol and its 3PL providers is lacking in terms of key parameter alignment and that SLAs are utilised sporadically and are not defined for the whole of Sasol's Base Chemicals business.

It was further confirmed that there has been deficiency in terms of the outsourcing approach, i.e. over the long term and over the short term, with poor results being achieved. Important elements were confirmed for the strategic decision-making model for application. Finally, it was confirmed what the common practices are and ought to be, which was incorporated into the development and application of the strategic decision-making model for Sasol's outbound final packaged product supply chain.

5.4.1.4 Research findings – section four

This subsection is devoted to gaining an understanding of the factors deemed to be important for the requirements of the strategic decision-making model.

Question 01: What are the most important aspects, as per your SME knowledge that will ensure optimal outsourcing of Sasol's final packaged product supply chain to a prospective 3PL provider? The results are in accordance with the services continuum elements and no new data was obtained.

Question 02: Do you believe that a strategic decision-making model will ensure optimal alignment between Sasol's outbound final packaged product requirements and prospective 3PL providers? All of participants indicated that a strategic decision-making model was required and that it would add considerable value to the organisation. This section confirms factors from the strategic decision-making model for consideration in achieving optimal outsourcing, and further confirms the Sasol perspective of the importance of a strategic decision-making model for ensuring optimal alignment and success.

5.4.2 Findings from the secondary research

Secondary research was conducted according to the research sample plan protocol (see Section 5.2). The research aspects, relating to the 3PL provider, are discussed in order to conduct a value analysis. The value analysis of the 3PL providers was conducted to enable differentiation in terms of the application of the strategic decision-making model.

Each of the 3PL providers was classified according to the value analysis format: organisation profile (size, turnover, geographical spread of operation) and review of organisation operations, and was concluded by reviewing the organisation specifics against the elements required to outsource to the 3PL provider. The value analysis served as input into the development and application of the strategic decision-making model (see Chapter 6). At the time of this research, Katoen Natie was utilised by Sasol for supply chain and additional value-added activities. Table 5.6 depicts the research findings in terms of the value analysis.

Table 5.6: Secondary research findings – Katoen Natie

Research aspects	Secondary research findings
Organisation profile (size, turnover and geographical spread of operation)	▪ Have operations in Belgium, France, Germany, Italy, Poland, Saudi Arabia, Spain, Sweden, Estonia, the Netherlands, Turkey, the United Kingdom, Canada, Mexico, the United States, Brazil, Uruguay, Colombia, India, Singapore, Thailand, Vietnam, Cameroon, Ghana, Côte d'Ivoire and South Africa (Katoen Natie, 2016). ▪ The organisation employs in excess of 12 000 people. ▪ Katoen Natie is a private-held organisation. ▪ Katoen Natie's turnover per annum in excess of R35 million and by definition according to the B-BBEE codes falls into the classification of a generic enterprise.
Review the operations of the organisation in terms of 3PL provider services	▪ Offers a wide range of supply chain logistics services and additional industrial-type service offerings. ▪ Katoen Natie "provides all kinds of semi-industrial services, designs builds and manages logistics platforms and complete supply chains" (Katoen Natie, 2016: para 2). ▪ These services include operation of port terminals for loading/unloading of loose cargo, break bulk, containers, automobiles, wood products. ▪ Logistics platforms comprise storage and handling of industrial products, commodities, consumer goods, petrochemicals, chemicals and food products. ▪ On-site terminals at customer's premises, semi-industrial services such as mixing, repacking, dusting, compounding, de-metalising, pre-assembly, assembly and gluing. ▪ Also involved with design, engineering, construction, financing and management of the total supply chain and logistics platform for industry (Katoen Natie, 2016).
Review the operations of the organisation in terms of collaboration and integrated planning systems, performance measurement and B-BBEE status	▪ Given the size and nature of Katoen Natie, no issues were foreseen in terms of collaboration and integrated planning systems or performance measurement. ▪ Katoen Natie is classified according to the B-BBEE code as a generic enterprise and is subjected to the generic scorecard. ▪ At the time of this research, a risk to the outsourcing venture as the organisation did not represent black-owned spend – no benefit to shipper.

SACD has been utilised by Sasol for more than a decade; yet, in recent years, business between the two parties has been dormant. SACD managed the polymers warehouse facility, but was limited to receiving products from the pack-line, warehousing and dispatch to customers in the form of road and railway loading. Table 5.7 depicts the research findings in terms of the value analysis.

Table 5.7: Secondary research findings – SACD

Research aspects	Secondary research findings
Organisation profile (size, turnover, and geographical spread of operation).	▪ SACD is part of the Bidvest Group of Companies and offers more support than before when the organisation operated on its own (SACD, 2016). ▪ SACD is operational within Africa with operations in Tanzania, Zambia, Malawi, Mozambique, Zimbabwe, Botswana, Namibia and South Africa (SACD, 2016). ▪ The organisation is classified according to the B-BBEE code as a generic enterprise. ▪ The annual turnover is in excess of R35 million.
Review the operations of the organisation in terms of 3PL provider services.	▪ SACD is an import and export management organisation that offers a complete, end-to-end, supply chain management solution (SACD, 2016). ▪ Services are supply chain management, cargo management, container management, transportation logistics, documentation and outsourcing (SACD, 2016). ▪ SACD handles in excess of 1.5 million tons of international cargo per annum (SACD, 2016).
Review the operations of the organisation in terms of collaboration and integrated planning systems, performance measurement and B-BBEE status.	▪ Given the geographical spread of operations as well as being part of the Bidvest Group of Companies, there are no unforeseen issues relating to collaboration and integrated planning systems as well as performance measurement. ▪ SACD is classified according to the B-BBEE code as a generic enterprise and is subjected to the generic scorecard. ▪ SACD is classified as a level 2 B-BBEE contributor, which allows shippers to claim 125% of all spend with SACD as BEE spends (SACD, 2016). SACD has been rated as an 'AAA' supplier that is a 'value-added supplier'.

Barloworld Logistics is regarded as setting a South African industry standard relating to supply chain and logistics activities (Barloworld Logistics, 2016).

Table 5.8 depicts the research findings in terms of the value analysis, i.e. the organisation profile and a review of organisation operations, which is concluded by reviewing the organisation specifics against the elements required to outsource to a 3PL provider.

Table 5.8: Secondary research findings – Barloworld Logistics

Research aspects	Secondary research findings
Organisation profile (size, turnover and geographical spread of operation).	▪ The organisation is classified according to the B-BBEE code as a generic enterprise. ▪ The annual turnover is in excess of R35 million. ▪ Barloworld has operations in 24 countries with logistics specifically focussed operations in Botswana, Germany, France, Namibia, Portugal, South Africa, Spain, Swaziland, the United Arab Emirates, the United Kingdom, the United States of America, Zambia and Zimbabwe (Barloworld, 2016).
Review the operations of the organisation in terms of 3PL provider services.	▪ Barloworld has two broad divisions, namely Equipment and Handling and Automotive and Logistics. ▪ Equipment and Handling comprises: · equipment: mining, construction and power systems; · handling: materials handling and agriculture. ▪ Automotive and Logistics comprises: · automotive: car rental, fleet services and motor retail · logistics: freight management and services, supply chain management and transport (Barloworld, 2016).
Review the operations of the organisation in terms of collaboration and integrated planning systems, performance measurement and B-BBEE status.	▪ Given the vast scope of operations, there is no foreseeable threat in terms of collaboration and integrated planning systems as well as in terms of performance measurement. ▪ Barloworld is classified according to the B-BBEE code as a generic enterprise and is subjected to the generic scorecard. ▪ Barloworld is classified as a level 2 B-BBEE contributor, which allows Sasol to claim 125% of all spend with Barloworld as BEE spends (Barloworld, 2016).

Imperial Logistics, as in the case of Barloworld Logistics, is regarded as setting a South African industry standard relating to supply chain and logistics activities. Table 5.9 depicts the research findings in terms of the value analysis.

Table 5.9: Secondary research findings – Imperial Logistics

Research aspects	Secondary research findings
Organisation profile (size, turnover and geographical spread of operation).	▪ Classified as one of the larger South African organisations. ▪ Imperial Logistics is predominantly geared for the fast-moving consumer goods industry. ▪ The organisation is classified according to the B-BBEE code as a generic enterprise. ▪ The annual turnover is in excess of R35 million. ▪ Imperial has a total staff establishment in excess of 51 000 serving customers in more than 1 200 locations in 31 countries on five continents (Imperial Logistics, 2016).
Review the operations of the organisation in terms of 3PL provider services.	▪ Imperial Logistics provides logistics and supply chain services in the following categories: freight and transport, managed logistics, warehousing and distribution, demand-driven route to market fulfilment and supply chain integration (Imperial Logistics, 2016). ▪ "At Imperial, we improve our clients' competitiveness through customising our experience in outsourced value chain management. Our diverse experience and expansive capabilities extend from procurement to brand activation, and include all the logistics services in between" (Imperial Logistics, 2016: para 1).
Review the operations of the organisation in terms of collaboration and integrated planning systems, performance measurement and B-BBEE status.	▪ Given the geographical spread of operations as well as being classified as one of the larger organisations within South Africa, there are no unforeseen issues relating to collaboration and integrated planning systems as well as performance measurement. ▪ Imperial Logistics is classified according to the B-BBEE code as a generic enterprise and is subjected to the generic scorecard. ▪ Imperial Logistics is classified as a level 3 B-BBEE contributor, which allows Sasol to claim 110% of all spend with Imperial Logistics as BEE spends (Imperial Logistics, 2016).

Sammar Investments, at the time of this research, was utilised by Sasol for both polymers and wax product handling and warehousing in Durban, South Africa. Table 5.10 depicts the research findings in terms of the value analysis.

Table 5.10: Secondary research findings – Sammar Investments

Research aspects	Secondary data research findings
Organisation profile (size, turnover and geographical spread of operation).	▪ Classified according to the B-BBEE code as a generic enterprise. ▪ The annual turnover is in excess of R35 million. ▪ Operations are limited, as are opportunities to increase scope, which could have vast detrimental effects on Sasol.
Review the operations of the organisation in terms of 3PL provider services.	▪ Organisation operations are loading and offloading activities as well as warehousing activities. ▪ Additional value-added activities can be executed via this organisation, i.e. packaging requirements.
Review the operations of the organisation in terms of collaboration and integrated planning systems, performance measurement and B-BBEE status.	▪ Sammar Investments is a comparably small operation in relation to the previously discussed operations. ▪ System integration is limited, given the size of Sammar Investments, and large investment is required to ensure level footing with competitors. ▪ B-BBEE status is that Sammar Investments is 100% black-owned. ▪ Sammar Investments is classified as a level 1 B-BBEE contributor, which allows Sasol to claim 135% of all spend with Sammar Investments as BEE spends.

GTWLS, at the time of this research, had initially been utilised for overflow warehousing needs in periods of stock building for the annual fertiliser season. GTWLS is currently utilised for the overflow warehousing needs for the polymer product stream. Table 5.11 depicts the research findings of the value analysis.

Table 5.11: Secondary research findings – GTWLS

Research aspects	Secondary research findings
Organisation profile (size, turnover and geographical spread of operation).	▪ The organisation is relatively small compared with the 3PL provider organisations discussed as part of the sampling protocol. ▪ The organisation is estimated to have an annual turnover of less than R35 million. ▪ The organisation is classified as a qualifying enterprise according to the B-BBEE code.
Review the operations of the organisation in terms of 3PL provider services.	▪ Provides warehousing activities related to receiving and dispatch of final packaged product in palletised form via road vehicles. ▪ Has the capability to provide additional value-added services, i.e. bagging/re-bagging of product.
Review the operations of the organisation in terms of collaboration and integrated planning systems, performance measurement and B-BBEE status.	▪ Systems integration would require substantial investment on the part of the shipper. ▪ Financial capability to operate on required level envisaged as problematic. ▪ B-BBEE certificate not available – no benefit to shipper.

The secondary research findings regarding prospective 3PL providers indicated large-scale 3PL provider operations. The findings of the secondary research were utilised during the development of a strategic decision-making model for optimal alignment between the 3PL provider and Sasol's outbound final packaged product supply chain, based on Sasol's objective (see Chapter 6).

5.5 CONCLUSION

The primary and secondary research was described in this chapter with the purpose to report on the research undertaken in light of the study objectives (see Subsections 1.3.1 and 1.3.2). This chapter specifically aligned with the seventh and eighth secondary objectives, i.e. to –

- confirm parameter alignment with Sasol's outbound final packaged product supply chain by means of structured interviews (seventh secondary objective); and
- conduct a value analysis of prospective 3PL providers in relation to establishing the most applicable 3PL provider, based on Sasol's outbound final packaged product requirement (eighth secondary objective).

The researcher obtained the required approval from the University of South Africa (Unisa), i.e. ethical clearance (Appendix A), and from Sasol, i.e. consent to undertake the research (Appendix B), prior to conducting the research. The research was confirmed to be predominantly literature-based, coupled with primary research for the explicit alignment of the strategic decision-making model with Sasol's outbound final packaged product supply chain. Both qualitative and quantitative research was conducted as part of the study. The time horizon was confirmed as cross-sectional. The data collection methods were operationalised via the sampling plan (see Table 5.2). The Sasol scope of outsourcing was confirmed as being confined to the outbound supply chain under the functional control of Sasol Base Chemicals. The following entities are included in the scope: Explosives, Fertilisers, Polypropylenes, Wax, Solvents and Polyvinyl Chloride,

Supply Chain Shared. The 3PL providers were confirmed to be 3PL provider organisations that had rendered a service to Sasol before, or which were rendering a service at the time of the study to Sasol, or which were regarded as being best in class. This scope confirmed the following 3PL providers: Katoen Natie, SACD, Barloworld Logistics, Imperial Logistics, Sammar Investments, and GTWLS. Subject matter experts were identified for the probability judgement sampling. The research was conducted during the latter half of 2016.

A sampling plan protocol and a research instrument were developed for both the primary and the secondary research. The strategic decision-making model design specifications were confirmed for the primary research conducted, and were discussed in Chapter 6. The participants, eight of whom participated and who were all regarded as subject matter experts, indicated that a strategic decision-making model was required to ensure optimal alignment between Sasol and prospective 3PL providers. Table 5.12 synthesises the research findings.

Table 5.12: Synthesised research findings

Research element	Confirmation from research conducted
Sasol Base Chemicals strategy per final packaged product supply chain	A categorical result was obtained, as all participants indicated that the Sasol outbound final packaged product supply chain followed a low-cost strategy
Sasol Base Chemicals selling strategy	Mixed strategy: selling both for cash and on 30 days' payment terms. Cash for local market and 30 days for exports.
Sasol Base Chemicals production and marketing alignment	Majority of operations not aligned due to downstream nature of the Sasol Base Chemicals business design. Sasol Synfuels is the primary operational concern and downstream production is the result of Synfuels operations.
Sasol Base Chemicals high-level process	There are two main streams of operations found at present: · where packaging is included in the outbound final packaged product supply chain; and · where packaging is not included in the outbound final packaged product supply chain. This difference is attributable to the previous business model where each business unit deployed its own strategy, with a subsequent lack of coordinated approaches.
Sasol Base Chemicals geographical spread	It was confirmed that the geographical spread of facilities comprised Sasolburg, Ekandustria and Secunda. The geographical spread of facilities was the result of the siting of Sasol production facilities.
Sasol Base Chemicals proximity to market	It was confirmed that production and marketing schedules were not aligned.

Special characteristics pertaining to market supply	The demand for fertiliser products are seasonal, general plant complexity and Sasol Chemicals Operations, which is a downstream receiver of feedstock at quantities not guaranteed.
Sasol Base Chemicals plant capacities	Confirmed 1 000 tons per day.
Sasol Base Chemicals suggested outsourcing activities	Varied responses in terms of what to include and what to exclude.
Services continuum application and pricing model	Participants indicated, based on the services continuum, the following: · 50% outsourcing based on SCSI16; · 25% outsourcing based on SCSI01; · 12.5% outsourcing based on SCSI11; and · 12.5% outsourcing based on SCSI06. Pricing model was indicated to be: · SCSI16 and SCSI11 at 62.5% fixed and variable rate; · SCSI06 at 12.5% fixed and performance incentive · SCSI01 at 25% fixed rate
Phased approach to outsourcing	Of the participants, 62.5% indicated **yes** and 37.5% indicated **no** that there should be outright outsourcing at the required level.
Risk management as part of outsourcing	It was indicated by the participants (87.5%) that the risk would decrease, even though the capital investment and strategic alignment increased. The remaining 12.5% indicated an increase in the risk in terms of the progression from SCSI01 to SCSI16. Anticipate and manage risk on a continuous basis.
Sasol Base Chemicals – current alignment models with 3PL providers	Currently, there are no alignment models and Sasol Chemicals Operations rely on contracts and, to a small extent, SLAs.
Sasol Base Chemicals factors/elements deemed important	The elements deemed important were in line with the strategic decision-making model.
Sasol Base Chemicals – current approaches with regard to outsourcing	The results indicated that there was no set practice for long- or short-term outsourcing practices, nor a process/model for the outsourcing decision. Of the participants, 37.5% indicated short-term outsourcing, 25% indicated long-term outsourcing, and 37.5% indicated a mixed-term outsourcing approach. This was because outsourcing for the chemical business of Sasol was not defined.
Katoen Natie	Organisation profile fits in terms of collaboration and integrated systems and performance management; however, does not provide the required preferential procurement spend (zero contribution).
SACD	Organisation profile fits the element requirements in terms of collaboration and integrated planning systems, performance measurement and preferential procurement (125% of spend, level 2 provider).
Barloworld Logistics	Organisation profile fits the element requirements in terms of collaboration and integrated planning systems, performance measurement and preferential procurement (125% of spend, level 2 provider).
Imperial Logistics	Organisation profile fits the element requirements in terms of collaboration and integrated planning systems, performance

	measurement and preferential procurement (110% of spend, level 3 provider).
Sammar Investments	Organisation profile does not fit the element requirements in terms of collaboration and integrated planning systems, performance measurement; however, the 3PL provider was strong on preferential procurement (135% of spend, level 1 provider).
GTWLS	Organisation profile does not fit the element requirements in terms of either collaboration and integrated plan or performance measurement systems. Neither was there any benefit in terms of preferential procurement (zero contribution).

The results obtained from the research, as reported in Chapter 5, were utilised during the application of the strategic decision-making model for optimal alignment of prospective 3PL providers and Sasol's outbound final packaged product supply chain. This is reported in Chapter 6.

CHAPTER 6
STRATEGIC DECISION-MAKING MODEL FOR SASOL

6.1 INTRODUCTION

The primary objective of the study, as indicated in Chapter 1 (see Subsection 1.3.1), was to develop a workable, end-to-end, supply chain strategic decision-making model for optimal alignment between prospective 3PL providers and the Sasol final packaged product supply chain. This chapter details the primary objective by following through on the primary and secondary research conducted (reflected in Chapters 2, 3, 4 and 5) and the application of the strategic decision-making model for optimal alignment between Sasol's outbound final packaged product supply chain and prospective 3PL providers. The development and application rested upon the eight secondary objectives (see Subsection 1.3.2 and Figure 4.3, page 112), i.e. to –

- develop a services continuum with the objective that it will be utilised as a mechanism that would provide detailed placement on the continuum based on four aspects, namely services type required, category of 3PL providers, strategic alignment, and investment required. The development of the services continuum is termed *development one*, and is a mathematical model that allows for optimal results to be obtained (first secondary objective). This secondary objective was covered in Chapter 2 of this thesis;

- review and classify outsourcing models by means of the services continuum (second secondary objective). This secondary objective was covered in Chapter 2 of this thesis;

- explain the unit of analysis in terms of collaboration and integrated planning, performance measurement, and the South African specific of broad-based black economic empowerment (B-BBEE) (thrids secondary objective). This secondary objective was covered in Chapter 3 of this

thesis;

- review risk in relation to outsourcing and the creation of an outsourcing risk matrix. The outsourcing risk matrix is termed *development two* (fourth secondary objective). The secondary objective was covered in Chapter 3 of this thesis;

- establish a generic application of the services continuum with the objective to arrive at an abridged reference table for each of the four permutation results (fifth secondary objective). This secondary objective was covered in Chapter 4 of this thesis;

- define a strategic decision-making methodology process path, specifically for application in relation to Sasol's outbound final packaged product supply chain (sixth secondary objective). This secondary objective was covered in Chapter 4 of this thesis;

- confirm parameter alignment with Sasol's outbound final packaged product supply chain by means of structured interviews (seventh secocndary objective). This secondary objective was covered in Chapter 5 of this thesis; and

- conduct a value analysis of prospective 3PL providers in relation to establishing the most applicable 3PL provider, based on Sasol's outbound final packaged product requirement (eighth secondary objective). This secondary objective was covered in Chapter 5 of this thesis.

The focus of this chapter is placed on Sasol's outbound final packaged product supply chain, which encompasses the product streams of explosives, fertilisers, polypropylenes, wax, solvents and polyvinyl chloride.

6.2 SCOPE OF STRATEGIC DECISION-MAKING MODEL

The scope for the final packaged product streams included processes from hand-over points at the production unit, up to and inclusive of final loading and

dispatching of the product to customers. Dispatching of the product to customers is inclusive of transport as the operating terms of sales are that of cost, insurance and freight (CIF); however, transport is omitted for fertilisers[9] due to the Competition Commission Finding in 2009 (see Competition Tribunal Republic of South Africa, 2009). The final packaged product supply chain of Sasol is operationalised through Sasol Base Chemicals, as well as the Sasol supply chain. Sasol Base Chemicals is the owner of the final packaged product, which has an annual turnover of approximately R60 billion. The Sasol supply chain is a business unit within Sasol, the Supply Chain Shared Services (SC SS), and is responsible for the warehousing activities, inclusive of product-receiving hand-over points, final loading, and dispatch of the product to customers.

The scope delineation for the 3PL provider would be to ensure packaging of dry chemicals according to the Sasol and industry standards, warehousing of the final product, scheduling of customers for collection, weighbridge operations at each specific site, and loading and dispatch of the product to customers. Although Sasol sells according to the CIF Incoterms 2010, the 3PL provider needs to ensure the product is transported to the designated place, noting, however, that fertilisers are excluded from this arrangement. Insurance is for the account of the 3PL provider as it relates to operational execution of the scope, excluding product quality, which is for Sasol's account. The process for bulk loading is also applicable, and the 3PL provider's accountability is initiated at the moment that the product falls into the 'bulk-area warehouses', under appropriate inventory control. Sasol defines four categories of functional processes, namely overland logistics, marine logistics, materials handling, and distribution requirements planning. The scope is defined for each of the functional process areas, together with the 3PL provider's responsibility towards scope inclusion.

Table 6.1 indicates the scope responsibilities between Sasol and the 3PL provider by means of four functional processes, namely overland logistics, marine logistics, material handling, and distribution requirement planning. Table 6.1 indicates the

9 Fertilisers are excluded from the arrangement due to a Competition Commission finding in 2009 in a case – the *Competition Commission South Africa v Sasol Chemicals Industries Ltd*. and the *Competition Commission South Africa v Sasol Chemical Industries Ltd and Others* – that alleged collusion and abusive behaviour.

annual spend for each functional process, coupled to the delineated scope confirmed via the research instrument (see Section 5.4) and the expected 3PL provider's responsibilities relating to each of the functional process scope elements.

Table 6.1: Sasol scope for final packaged product supply chain

Functional process area	Annual spend	Scope inclusion	3PL provider responsibility
Overland logistics **Functional locations – Sasolburg and Secunda.**	R1 508 million	▪ Fleet ▪ Weighbridges ▪ Gantries ▪ The products included under overland logistics refer to product transportation to customers (customer pays for the transportation as per price calculation), including both road and rail logistics. ▪ Liquid petroleum gas (LPG), illuminating paraffin, waxy oil 1, 2 ,12, 30, polyfuel, catlight, catbot, decant oil ▪ Explosives, which consist of ammonium nitrate solution, prills, detonators, matrix, and accessories. ▪ Base Chemicals overland logistics: co-monomers, dry-bulk (pitch coke and fertilisers*), break-bulk and packaged product (polypropylene, polyvinyl chloride (PVC) and wax), solvents, phenolic, tars and acids, cyanide, caustic soda and salt. ▪ * Note: Fertiliser transportation is to overflow warehouse facilities and not to end-users – this is due to a Competition Commission finding (Competition Tribunal Republic of South Africa, 2009) prohibiting Sasol from transporting fertilisers to customers.	▪ Perfect order fulfilment ▪ Loading activity ▪ Transport administration
Marine logistics (clearing and forwarding) **Functional locations – Durban and Secunda.**	R295 million	▪ Bulk shipping ▪ Container shipping ▪ Break-bulk and packaged product (polypropylene, PVC and wax), solvents, phenolic, tars and acids, cyanide, caustic soda and salt	▪ Sourcing of logistics ▪ Logistics coordination ▪ Logistics execution ▪ Warehouse operations at the coast relating to container loading ▪ Clearing and forwarding
Material handling, inclusive of container handling.	R611 million	▪ All final packaged product material handling ▪ Planning of, and procurement of bags ▪ Pack line operations ▪ Products warehoused; Hard and medium waxes,	▪ Stock accuracy ▪ Turnaround times ▪ Perfect order

Functional locations: Sasolburg, Durban, Alrode, Germiston and Secunda.		PVC, Poly Ethylene, Fertilisers, Ammonium Sulphate, Sulphur, Polypropylene, Solvents, Pitch Coke, Lubricants and Catalyst.	fulfilment
Distribution requirement planning	R1 108 million	▪ All distribution requirements to be taken over by 3PL provider ▪ Sourcing of bulk shipping and logistical support services.	▪ Order generation ▪ Demand fulfilment ▪ Expediting and execution monitoring ▪ Invoicing function

In Table 6.1, the functional process and area are indicated and the annual spend per functional process is indicated, as is the scope for the 3PL provider and the 3PL provider's responsibility. The products in scope are identified according to the functional process area, i.e. overland logistics consists of the largest single area of spend among the four functional process areas, at R1 508 million per annum. The products included in the scope are also the most comprehensive of the scopes. The same protocol is utilised with the remainder of the functional process areas.

Sasol utilises systems, applications, and products (SAP) as the enterprise resource planning (ERP) system – serving as an enabler of shared information per process via system-driven instructions. The modules of the SAP ERP system that were utilised were the extended warehouse management (EWM) scanner and barcoding system, SAP ERP for transport management (TM), and SAP ERP for invoicing. The weighbridges operate from an ERP system called 'Renaissance'. The Renaissance ERP system is integrated with the SAP ERP system and automatically invoices a load once it has gone over a weighbridge. The ERP system is provided by Sasol, and the 3PL provider needs to ensure the proficiency of the system and accurate reporting by means of the ERP system.

Scope delineation is confirmed through responsible, accountable, consulted and informed (RACI) matrices per process relating to the Sasol outbound final packaged product supply chain. The RACI matrices indicate the 3PL provider and Sasol's roles and accountabilities. The processes defining the outbound final

packaged product supply chain for Sasol is established through the application of the strategic decision-making methodology process path (see Figure 4.3, page 112), phase two, step four (shipper-specific research):

- demand forecasting;
- conversion of feedstock into final product;
- selling of final product (including bulk);
- internal transfers to overflow warehouses;
- clearing and forwarding; and
- performance review.

6.2.1 Demand forecasting

Sasol predominantly drives the process of demand forecasting, which is informed by marketing activities. The 3PL provider, however, needs to take full cognisance of such planning activities and what the market requirements are in order to plan warehouse utilisation and, more specifically, to know what product grades and quantities need to be scheduled for pack line activities for shipment to customers. The process of demand forecasting consists of the following activities:

- performing sales and operations planning;
- performing supply chain operations scheduling;
- reconciling all daily movements and initiating investigation if discrepancies are found; and
- creating stock transfer requisitions to overflow warehouses, once required.

Table 6.2 indicates the responsibilities, accountabilities, consulted parties, and the informed parties between Sasol and the 3PL provider, as they relate to each activity of the demand forecast process.

Table 6.2: RACI matrix of the demand forecasting process

Activity	Frequency	Responsibility	Accountability	Consulted	Informed
Process: Demand forecast					
Performing sales and operations planning	Weekly	Sasol Production Planning and 3PL provider	Sasol Production Planning and 3PL provider	Sasol Marketing	Sasol Production Sasol Marketing
Performing supply chain operations scheduling	Daily	Sasol Production Planning and 3PL provider	Sasol Production Planning and 3PL provider	Sasol Marketing	Sasol Production Sasol Marketing
Reconciling all product movements daily and initiating investigation of variances	Daily	Sasol Production Planning and 3PL provider	Sasol Production Planning and 3PL provider	Sasol Marketing	Sasol Production Sasol Marketing
Creating stock transfer requisitions to overflow facilities / initiating overflow facility when needed	Per event and monthly review	3PL provider	3PL provider	Sasol Production Planning	Sasol Production Planning

6.2.2 Conversion of feedstock into final product

The RACI matrix focusses on the conversion of feedstock into final products, and consists of the following activities:

- providing daily reconciliation (opening and closing stock for both final product and feedstock);
- production activity to convert feedstock into final product;
- signing off daily production into the warehouse reconciliation report;
- compiling of a reconciliation report of bulk stock into the warehouse;
- compiling of a production report of break bulk and final packaged product into the warehouse; and

- updating the SAP ERP system in terms of production volumes and bagging volumes into warehouse.

Sasol owns and controls the production process, yet there is close interaction that requires the managing of the 3PL provider, i.e. stock hand-over points between Sasol Production to the 3PL provider. The 3PL provider is the process owner for the outbound supply chain activities, while the product owner is Sasol Base Chemicals. The activity, for example, between the 3PL provider and Sasol for the activity of daily reconciliation of opening and closing stock for the final product is the responsibility and accountability of the 3PL provider. The activity needs to be done daily and the 3PL provider needs to consult and inform Sasol Production and Sasol Production Planning departments, as well as Sasol Base Chemicals, of the daily reconciliation of opening and closing stock of the final product. Each of the process activities is specified in detail to enable the outsourcing venture, i.e. each party knows what the expectation is and can manage the resources in order to deliver on the expectation. Table 6.3 indicates the RACI matrix for the conversion of feedstock into final products.

Table 6.3: RACI matrix of converting feedstock into final product

Activity	Frequency	Responsibility	Accountability	Consulted	Informed
Process: Convert feedstock into final product					
Provide daily reconciliation (opening and closing stock for final product)	Daily	3PL provider	3PL provider	Sasol Production Planning Sasol Production	Sasol-Production Planning Sasol Base Chemicals.
Production activity to convert feedstock into final product	Daily	Sasol Production	Sasol Production	Sasol Production Planning Sasol Marketing	3PL provider Sasol Production Planning Sasol Marketing
Sign off daily production into warehouse reconciliation report	Daily	3PL provider	3PL provider	Sasol Production Planning & Sasol Production	Sasol Production Planning Sasol Base Chemicals
Report on bulk stock into	Daily	3PL provider	3PL provider	Sasol Production	Sasol Production

warehouse reconciliation				Planning & Sasol Production	Planning Sasol Base Chemicals
Production of break bulk and final packaged product into warehouse report	Daily	3PL provider	3PL provider	Sasol Production Planning & Sasol Production	Sasol Production Planning Sasol Base Chemicals
Update SAP ERP system of production volumes and bagging volumes into warehouse	Daily	3PL provider	3PL provider	Sasol Production Planning & Sasol Production	Sasol Production Planning Sasol Base Chemicals

6.2.3 Selling of final product (including bulk)

The RACI matrix of selling the final product, inclusive of bulk, is comprised of the following activities:

- creation of sales orders;
- scheduling of customer for loading;
- customer/3PL provider fleet to record empty weight at weighbridge against sales order;
- loading of final bulk product;
- bulk product to be measured as per weighbridge;
- the weighbridge automatically issues the quantity against the sales order;
- ensuring billing and invoicing are correct and expediting of payment; and
- weighbridge reconciliation report.

This process is predominantly executed by the 3PL provider. The 3PL provider needs to ensure the creation of the sales order according to the information received from the Sasol Marketing and Sasol Production Planning departments. The process is inclusive of the loading at the 3PL provider-operated warehouses

or gantries, and the dispatch of either a customer vehicle or a 3PL provider fleet vehicle for delivery at the customer. This process includes the SAP ERP system process from sales order creation to issuing of the sales order to enable customer order invoicing.

Sasol currently operates on the CIF[10] Incoterm 2010. This indicates Sasol's responsibility for cost of freight charges to move the product to the buyer's destination of choice. This cost is carried by Sasol, although the 3PL provider will incur the cost, and Sasol pays the 3PL provider for services rendered. Insurance is the accountability of the 3PL provider as it relates to the functional execution of the order, but excludes product quality, which is for Sasol's account.

Production and marketing are excluded from the 3PL provider's accountability and reside within Sasol's full control.

Production scheduling resides with Sasol, although the 3PL provider has to be fully aware of the production requirements from the market, and is required to ensure the execution of operations, based on the plant production schedule.

Maintenance of pack lines is for the cost of the 3PL provider; however, the facilities remain the property of Sasol, and Sasol carries all routine maintenance costs (routine maintenance work to be done and costs to be carried by Sasol).

A single point of entry with regard to the Sasol outbound supply chain is required with the 3PL provider, i.e. a single 3PL provider opting to ensure ease of transacting, given the vast operation of the Sasol final packaged product supply chain (geographical spread as well as volumes handled per annum). Table 6.4 indicates the RACI matrix for the process of selling the final product, inclusive of bulk.

10 CIF refers to a situation where where the seller delivers goods on board a vessel. The seller is responsible to contract for and pay the costs and freight required to bring the goods to the named port of destination (International Chamber of Commerce, 2018).

Table 6.4: RACI matrix for selling of final product (including bulk)

Activity	Frequency	Responsibility	Accountability	Consulted	Informed
Process: Selling of final product (including bulk)					
Creation of sales order	Daily	3PL provider	3PL provider	Sasol Marketing Sasol Production Planning	Sasol Marketing Sasol Production Planning
Scheduling of customer for loading	Daily	3PL provider	3PL provider	Production Planning Sasol Marketing	
Customer/3 PL provider fleet to record empty weight at weighbridge against sales order	Per event	3PL provider	3PL provider		
Loading of final bulk product	Per event	3PL provider	3PL provider		
Bulk product to be measured as per weighbridge	Per event	3PL provider	3PL provider		
The weighbridge automatically issues the quantity against sales order	Per event	3PL provider	3PL provider		
Ensure billing and invoicing are correct and expedite of payment	Daily	3PL provider	3PL provider	Sasol Marketing	Sasol Marketing
Weighbridge reconciliation report	Daily	3PL provider	3PL provider	Sasol Marketing Sasol Production Planning	Sasol Marketing Sasol Production Planning

6.2.4 Internal transfers to overflow warehouses

The process for internal transfers to overflow warehouses is predominantly informed by the forecast made by Sasol Production Planning, and the 3PL provider is required to act upon it. An overflow warehouse facility is for the cost of Sasol, as Sasol initiates the request for such facilities. The purpose of additional/overflow warehouses is to ensure that the delivery of the product to the customer is done in a fashion that warrants the additional costs incurred, while keeping production runs uninterrupted. The need for overflow warehouses is to be avoided as a business rule, although it is catered for, should the need arise. The 3PL provider should be capable of assisting Sasol in situations that warrant the internal transfer to overflow warehouses within 24 hours' notice by Sasol. The need for overflow warehouses is not primarily a market requirement only, but also a production requirement, i.e. planned prolonged shutdown. Table 6.5 indicates the RACI matrix for the process of internal transfers to overflow warehouses.

Table 6.5: RACI matrix for internal transfers to overflow warehouses

Activity	Frequency	Responsibility	Accountability	Consulted	Informed
Process: Internal transfers to overflow warehouses					
Create stock transfer requisitions to overflow facilities / initiate overflow facility need	As per event and monthly review	3PL provider	3PL provider	Sasol Production Planning	Sasol Production Planning
Scheduling of internal transport	As per event and monthly review	3PL provider	3PL provider	Production Planning Sasol Marketing	
Loading, transport and unloading at overflow warehouse facility	As per event and monthly review	3PL provider	3PL provider	Production Planning Sasol Marketing	
Update SAP ERP system of	Daily	3PL provider	3PL provider	Sasol Production Planning	Sasol Production Planning

production volumes and bagging volumes				Sasol Production	

6.2.5 Clearing and forwarding

The process for clearing and forwarding is in the full operational control of the 3PL provider. The clearing and forwarding activities are conducted after being informed by Sasol Production Planning and Sasol Marketing departments daily, and logistics administration is conducted per event. Logistics administration is for the 3PL provider solely, and does not require it to consult or inform, or to be informed by Sasol. Table 6.6 indicates the RACI matrix for clearing and forwarding.

Table 6.6: RACI matrix for clearing and forwarding

Activity	Frequency	Responsibility	Accountability	Consulted	Informed
Process: Clearing and forwarding as well as logistics administration					
Clearing and forwarding	Daily	3PL provider	3PL provider	Sasol Production Planning Sasol Marketing	Sasol Production Planning Sasol Marketing
Logistics administration	As per event	3PL provider	3PL provider		

6.2.6 Performance review

The process of performance review takes place monthly, and reports on stock accuracy, turnaround times and budget requirements. The 3PL provider is responsible, together with Sasol Base Chemicals, for conducting a monthly business review. Table 6.7 indicates the RACI matrix of performance review.

Table 6.7: RACI matrix for performance review

Activity	Frequency	Responsibility	Accountability	Consulted	Informed
Process: Performance review					
Monthly report on stock accuracy, turnaround times, expenditure budgetary requirements	Monthly	3PL provider and Sasol Base Chemicals	3PL provider and Sasol Base Chemicals	Sasol Production Planning Sasol Production, Sasol Marketing	Sasol Base Chemicals

The accountability for the performance discussion lies with both Sasol Base Chemicals and the 3PL provider. The performance is measured against agreed KPIs and interface management practices between Sasol Production Planning, Sasol Production and Sasol Marketing.

6.2.7 Synthesising of the RACI matrix accountabilities between Sasol and the 3PL provider

The projected annual spent to outsource the final packaged product supply chain of Sasol is in excess of R3.5 billion, based on the 2017 actual spend. From the six processes discussed (see Subsection 6.2.1–6.2.6), it became apparent that the processes led to interphases, namely

- Sasol Planning department;
- Sasol Marketing department;
- 3PL provider administration function;
- Sasol Production;
- 3PL provider administration and execution function; and
- the customer.

The overall process relating to the outsourcing scope starts with the identification of customer needs and the actual placement of an order by the customer for final packaged products (including bulk). Sasol is responsible for market analysis, as well as for selling the product to customer. The result of the market analysis and market information is relayed to Sasol Production Planning and the 3PL provider for understanding and arranging of resources in order to execute the plan. Sasol instructs the Production Department to convert feedstock into the final product.

The final product is physically transferred to the 3PL provider for packaging, warehousing and logistics. The product transferred to the 3PL provider does not become the property of the 3PL provider; the product owner is Sasol Base Chemicals. The 3PL provider is merely the process owner and executer. A blanket approach to the various Sasol outbound final packaged product supply chain product streams is applied. Before the inception of the Sasol Base Chemicals business, the various product streams had their own processes. As a result of the different approaches taken, a vast array of inefficiencies and fragmentation followed, to the detriment of Sasol.

Figure 6.1 indicates a centralised function for sales order capturing and scheduling of customer or 3PL provider fleet for collection and delivery. The warehouses and loading capabilities are managed by operational site; however, the sales order planning and scheduling take place at a centralised location, namely Gauteng, South Africa. The blocks at the top in Figure 6.1 indicate the accountable entity and the outbound final packaged product process flows across these various entities. The blocks indicate the specific activity occurring at each accountable entity. The process starts in the top left-hand corner with demand forecasting with the responsible entity, namely Sasol Planning, and the process ends where the customer has received the invoice for payment.

Figure 6.1 indicates the synthesised process as it relates to the various functional interphases.

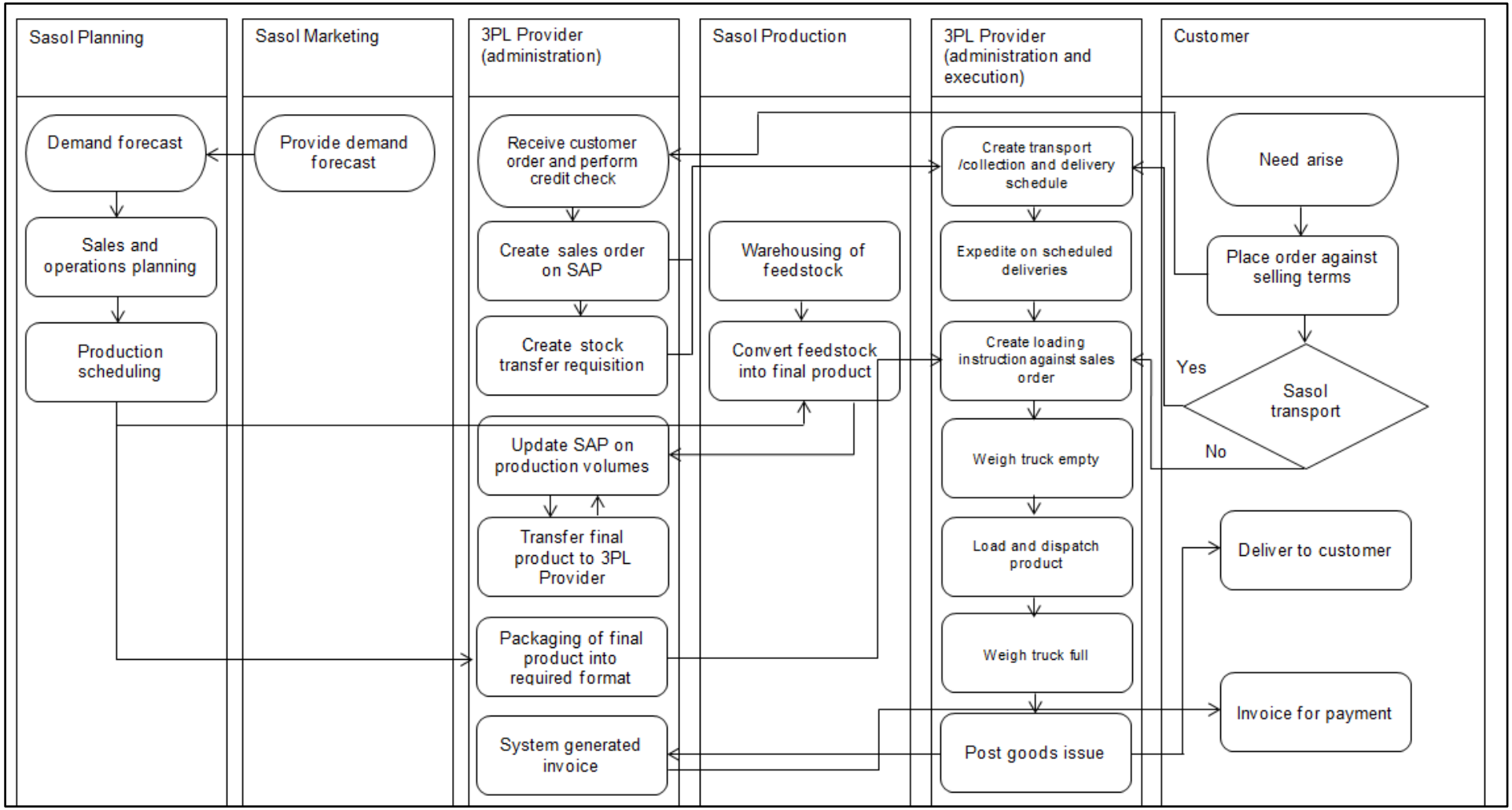

Figure 6.1: Process scope for outsourced operating model (interphases)

The following section discusses the application of the strategic decision-making model by utilising the strategic decision-making methodology process path.

6.3 APPLICATION OF THE STRATEGIC DECISION-MAKING MODEL

The strategic decision-making model for Sasol is applied by following the universal approach of the strategic decision-making model methodology process path. The strategic decision-making methodology process path comprises three phases (see Figure 4.3, page 112). The strategic decision-making model has the objective to ensure optimal alignment between Sasol's outbound final packaged product supply chain and prospective 3PL providers. The universal process was discussed in Section 4.4. The universal aspects will not be repeated, and only those aspects that directly contribute to the unique application of the strategic decision-making model between Sasol and prospective 3PL providers are mentioned.

6.3.1 Strategic decision-making model – phase one

The universal approach is discussed in Section 4.4.1 and draws on the models and elements reviewed in Chapters 2 and 3, respectively. The inputs of phase one serve as an enablement in terms of the development of the strategic decision-making model. The inputs are the nine models and three categories of elements as reviewed. The models reviewed were:

- The capabilities matrix for 3PL provider services of Prockl *et al.* (2012) (see Subsection 2.4.1);
- Bolumole's (2003) framework for evaluating the supply chain role of 3PL providers (see Subsection 2.4.2);
- Perçin's (2009) mathematical model (see Subsection 2.4.3);
- Monczka *et al.*'s (2005) supplier selection and evaluation process (see Subsection 2.4.4);

- Hum's (2000) extension of the Hayes–Wheelwright framework (see Subsection 2.4.5);
- Qureshi *et al.*'s (2008) differentiated outsourcing variables model (see Subsection 2.4.6);
- Hertz and Alfredsson's (2003) four categories of 3PL providers model (see Subsection 2.4.7);
- Huo *et al.*'s (2008) estimated path model (see Subsection 2.4.8); and
- Mellat-Parast and Spillan's (2014) process integration via survey data collection model (see Subsection 2.4.9).

The three categories of elements reviewed were:

- collaboration and integrated planning systems (see Subsection 3.2.1);
- performance measurement (see Subsection 3.2.2); and
- B-BBEE (SA-specific) (see Subsection 3.2.3).

The models and the elements reviewed all served to enable phase two of the strategic decision-making model.

6.3.2 Strategic decision-making model – phase two

This phase utilised the literature review according to phase one and organised the 3PL provider outsourcing models and elements via the services continuum into optimal results permutation categories. The services continuum is utilised, together with the outsourcing risk matrix, i.e. a dualistic development approach, in order to enable the strategic decision-making model. Phase two is graphically depicted in Figure 6.2.

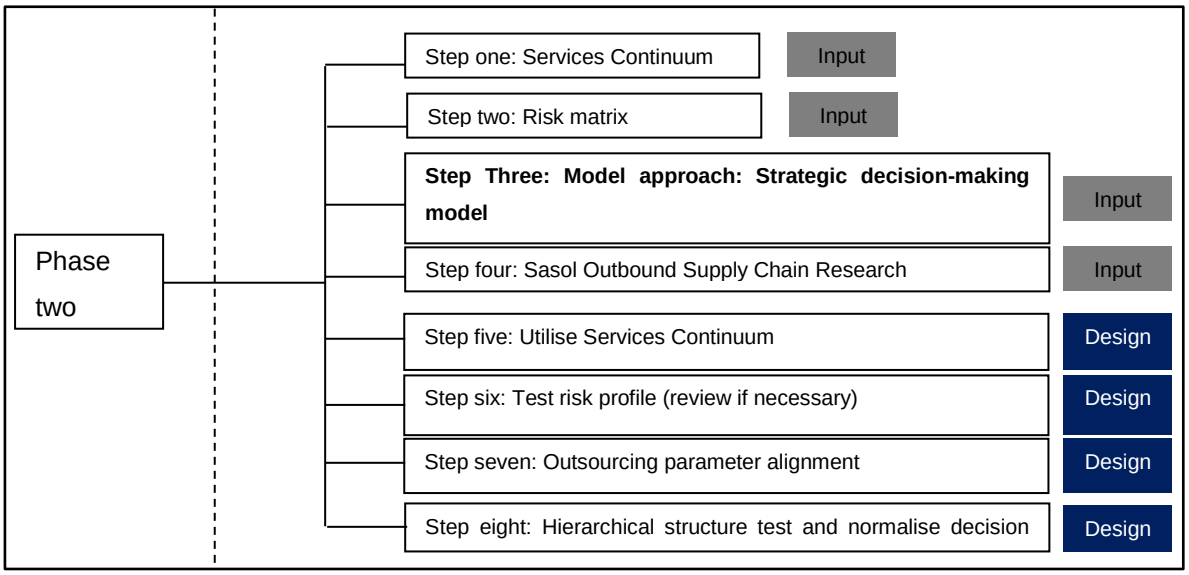

Figure 6.2: strategic decision-making model

Steps one and two were discussed in Section 4.4 as part of the universal application of the strategic decision-making model – and served as input into the strategic decision-making model. The services continuum is a conglomeration of the various models discussed in Chapter 2 (see Section 2.3).

Step three is positioned in relation to the model approach for the strategic decision-making model (input). According to the results obtained from the primary research (see Chapter 5), the strategic decision-making model requirements for Sasol requires indicate:

- ethical leadership and corporate citizenship;
- auditing of both organisations;
- governance of risk;
- compliance with laws, rules codes and standards;
- internal auditing;
- governing of stakeholder relations; and

- integrated reporting disclosure.

The objective of outsourcing for Sasol is to allow Sasol to focus on its core business functions, namely production and marketing. The benefits of outsourcing are sought from the outsourcing partnership in the form of reduced costs and increased efficiency. The formation of a strategic partnership is essential in order for a 3PL provider to take over full operation of the final packaged product supply chain of Sasol, which has an annual spend in excess of R3.5 billion.

Step four focusses on the Sasol outbound supply chain research (input). The scope relating to Sasol's outbound supply chain was discussed in Section 6.2. A total supply chain logistics solution is opted for – from the production hand-over point to final loading and dispatch to the customer, including administration and expediting until order payment – referred to as the 'product-to-cash cycle' (Chen, Melamed, Sokolinskiy & Sopranzetti, 2017). The fertiliser product stream is the only exception to CIF, as discussed in Subsection 6.2.3 of this chapter. Final product ownership resides with Sasol Base Chemicals. Only the supply chain logistics processes, maintenance, and operations of the pack lines (as value-added activities) are outsourced. The potential 3PL providers, as reported in Chapter 5, are Katoen Natie, SACD, Barloworld Logistics, Imperial Logistics, Sammar Investments, and GTWLS.

Step five comprises the utilisation and application of the services continuum. This forms part of the design of the strategic decision-making model. Given the scope and requirements necessary (primary and secondary research as reported in Chapter 4), Sasol is classified as indicated in block SCSI16.

Figure 6.3 displays the extract from the classification in terms of the services continuum SCSI16, highlighted in grey.

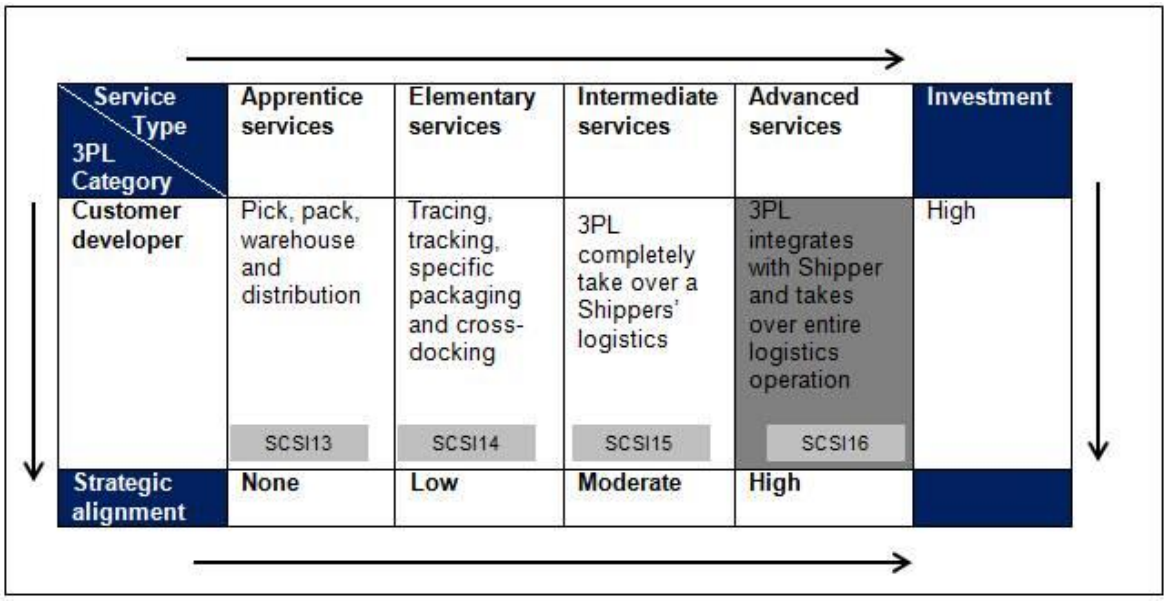

Figure 6.3: Services continuum

According to this placement, an advanced service is required, a high investment is necessary, and the strategic alignment required is high. The strategic alignment required is at executive management and board level to ensure the successful and optimal alignment between Sasol and the 3PL provider. The category of 3PL provider is that of *customer developer*. Sasol's requirement is placed at SCSI16 as a result of the vast operations requirement (covering Sasolburg, Secunda, Rosebank, Germiston, Alrode and Durban), the financial investment required, and the integration required to operationalise the outbound final packaged product supply chain. Given the strategic decision-making model's design, the service requirement is strategic in nature. The operations requirements, from product bagging, warehousing, dispatch, distribution, and clearing and forwarding, to the capacity scheduling to be incorporated by a prospective valuable partner within the supply chain to customers, all require nothing less than an advanced service offering, whereby the 3PL provider integrates with Sasol and takes over the entire logistics operation (see SCSI16).

To test the placement on the services continuum mathematically in terms of any element according to the formulation, the underlying mathematical principles of the services continuum were utilised. An extract is shown in Figure 6.4.

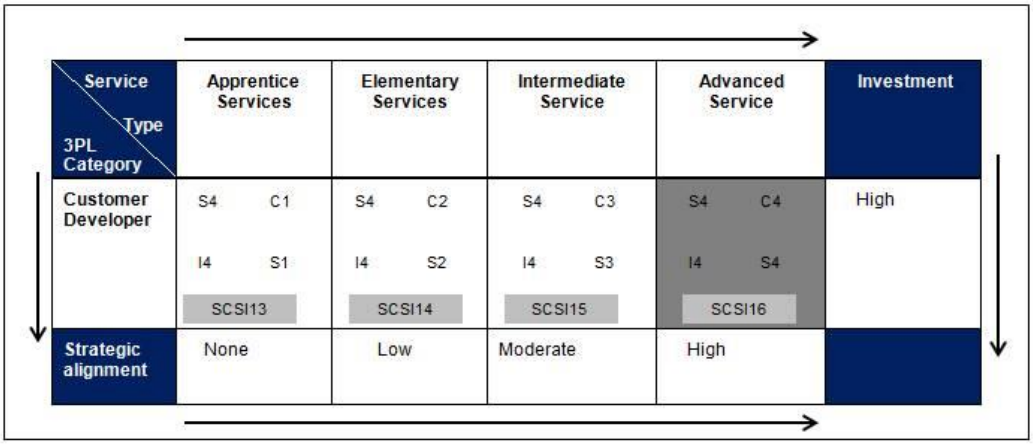

Figure 6.4: Extract of the mathematical formulation relating to the services continuum

Table 2.1 (page 35) indicates the various values per optimum permutation result. A result of 64 is required for the advanced service offering. To ensure the advanced service offering is obtained, the remainder of the variables (Category of 3PL provider, strategic alignment and investment) requires to be plotted on the services continuum. This is achieved by multiplying the three values inside the grey block, in mathematical form:

Advanced service requirement = 3PL category x strategic alignment x investment

= 4 x 4 x 4

= 64

The value of 64 matches with the mathematical alignment of the services continuum. The value (64) indicates a perfect fit with SCSI16 (see Table 6.8). According to the design of the mathematical formulation of the services continuum, should there be a deviation from the mathematical alignment data set, re-evaluation and placement on the services continuum are necessitated.

Table 6.8: Services continuum mathematical formulation

Mathematical outcome	Placement on services continuum	SCSI alignment
64	SCSI16	Advanced service, *customer developer*, high strategic alignment and high investment required

On the services continuum, the level of strategic involvement is characterised by

executive and board management involvement for Sasol, as the placement necessitates a high level of strategic alignment. The service type is an advanced service offering and a high degree of investment is required. The level of investment is characterised by the extensive nature of the Sasol-owned facilities and the system infrastructure, as well as the move from fixed cost investment to variable cost. The *customer developer* is indicated as the type of 3PL provider required for Sasol's outsourcing initiative. According to Hertz and Alfredsson (2003), the groupings form part of the permutation matrix on the services continuum, with the specific categorisation of standard 3PL providers through to *customer developers*. Customer adaption and the general ability of problem-solving by the 3PL provider were used as dimensions in order to differentiate between 3PL providers, as indicated in Figure 6.5 (Hertz and Alfredsson, 2003).

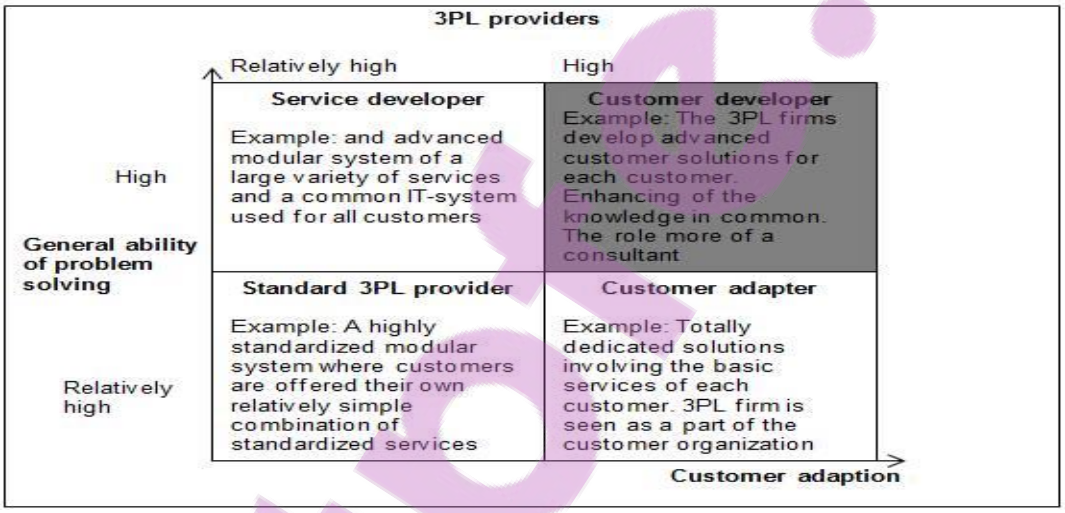

Figure 6.5: 3PL provider classification according to abilities of general problem-solving and customer adaption

Source: Hertz and Alfredsson (2003)

Sasol's placement on the services continuum will allow for the evaluation of the prospective 3PL providers in terms of the service provided for classification of the 3PL provider. Once the prospective 3PL provider has been classified, this will lead to either inclusion for further analysis or exclusion as a potential 3PL provider, i.e. a matchup between Sasol and the prospective 3PL provider. The value analysis that stems from the detailed value analysis is reflected in Section 5.4.2 of this thesis. The summarised value analysis, as displayed in Table 6.9, is focussed on

the reconciliation of the Sasol scope (as discussed in Section 6.2 of this thesis) in the form of collaboration and integrated planning systems, performance measurement and B-BBEE benefits.

Table 6.9: Prospective 3PL provider value analysis

3PL provider	Capability overview matched against unit of analysis
Katoen Natie	▪ No foreseeable issues in terms of collaboration and integrated planning systems or performance measurement ▪ Katoen Natie is classified according to the B-BBEE code as a generic enterprise and is subjected to the generic scorecard. ▪ This is a threat to the shipper as the organisation has no procurement benefit according to B-BBEE codes
South African Container Depots (SACD)	▪ No foreseeable issues in terms of collaboration and integrated planning systems or performance measurement ▪ SACD is classified according to the B-BBEE code as a generic enterprise and is subjected to the generic scorecard. ▪ SACD is classified as a level 2 B-BBEE contributor, which allows shippers to claim 125% of all spend with SACD.
Barloworld Logistics	▪ No foreseeable issues in terms of collaboration and integrated planning systems or performance measurement ▪ Barloworld is classified according to the B-BBEE code as a generic enterprise and is subjected to the generic scorecard ▪ Barloworld is classified as a level 2 B-BBEE contributor, which allows Sasol to claim 125% of all spend with Barloworld
Imperial Logistics	▪ No foreseeable issues in terms of collaboration and integrated planning systems or performance measurement ▪ Imperial Logistics is classified according to the B-BBEE code as a generic enterprise and is subjected to the generic scorecard ▪ Imperial Logistics is classified as a level 3 B-BBEE contributor, which allows Sasol to claim 110% of all spend with Imperial
Sammar Investments	▪ Sammar Investments is a comparably small operation ▪ System integration is limited, given the size of Sammar Investments, and large investment is required to ensure level footing with competitors ▪ B-BBEE status is that Sammar Investments is 100% black-owned ▪ Procurement benefit of 135% due to classification as level 1 B-BBEE contributor
GTWLS	▪ Systems integration would require substantial investment on the part of the shipper ▪ Financial capability to operate on required level envisaged as problematic ▪ Currently a threat to the shipper as the organisation has no procurement benefit according to B-BBEE codes

Based on the value analysis conducted and reported in Subsection 5.4.2, the prospective 3PL providers are plotted on the services continuum (see Figure 6.6).

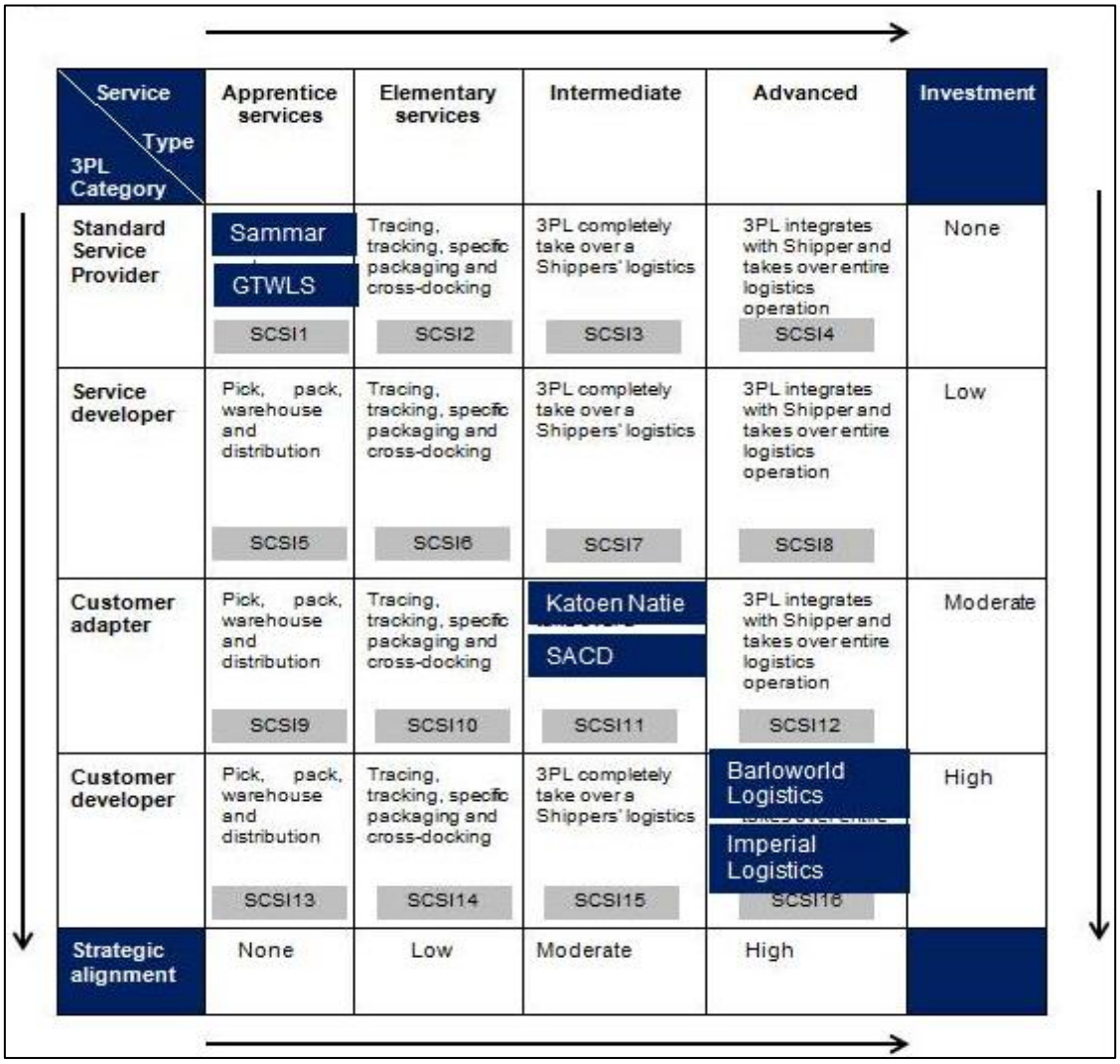

Figure 6.6: Placement of prospective 3PL providers on the services continuum

Step six is to test the risk profile (design). The ISO 31000: 2009 risk management process was adopted for the development of the strategic decision-making model (see Section 3.3 for detailed discussion).

The potential risk areas were identified as:

- successful identification and engaging with a potential partner;
- anticipated efficiencies and enhanced execution/optimisation not realised;

- poor management of the new entity;
- influence on workforce (~ 220 employees) – Act No. 66 of 1995, section 197 (transfer of employees) and section 189 (retrenchment based on operational requirements);
- effect of process/system could be significant after completion of detailed design;
- initial costing could potentially only be reduced in a phased approach due to complexity to implement;
- supplier fails to be aligned in terms of B-BBEE specifications;
- delays and additional costs due to ineffective management at execution;
- customer relations negatively affected;
- SHE standards and quality governance to be adhered to. Risk mitigated by the 3PL provider selection process of independent distribution transporters;
- ineffective change management; and
- existing assets largely depreciated and 3PL provider would experience a replacement spike in the first three years. Assets nearing their end of useful lives could affect the market value and 'buy-in' price negotiations negatively.

In terms of the initial potential risk indication, the nature of the outsourcing venture for Sasol's outbound final packaged product supply chain necessitated the involvement of the board of directors to ensure that the mitigating actions are implemented that would ensure an acceptable process and risk rating with the implementation of the outsourced venture.

The second development, the outsourcing risk matrix, was used to execute the potential risk rating for Sasol's outbound final packaged product supply chain. Table 3.8 (page 95) and Table 3.9 (page 96) reflect the results of the analysis.

Table 6.10 indicates the potential risk rating analysis for Sasol, and shows that the initial risks ratings were high, with 11 potential risks identified: four level-one risks, five level-two risks, one level-four risk and, one level-five risk. After risk mitigation, all 11 potential risks had been brought down to a level-six risk. The risk mitigation was used to assign the potential risks at the correct level within the organisation for management control. The risk was further mitigated by following a scientific approach to the application of the strategic decision-making model.

Table 6.10: Potential risk and mitigation action

Potential risks	Outsourcing risk matrix rating	Risk mitigation	Outsourcing risk matrix rating
▪ Successful identification and engaging with a potential partner	I6P7, level 1 risk	▪ Mitigated through the strategic decision-making model	I1P1, level 6 risk
▪ Anticipated efficiencies and enhanced execution/optimisations not realised	I5P7, level 2 risk	▪ Official parameter alignment and sign-off through contract. Critical that the correct 3PL provider be chosen in terms of placement capabilities on the services continuum ▪ Continual process of performance management on monthly basis	I1P1, level 6 risk
▪ Poor management of the new entity	I6P7, level 1 risk	▪ Official parameter alignment and sign-off through contract. Critical that the correct 3PL provider be chosen in terms of placement capabilities on the services continuum	I1P1, level 6 risk
▪ Influence on workforce (~ 220 employees) – Act No. 66 of 1995, section 197 (transfer of employees) and section 189 (retrenchment based on operational requirements)	I6P7, level 1 risk	▪ In terms of placement on the services continuum, the board of directors is involved with this decision. Given the number of employees directly affected, engagement with employee relations experts necessary, together with the establishment of a steering committee for successful execution of section 197 or 189 of Act No. 66 of 1995.	I1P1, level 6 risk
▪ Effect of the process/system could be significant after completion of detailed design ▪ Initial costing could potentially only be reduced in a phased approach due to complexity to implement	I5P7, level 2 risk	▪ Ensure outsourcing parameter alignment according to the strategic decision-making model	I1P1, level 6 risk
▪ Supplier fails to be aligned on B-BBEE specification	I7P7, level 1 risk	▪ Sasol aims to ensure a 3PL provider is chosen in order for Sasol to gain the approximately R3.5 billion spend as BEE spend on level two or three, ensuring greater BEE spend when multiplied with the B-BBEE recognition level percentage	I1P1, level 6 risk
▪ Delays and additional costs due to ineffective management at execution	I5P5, level 2 risk	▪ Official parameter alignment and sign-off through contract. Critical that the correct 3PL provider be chosen in terms of placement capabilities on the services continuum ▪ Continual process of performance management on monthly basis	I1P1, level 6 risk
▪ Customer relations negatively affected	I5P5, level 2 risk	▪ Official parameter alignment and sign-off through contract. Critical that the correct 3PL provider be chosen in terms of placement capabilities on the services continuum ▪ Continual process of performance management on monthly basis	I1P1, level 6 risk
▪ SHE standards and quality governance to be adhered to. Risk mitigated by the 3PL provider selection process of independent distribution transporters	I5P5, level 2 risk	▪ Official parameter alignment and sign-off through contract. Critical that the correct 3PL provider be chosen in terms of placement capabilities on the services continuum ▪ Continual process of performance management on monthly basis	I1P1, level 6 risk
▪ Ineffective change management	I3P3, level 5 risk	▪ The strategic decision-making model is designed for optimum alignment between 3PL provider and Sasol. Change management is essential, and the overarching steering committee should ensure a functional stream for change management. Change management will not be left for line management to conduct or conclude	I1P1, level 6 risk
▪ Existing assets largely depreciated and 3PL provider will have a replacement spike in the first three years. Assets nearing the end of their useful life that could affect the market value and ‘buy-in’ price negotiations negatively	I4P4, level 4 risk	▪ Official parameter alignment and sign-off through contract. Critical that the correct 3PL provider be chosen in terms of placement capabilities on the services continuum ▪ Continual process of performance management on monthly basis ▪ Assets will not be transferred to the 3PL provider, such as fleet vehicles. These fleet vehicles will be disposed of by means of the internal Sasol process of redundant materials management, which is operationalised through an auction house. The money recovered from the fleet will be added to the project as a benefit	I1P1, level 6 risk

Step seven is the outsourcing parameter alignment. For Sasol, the outsourcing parameter alignment is done through a process, indicating the elements required via collaboration and integrated planning systems, performance measurement and B-BBEE (see Chapter 3).

The outsourcing requirements are based on the following parameters:

- business continuity and no bottlenecks or insufficient delivery;
- customer experience should be the same or improved;
- integrated interface management, including systems;
- contract to guard against unrealistic price increases;
- clear process indication; and
- safe operations to be adhered to at all times.

The requirements for outsourcing are to ensure cost economy, capability building, flexibility and the possibility of gaining access to new technology, and reduced risk.

A low-cost strategy primarily focusses on delivering the required product at the lowest possible cost, from manufacturing to distribution. Once the strategic intent is known, low-cost as in this case, the capabilities matrix of Prockl *et al*. (2012) should be used (see Subsection 2.4.1 for a detailed model discussion). The capabilities matrix matches the requirements for sourcing of 3PL provider services with the structural settings in terms of resources and relationships. In terms of the placement of Sasol on the services continuum, the service lernstatt (quadrant 2b as displayed in Figure 2.7, page 45) is applicable. This is the most advanced form of integration in the matrix, and indicates the highest level of integration power and involvement between shipper and 3PL provider. Service lernstatts are characterised by value creation through providing know-how and impulses for innovation for the processes of the client, meaning customised solutions. The service lernstatt is utilised for complex and relationship-intense service requirements.

Figure 6.7 indicates the service lernstatt (Prockl *et al.*, 2012) as the type of 3PL provider required.

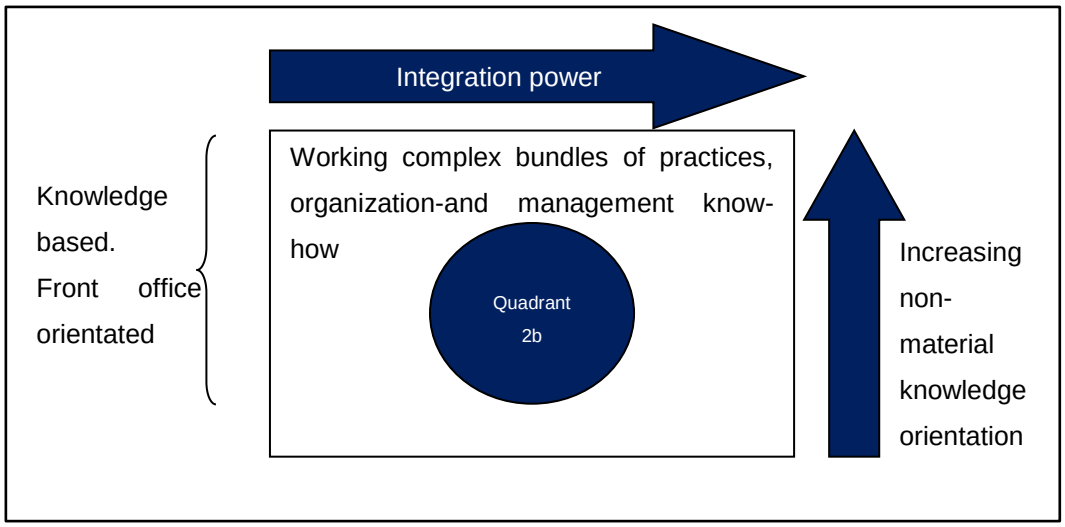

Figure 6.7: Service lernstatt
Source: Adapted from Prockl *et al*. (2012)

Bolumole's (2003) framework for evaluating the supply chain role of 3PL providers (discussed in detail in Subsection 2.4.2) was utilised in conjunction with the value analysis reported on in Chapter 5, in order to place the prospective 3PL provider organisations (see Figure 6.8).

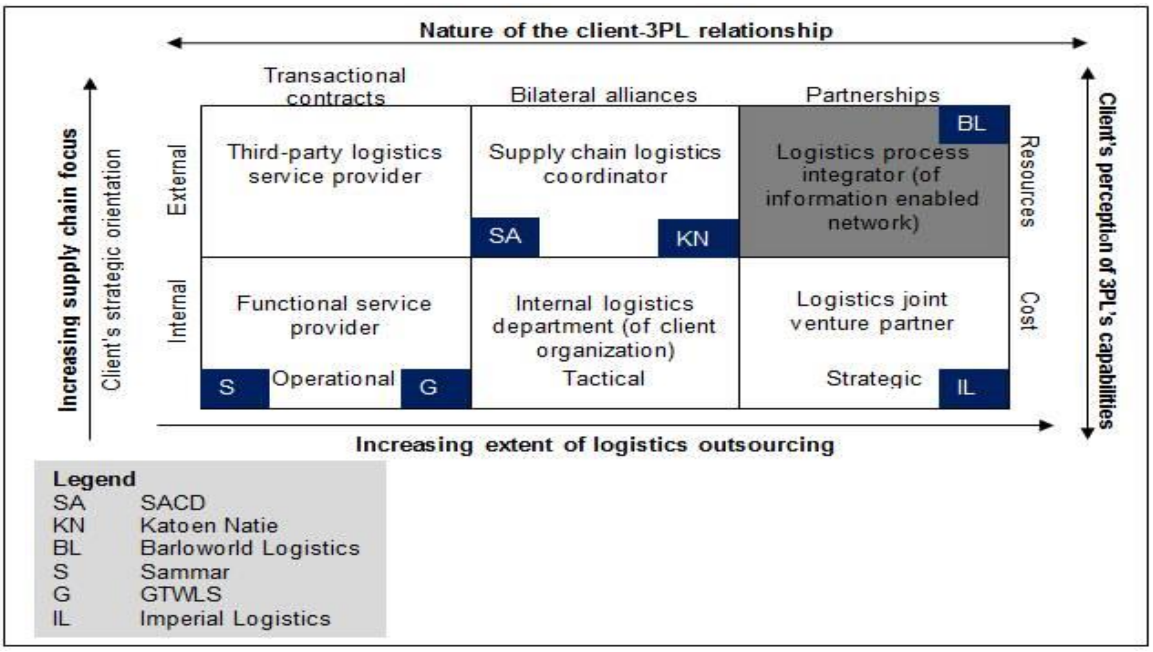

Figure 6.8: Evaluating the supply chain role of 3PL providers
Source: Adapted from Bolumole (2003)

The prospective 3PL providers have been placed in accordance with Bolumole's (2003) framework after a value analysis had been completed for the prospective 3PL provider organisations (Figure 6.8). In terms of the classification of the service lernstatt, four of the prospective 3PL providers could be categorised under service lernstatt: SACD, Katoen Natie, Barloworld Logistics, and Imperial Logistics. However, only two of the four organisations have been placed on the services continuum as SCSI16. Sammar Investments is seen as a functional service provider, as is GTWLS, i.e. container loading and warehousing activity. SACD and Katoen Natie are viewed as a bilateral alliance and act as a logistics coordinator. Imperial Logistics is classified as a logistics joint venture, as the organisation focusses especially on the fast-moving consumer goods industry, although it has all the necessary competencies to ensure a successful outsourced partnership with Sasol.

Barloworld is classified the highest in terms of placement on the framework of Bolumole (2003). Perçin (2009) provides a mathematical model for evaluating and selecting 3PL providers. The methodology of Perçin is sound and the underlying principles of the model are utilised to develop and determine criteria for 3PL provider placement on the services continuum, matched with a risk review. Should the risk not be acceptable, alternative placement on the services continuum is required. The universally applied supplier selection and evaluation framework of Perçin (2009) is utilised (the model is discussed in detail in Chapter 2, see Subsection 2.4.3) in the broader approach taken by Monczka *et al.* (2005) (see Subsection 2.4.4) to evaluate prospective 3PL providers. See Appendix F: Evaluation of 3PL providers and Appendix G: Evaluation of prospective 3PL providers, for the detailed analysis, given the Sasol perspective.

The model by Hum (2000), which is an extension of the Hayes–Wheelwright framework (see Subsection 2.4.5), is a strategic model for measuring manufacturing effectiveness. The stage deemed appropriate for the Sasol strategic decision-making model was stage four, which related to the manufacturing function becoming 'externally supportive'. The 3PL provider should utilise this model to build its logistics capabilities in order to operate at the externally supportive stage of the Hayes–Wheelwright framework, providing

logistics-based capabilities to its customers. Four tests have been utilised by Hum (2000) with the Hayes–Wheelwright framework in order to assist in determining the level of effectiveness, as discussed in Subsection 2.4.5. The four tests indicate what is required per stage of the Hayes–Wheelwright framework. These tests have been done for the potential 3PL providers for Sasol's outbound final packaged product supply chain. Table 6.11 shows that the prospective 3PL providers have been evaluated based on the secondary research (see Chapter 5). Based on the model specifics of a SCSI16 services continuum placement, both Imperial Logistics and Barloworld Logistics satisfy the required output level.

Table 6.11: Hayes–Wheelwright framework applied

3PL provider	Test 1	Test 2	Test 3	Test 4
GTWLS	Limited	Limited	Limited	Limited
Sammar Investments	Limited	Limited	Limited	Limited
SACD	Moderate	Moderate	Moderate	Moderate
Katoen Natie	Moderate	Moderate	Moderate	Moderate
Imperial Logistics	High	High	High	High
Barloworld Logistics	High	High	High	High

Outsourcing parameter alignment between Sasol and the prospective 3PL provider is required. There are seven process areas of parameter alignment, namely:

- demand forecast;
- conversion of feedstock into final product;
- selling of final product;
- internal transfers to overflow warehouses;
- clearing and forwarding;
- performance review; and
- pricing model alignment.

The alignment of demand forecast process parameters entails the following activities:

- perform sales and operations planning;
- perform supply chain operations scheduling;
- reconcile all product movement daily and initiate investigation of variances; and
- create stock transfer requisitions to overflow facilities/trigger overflow facility need.

Table 6.12 indicates the alignment of the demand forecast process parameters between Sasol and the prospective 3PL by indicating each activity, inclusive of the frequency of the required outcome, as well as the responsibilities between Sasol and the prospective 3PL provide.

Table 6.12: Alignment of the demand forecast process parameters

Activity	Frequency	Responsibility	Parameter alignment – expected outcome
Process: Demand forecast			
Perform sales and operations planning	Weekly	Sasol Production Planning and 3PL provider	3PL provider needs to ensure adherence to the Sasol production schedule and should ensure that the correct product is bagged as per requirement.
Perform scheduling of supply chain operations	Daily	Sasol Production Planning and 3PL provider	It is expected from the 3PL provider to ensure that all tasks and activities are scheduled and that there is adherence to the schedule. The schedule includes availability of packaging material, availability of equipment and scheduling of customer requirements.
Reconcile all product movement daily and initiate investigation of variances	Daily	Sasol Production Planning and 3PL provider	The 3PL provider is expected to ensure that all product movement is recorded and accounted for.
Create stock transfer requisitions to overflow facilities/trigger overflow facility need	According to event and monthly review	3PL provider	The 3PL provider is required to ensure that the stock that moves between facilities is recorded in a timely fashion and should also ensure capacity utilisation.

The conversion of feedstock into alignment of final product process parameters entails the following activities:

- provide daily reconciliation (opening and closing stock for both final product and feedstock);
- sign off production daily into warehouse reconciliation report;
- bulk stock into warehouse reconciliation report;
- break bulk and final packaged product production into warehouse report; and
- update SAP ERP system with production volumes and bagging volumes into warehouse.

Table 6.13 indicates the parameter alignment necessary for the converting feedstock into final product process by indicating the frequency of the required outcome, inclusive of responsibilities between Sasol and the prospective 3PL provider.

Table 6.13: Conversion of feedstock into final product process parameter alignment

Activity	Frequency	Responsibility	Parameter alignment – expected outcome
Process: Convert feedstock into final product			
Provide daily reconciliation (opening and closing stock for both final product and feedstock)	Daily	3PL provider	The 3PL provider is expected to provide accurate reconciliation reports in order to allow Sasol to do accurate planning.
Sign off daily production into warehouse reconciliation report	Daily	3PL provider	The 3PL provider is expected to sign formally in terms of accountability for the product under its direct control formally and to ensure effective and efficient warehousing of product.
Bulk stock into warehouse reconciliation report	Daily	3PL provider	The 3PL provider is expected to provide accurate reconciliation reports in order to allow Sasol to do accurate planning and to ensure effective and efficient warehousing of bulk product.
Break-bulk and final packaged	Daily	3PL provider	Ensure safekeeping of product in

product production into warehouse report			warehouses.
Update SAP ERP system with production volumes and bagging volumes into warehouse	Daily	3PL provider	The 3PL provider is expected to ensure that physical products in the warehouse are accounted for within the SAP ERP system.

The selling of the final product, including bulk, process parameter alignment entails the following activities:

- creation of sales order;
- scheduling of customer/3PL provider fleet for loading;
- customer/3PL provider fleet to record empty weight at weighbridge against sales order;
- loading of bulk final product;
- bulk product to be measured as per weighbridge;
- the weighbridge automatically issues the quantity against the sales order;
- ensure billing and invoicing are correct and expedite payment; and
- weighbridge reconciliation report.

Table 6.14 indicates the parameter alignment necessary for the selling of the final product, inclusive of bulk process, by indicating the frequency of the required outcome, inclusive of responsibilities between Sasol and the prospective 3PL provider.

Table 6.14: Alignment of selling of final product (including bulk) process parameters

Activity	Frequency	Responsibility	Parameter alignment – expected outcome
Process: Selling of final product (including bulk)			
Creation of sales order	Daily	3PL provider	The 3PL provider is required to ensure accurate and timely creation of sales orders.
Scheduling of customer/3PL provider fleet for loading	Daily	3PL provider	The 3PL provider is required to ensure timely scheduling of customer or 3PL provider fleet for loading.
Customer/3PL provider fleet to record empty weight at weighbridge against sales order	Per event	3PL provider	3PL provider is responsible and accountable to ensure weighbridge activities take place and that accurate empty weights are captured against a sales order.
Loading of bulk final product	Per event	3PL provider	The 3PL provider is responsible and accountable for loading of bulk product to customer at gantry facilities.
Bulk product to be measured at weighbridge	Per event	3PL provider	3PL provider is responsible and accountable to ensure weighbridge activities take place and that accurate empty weights are captured against a sales order.
The weighbridge automatically issues the quantity against sales order	Per event	3PL provider	The 3PL provider should ensure that the SAP ERP system supplies accurately against the correct sales order in order for invoicing to customer to take place.
Ensure billing and invoicing are correct and expedite payment	Daily	3PL provider	The 3PL provider should ensure that all information captured on the invoice is correct. The 3PL provider is also required to ensure expediting against a processed sales order.
Weighbridge reconciliation report	Daily	3PL provider	The 3PL provider should ensure accurate weighbridge reconciliation reporting.

The internal transfer to overflow warehouse process parameter alignment entails the following activities:

- create stock transfer requisitions to overflow facilities;

- scheduling of internal transport;
- loading, transport and unloading at overflow warehouse facility; and
- update SAP ERP system with production volumes and bagging volumes.

Table 6.15 indicates the parameter alignment necessary for internal transfers to overflow warehouses by indicating the frequency of the required outcome, inclusive of responsibilities between Sasol and the prospective 3PL provider.

Table 6.15: Internal transfers to overflow warehouses process parameter alignment

Activity	Frequency	Responsibility	Parameter alignment – expected outcome
Process: Internal transfers to overflow warehouses			
Create stock transfer requisitions to overflow facilities/trigger overflow facility requirement	Per event and monthly review	3PL provider	The 3PL provider is required to ensure timely creation of stock transfer orders to overflow facilities. The 3PL provider is also required to indicate in good time the need for overflow warehouse space requirements.
Scheduling of internal transport	Per event and monthly review	3PL provider	The 3PL provider should ensure timely scheduling of internal transport.
Loading, transport and unloading at overflow warehouse facility	Per event and monthly review	3PL provider	The 3PL provider to ensure effective and efficient loading of transportation vehicles.
Update SAP ERP system with production volumes and bagging volumes	Daily	3PL provider	The 3PL provider is expected to ensure that physical products in the warehouse are accounted for within the SAP ERP system.

The clearing and forwarding process parameter alignment entails the following activities:

- clearing and forwarding; and
- logistics administration.

Table 6.16 indicates the parameter alignment necessary for clearing and forwarding, as well as the logistics administration process, by indicating the frequency of the required outcome, inclusive of responsibilities between Sasol and the prospective 3PL provider.

Table 6.16: Clearing and forwarding process parameter alignment

Activity	Frequency	Responsibility	Parameter alignment – expected outcome
Process: Clearing and forwarding as well as logistics administration			
Clearing and forwarding	Daily	3PL provider	The 3PL provider is required to ensure accurate and timely execution of clearing and forwarding activities.
Logistics administration	Per event	3PL provider	The 3PL provider is required to ensure best-in-class logistics administration services.

Table 6.17 indicates the parameter alignment necessary for the performance review process. This alignment occurs between the 3PL provider and Sasol, with the purpose of indicating the activity required per performance review process, the frequency of the required activity, with whom responsibility for the activity resides, and what the expected outcome of the activity is.

Table 6.17: Performance review process parameter alignment

Activity	Frequency	Responsibility	Parameter alignment – expected outcome
Process: Performance review			
Monthly report on stock accuracy, turnaround times, expenditure budgetary requirements	Monthly	3PL provider and Sasol Base Chemicals	The 3PL provider is expected to provide performance measurement rating according to the agreed KPI measurement system.

Table 6.18 indicates the pricing model alignment between Sasol and the 3PL provider. This alignment occurs between the 3PL provider and Sasol, with the purpose of indicating the activity required in terms of the pricing model alignment process, the frequency of the required activity, with whom responsibility for the activity resides, and what the expected outcome of the activity is. Research has proposed that the best-fitting model to be utilised, at the most advanced state of

outsourcing to the 3PL provider, is one that ensures an iterative process is followed, where the benefit is shared between the shipper and the 3PL provider. This will ensure a continuous process of improvement to the benefit of both parties.

Table 6.18: Pricing model alignment

Activity	Responsibility	Parameter alignment – expected outcome	Pricing calculation
Process: Pricing model			
Outsourcing with a percentage of sales value charge model, according to Bloem and Bean (2015), is utilised for the outsourcing partnership between Sasol and the 3PL provider. The 3PL provider charges a percentage of the value of goods sold. This percentage should be negotiated as a start and continuously reviewed as a percentage of sales, thereby ensuring benefit for both shipper and 3PL provider.	3PL provider and Sasol Base Chemicals	Sasol and the 3PL provider agree on the sales volume throughput – percentage to be based on sliding scale – to the benefit of both Sasol and 3PL provider.	▪ The current cost to operationalise the outbound final packed product supply chain of Sasol is approximately R3.5 billion per annum, which represents 5.83% in relation to total turnover (R60 billion per annum). ▪ The aim is to operationalise by using a 3PL provider utilising a sliding scale to the benefit of both Sasol and 3PL provider. ▪ Initial saving of 5.5%, representing R200 million per annum. ▪ The calculation should be based on a continuous review to ensure a process of continual renewal and optimisation of the system as a whole (sliding scale advantages after initial saving).

Step eight comprises the hierarchical structure test and the normalising of the decision (design). McIvor and Humphreys (2000) indicate that organisations traditionally outsource without having a formal method for evaluating the outsourcing decision; however, according to Perçin (2009), there is a hierarchical structure for selecting the best 3PL provider. Based on the hierarchical structure of Perçin (2009), the structure and elements are utilised in conjunction with the

services continuum after the category type has been identified and a list of specific suppliers has been identified, which conforms to the specific category of 3PL provider – in this case, the category of 3PL provider is that of a *customer developer* offering an advanced service. The hierarchical structure utilises different elements, grouped into three factor categories:

- strategic factors – similar values, similar size, financial stability, compatible culture and strategic partners;
- business factors – technical ability, management capacity, market knowledge and performance.
- risk factors – loss of functional control, complexity in operations and delivery, and risk in choosing the right partner.

From the criteria, a pairwise comparison matrix was drawn up and normalised, as reflected in Table 2.10 (page 55) and Table 2.11 (page 56).

6.3.3 Strategic decision-making model – phase three

Phase three is the final section of the strategic decision-making model and is a design element of continuous review of performance and business appraisal. The business review aligns with the ISO 31000: 2009 standard with regard to risk management processes to review continuously the risk involved with the outsourcing venture. Figure 6.9 sets out an extract of phase three from the strategic decision-making model.

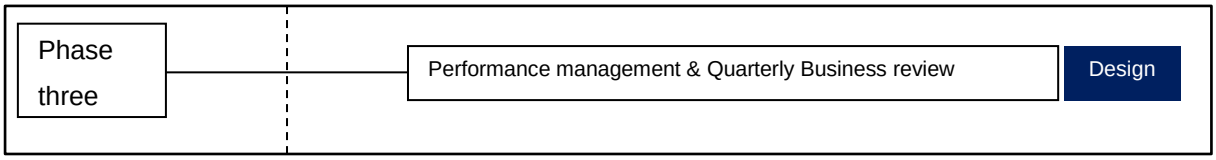

Figure 6.9: Phase three of the strategic decision-making model

Performance measurement is executed by means of agreed KPIs between

shipper and 3PL provider (see Subsection 3.2.2 for a detailed discussion of performance measurement). Given the nature of the outsourcing venture between Sasol and the 3PL provider, the utilisation of third-generation performance measurement was instituted. According to Neely *et al*. (1994), a third-generation performance measurement has the following features:

- links the non-financial and intangible dimensions of organisational performance, and extends the measurement of cash flow;
- has the criteria of information adequacy and organisational alignment; and
- emphasises the need for right information, at the right time, and integration of the performance model with the process. To this extent, the process definition and the relevant KPIs are subsequent to the outsourced process.

The demand forecast process KPIs are indicated in terms of the following activities by means of the frequency of the required activity, the responsible entity, and the required outcome (KPI) per activity:

- perform sales and operations planning;
- perform supply chain operations scheduling;
- reconcile all product movement daily and initiate investigation of variances; and
- create stock transfer requisitions to overflow facilities/trigger overflow facility need.

Table 6.19 indicates the KPIs in terms of the demand forecast process, consisting of ten selected KPIs. The KPIs are specific and require full adherence in order to ensure the success of the outsourced venture.

Table 6.19: Demand forecast process KPIs

Activity	Frequency	Responsibility	KPI
Process: Demand forecast			
Perform sales and operations planning	Weekly	Sasol Production Planning and 3PL provider	▪ Correct bagging as per schedule – 99.99% (error in bagging divided by total bagging plan) ▪ Utilisation of resources > 95%
Perform supply chain operations scheduling	Daily	Sasol Production Planning and 3PL provider	▪ Production and operations plan to be executed within 8 hours of receipt of plan ▪ 99.99% compliance with production schedule ▪ 99.99% of scheduled deliveries per day to be executed without fault ▪ Today's scheduled scheduling to take place today (99.99%)
Reconcile all product movement daily and initiate investigation of variances	Daily	Sasol Production Planning and 3PL provider	▪ All daily product movements to be provided by 09:00. ▪ 100% of variances to be investigated and resolved within 24 hours after identification
Create stock transfer requisitions to overflow facilities / trigger overflow facility need	As per event and monthly review	3PL provider	▪ Stock transfer order to be created without fault; fault index to be below 0.01%. ▪ Overflow facility need based on capacity utilisation, capacity utilisation to be at a minimum of 95% before a trigger can be initiated to utilise overflow warehouse facility

There are two KPIs for the activity of performing sales and operations planning:

- Bagging accuracy of 99.9% according to schedule

  This ensures that rework as a result of incorrect bagging is eliminated and enables correct delivery to the customer. Further, the accuracy of bagging ensures plant availability to Sasol according to Production Planning.

- Utilisation of resources > 95%

  This is to ensure that no excess capacity is created, which will have detrimental cost implications of not utilising assets to the full.

The KPIs should ensure production is achieved according to production plans, for satisfying demand.

Table 6.20 indicates the KPIs, according to the feedstock into final product process, which comprise 12 KPIs. The KPIs are specific and require full adherence in order to ensure the success of the outsourced venture.

Table 6.20: Feedstock into final product process KPIs

Activity	Frequency	Responsibility	KPI
Process: Convert feedstock into final product			
Provide daily reconciliation (opening and closing stock) of final product	Daily	3PL provider	▪ Daily reconciliation sheet to be provided at 09:00 ▪ 99.99% accuracy in stock reconciliation sheet ▪ Deviations to be investigated and resolved within 24 hours of identification
Sign off daily production into warehouse reconciliation report	Daily	3PL provider	▪ 99.99% accuracy in stock reconciliation sheet ▪ Deviations to be investigated and resolved within 24 hours of identification
Bulk stock into warehouse reconciliation report	Daily	3PL provider	▪ Daily reconciliation sheet to be provided at 09:00 ▪ 99.99% accuracy in stock reconciliation sheet ▪ Deviations to be investigated and resolved within 24 hours of identification
Break bulk and final packaged product production into warehouse report	Daily	3PL provider	▪ 99.99% accuracy in stock reconciliation sheet ▪ Deviations to be investigated and resolved within 24 hours of identification
Update SAP ERP system with production volumes and bagging volumes into warehouse	Daily	3PL provider	▪ SAP ERP system to be updated within 30 minutes of physical transaction ▪ SAP to reflect 99.99% of actual product within the supply chain

The activity to provide daily reconciliations of final product has three KPIs:

- Daily reconciliation sheet to be provided at 09:00

This is to ensure full visibility to Production Planning and Production against the production plan. This information enables feedback back to Sales and Marketing.

- 99.99% accuracy in stock reconciliation sheet

  Inventory accuracy is of the utmost importance and indicates the custody, care, and control exercised by the 3PL provider. Deviations greater than 0.01% are for the 3PL provider's account.

- Deviations to be investigated and resolved within 24 hours of identification

  Deviations need to be understood, and remedial action should be implemented to prevent reoccurrence.

The KPIs for each activity of converting feedstock into final product should ensure that market needs are served, and should also ensure 3PL provider performance. Table 6.21 indicates the parameter alignment necessary for the process of selling of the final product, consisting of 15 KPIs. The KPIs are specific and require full adherence in order to ensure the success of the outsourced venture. For example, in terms of the activity of billing and invoicing, the 3PL provider is accountable and responsible to ensure 99.9% error-free billing to customers.

Table 6.21: Process for selling of final product (including bulk) KPIs

Activity	Frequency	Responsibility	KPI
Process: Selling of final product (including bulk)			
Creation of sales order	Daily	3PL provider	▪ Sales order creation error-free rate 99.9% ▪ Conversion of the order-bank to sales orders in less than 24 hours
Scheduling of customer/3PL provider fleet for loading	Daily	3PL provider	▪ Error-free scheduling rate of 99.9% ▪ Conversion of sales order into scheduling in less than 24 hours
Customer/3PL provider fleet to record empty weight at weighbridge against sales order	Per event	3PL provider	▪ Weighbridge time-in to loading point to be less than 15 minutes ▪ Error-free weigh-in rate 99.9%
Loading of bulk final	Per event	3PL provider	▪ Turnaround time of 40 minutes per load

product			▪ Error-free loading rate of 99.9%
Bulk product to be measured according to weighbridge	Per event	3PL provider	▪ Weighbridge time-in to loading point to be less than 15 minutes
The weighbridge automatically issues the quantity against sales order	Per event	3PL provider	▪ Ensure 99.9% error-free posting against sales orders ▪ Posting to take place within 15 minutes after loading process
Ensure billing and invoicing is correct and expedite payment	Daily	3PL provider	▪ Error-free billing and invoicing rate of 99.9%
Weighbridge reconciliation report	Daily	3PL provider	▪ Daily reconciliation sheet to be provided at 09:00 ▪ 99.99% accuracy in stock reconciliation sheet ▪ Deviations to be investigated and resolved within 24 hours

Table 6.22 indicates the parameter alignment necessary for internal transfers to overflow warehouse process, consisting of nine KPIs. The KPIs are specific and require full adherence in order to ensure the success of the outsourced venture.

Table 6.22: Process for internal transfers to overflow warehouses KPIs

Activity	Frequency	Responsibility	KPI
Process: Internal transfers to overflow warehouses			
Create stock transfer requisitions to overflow facilities/ trigger overflow facility need	As per event and monthly review	3PL provider	▪ Stock transfer order creation error-free rate 99.9% ▪ Warehouse facility utilisation to be at 95% utilisation
Scheduling of internal transport	As per event and monthly review	3PL provider	▪ Error-free scheduling rate of 99.9% ▪ Scheduling to overflow facilities to take place within 24 hours
Loading, transport and unloading at overflow warehouse facility	As per event and monthly review	3PL provider	▪ Turnaround time of 40 minutes per load ▪ Error-free loading rate of 99.9% ▪ Turnaround time to facilities to be determined based on geographical placement of the facility
Update SAP ERP system with production	As per event and monthly	3PL provider	▪ Ensure 99.9% error-free posting against sales orders

volumes and bagging volumes	review		▪ Posting to take place within 15 minutes after loading/off-loading process

The activity to create stock transfer requisitions to overflow facilities of Sasol occurs per event and carries two KPIs:

- Stock transfer requisition creation to be error-free, at a rate of 99.9%

  The execution of the stock transfer requisition is to ensure that the product is moved timeously and without error.

- Warehouse facility utilisation to be at 95% utilisation

  While the 3PL provider will indicate storage shortage (in terms of the stock requisition), the 3PL provider must first ensure current warehouse facility utilisation is at 95%.

Table 6.23 indicates the parameter alignment necessary for clearing and forwarding, as well as the logistics administration process, consisting of five KPIs. The KPIs are specific and require full adherence in order to ensure the success of the outsourced venture.

Table 6.23: Clearing and forwarding as well as logistics administration process KPIs

Activity	Frequency	Responsibility	KPI
Process: Clearing and forwarding as well as logistics administration			
Clearing and forwarding	Daily	3PL provider	▪ Clearing and forwarding execution error-free rate 99.9% ▪ Conversion of executable order in less than 24 hours
Logistics administration	As per event	3PL provider	▪ Cost spend to be less than 10% current cost or 6% of total sales volume ▪ Perfect order fulfilment 99.9% ▪ Cash-to-cash cycle as per payment terms plus 3 working days maximum. i.e. outstanding payment < 4 working days.

The clearing and forwarding activity has two KPIs:

- Clearing and forwarding execution error-free rate of 99.9%.

  This is to ensure effective delivery to the customer. By ensuring 99.9% error-free clearing and forwarding, the customer of Sasol is serviced appropriately.

- Conversion of executable order in less than 24 hours.

  The KPI is focussed to ensure proper service delivery to the customers of Sasol's final product.

Following from Subsection 6.3.3, it is important that the KPIs be known and understood by the 3PL provider to enable performance and performance measurement. Given the scope of the alignment required, outsourcing based on SCSI16 is appropriate and there is an implied commitment and trust (strategic alignment and investment). This is true for both shipper and 3PL provider. The business nature is collaborative, meaning that the optimisation to follow should be accounted for both in equal proportions, i.e. the shipper and 3PL provider. The performance management is not purely transactional in nature, but rather a business review session to optimise and improve operations for the benefit of the outsourcing venture.

6.4 CONCLUSION

This chapter discussed the strategic decision-making model for Sasol's outbound final packaged product supply chain according to the primary objective of the study (see Subsection 1.3.1). The discussion in this chapter was enabled by the secondary objectives (see Subsection 1.3.2, objectives one to eight). The strategic decision-making model is dualistic in nature and consists of two developments: *development one* – the establishment of a services continuum (see Chapter 2), and *development two* – the establishment of an outsourcing risk matrix (see Chapter 3). Chapter 4 brought the two developments together in a methodology process path, which enabled the utilisation of the developments as a strategic decision-making model. Chapter 5 focussed on confirming input elements as they

pertain to Sasol, as well as conducting a value analysis on prospective 3PL providers.

Chapter 6 indicated and confirmed the scope of Sasol's outbound final packaged product supply chain as being inclusive of the following product streams: explosives, fertilisers, polypropylenes, wax, solvents and polyvinyl chloride. These product streams are managed under one Sasol entity once the final product has been produced, namely Sasol Base Chemicals. By following the strategic decision-making model process path for this supply chain, this chapter has indicated that there is an opportunity to increase outsourcing efficiency and effectiveness.

The strategic decision-making model should ensure optimal outsourcing parameter alignment to enable successful outsourcing, i.e. obtaining benefits based on business objectives, in the form of variable cost reduction, inventory reduction, fixed cost reduction, and improved service delivery. These aspects were encapsulated via the specific RACI matrices drawn up and agreed upon between Sasol and 3PL provider (see Section 6.2). The strategic decision-making model, as presented in this chapter, is both strategic and operational in nature, as it is all-inclusive of the outsourcing venture and provides for a continuous management interphase with the 3PL provider (phases one, two and three of the strategic decision-making model) (see Section 6.3). The key areas addressed through the strategic decision-making model are collaboration and integrated planning systems, as well as performance measurement of the 3PL provider by indicating the KPIs being measured. The chapter mapped the outsourced operating model with interphases with the various entities involved, and highlighted a revised operating model requiring an iterative process of continuous management, engagement and collaboration to ensure optimal success as the business process and outsourcing relationship progress over time.

The methodological approach of the strategic decision-making model provides for alignment on supplier selection, an integrated performance measurement programme, a unified systems requirement, a basis for the relationship management in terms of the requirements, coordinated communication, strategy,

selection, a sufficiently appropriate costing methodology, and a suitable project implementation strategy. The strategic decision-making model applied for the Sasol outbound final packaged product supply chain is summarised in Table 6.24.

Table 6.24: Methodological approach of the strategic decision-making model

Phase	Section	Detail
One	Models review	Served as input into the strategic decision-making model, which consisted of outsourcing models being reviewed (Chapter 2) as well as the elements deemed critical for the outsourcing venture (Chapter 3). Both sections served as input into the strategic decision-making model.
	Elements review	
Two	Step one: Services continuum	Services continuum (see discussion in Chapter 2). This step served as an input into the strategic decision-making model.
	Step two: Risk matrix	The risk matrix was discussed in Chapter 3 and served as an input into the strategic decision-making model.
	Step three: Model approach	This step served as input into the strategic decision-making model and indicated that, for Sasol, the objective with the outsourcing was to obtain optimum alignment for the benefits sought from outsourcing, i.e. proficient supply chain activities, while Sasol focussed primarily on its business functions of production and marketing.
	Step four: Sasol outbound supply chain research	This step served as input to the strategic decision-making model. The outbound research was reported in Chapter 4 and indicated a complete supply chain logistics solution should be opted for by Sasol (needs requirement).
	Step five: Application of services continuum	This step comprised bringing all the various forms of input together to design the solution, based on Sasol's needs. Sasol was placed at SCSI16 on the services continuum and the placement was mathematically confirmed. The model of Hertz and Alfredsson (2003) was applied (see 6.3.2). The various 3PL providers (as per the sample protocol) were plotted on the services continuum, and it was found that only two 3PL providers served on SCSI16: Barloworld Logistics and Imperial Logistics.
	Step six: Test the risk profile	This step served as a designing element to the strategic decision-making model. The risk matrix was utilised and a potential risk matrix was drawn up, together with mitigating actions, to ensure that risk was appropriately managed in terms of the outsourcing decision of Sasol (Table 6.10, page 180).
	Step seven: Outsourcing parameter alignment	This step served as a design element to the strategic decision-making model. The element alignment was done per process. The model of Prockl *et al.* (2012) was applied (according to the low cost strategy) – the service lernstatt. Furthermore, the framework of Bolumole (2003) was utilised in conjunction with the value analysis, as discussed in Chapter 4, to plot the prospective 3PL provider organisations (Figure 5.10). In terms of Bolumole's (2003) framework, only Barloworld Logistics was opted for. Perçin (2009) model was applied in parallel to Monczka *et al.*'s (2005) model. Hum's (2000) extension of the Hayes–Wheelwright framework was employed via the four tests (Table 5.12, page 150). The final work on the parameter alignment was done in the form of a RACI matrix.
	Step eight: Hierarchical	This step was a design element. The Perçin (2009) hierarchical structure test model was applied and found to be sound, i.e. *customer*

	structure testing and normalising of the decision	*developer* offering an advanced service offering.
Three	Performance measurement	Design element to the strategic decision-making model. Monthly performance measurement is done to track performance, and the business review has to allow for critical hold-points in the contract if performance is not met, i.e. penalties payable or revoking of 3PL provider's contract. Performance measurement takes place per process in the form of an RACI matrix indicating the deliverable state, i.e. KPI. The result of the performance measurement is to ensure an iterative process of continuous improvement, to the shared benefit of both shipper and 3PL provider.

Chapter 7 follows and provides the conclusion and recommendations pertaining to the strategic decision-making model for optimal alignment between prospective 3PL providers and Sasol's outbound final packaged product supply chain.

CHAPTER 7
CONCLUSIONS AND RECOMMENDATIONS

7.1 INTRODUCTION

Rushton and Walker (2007); 3PL News (2016); Lieb (2014); and Koch (2013) have indicated that the reasons for the failures of outsourcing ventures are based on misalignment of key aspects (see Section 1.1). The problem statement in Chapter 1 (see Section 1.2) confirmed that the primary reason for the failure of 3PL ventures is misalignment. Sasol's outbound final packaged product supply chain was found to have experienced misalignment and fragmented approaches concerning outsourcing as a whole. Sasol was chosen for the current study, as Sasol is a major blue chip organisation in South Africa, and at the time of the study, Sasol was unable to outsource outbound logistics operations optimally. Sasol is headquartered in South Africa and has operations in 33 countries (Sasol, 2016).

The primary objective of the study (see Subsection 1.3.1) was the development of an end-to-end strategic decision-making model for optimal alignment between the outbound final packaged product supply chain of Sasol and prospective 3PL providers. In order to satisfy the primary objective, the secondary objectives were stated, including the development of two developments, namely a services continuum and an outsourcing risk matrix (developments one and two, respectively). The operationalisation of the strategic decision-making model, inclusive of the two developments, was done by means of the utilisation of a three-phased strategic decision-making methodology process path to enable the primary objective. Eight secondary objectives were established for the study (see Subsection 1.3.2), i.e. to –

- develop a services continuum with the objective for it to be utilised as a mechanism that would provide detailed placement based on four aspects, namely services required, category of 3PL providers, strategic alignment, and investment required. The development of the services continuum is

termed *development one*, and is a mathematical model, which allows for optimal results to be obtained (first secondary objective);

- review and classify outsourcing models by means of the services continuum (second secondary objective);
- explain the unit of analysis in terms of collaboration and integrated planning, performance measurement, and the South African specific of broad-based black economic empowerment (B-BBEE) (third secondary objective);
- review risk in relation to outsourcing and the creation of an outsourcing risk matrix. The outsourcing risk matrix was termed *development two* (fourth secondary objective);
- establish a generic application of the services continuum with the objective to arrive at an abridged reference table for each of the four permutation results (fifth secondary objective);
- define a strategic decision-making methodology process path, specifically for application in relation to Sasol's outbound final packaged product supply chain (sixth secondary objective);
- confirm parameter alignment with Sasol's outbound final packaged product supply chain by means of structured interviews (seventh secondary objective); and
- conduct a value analysis of prospective 3PL providers in relation to establishing the most applicable 3PL provider, based on Sasol's outbound final packaged product requirement (eighth secondary objective).

7.2 SUMMARY OF STUDY

The study established the 3PL provider concept definition as involving two parties, namely the shipper organisation and the 3PL provider. The 3PL provider does not

take ownership of the product, but forms part of the shipper's normal course of business to ensure delivery to the customers of the shipper organisation. Chapter 2 of the study focussed on the secondary objectives, the first and second secondary objectives as stated in Subsection 1.3.2: the development of a services continuum, and the review and the classification of the outsourcing models, respectively. The services continuum brought four categories of importance together as they relate to outsourcing, namely service type required, category of 3PL provider, strategic alignment required, and the investment required (SCSI).

The services continuum was developed as a mathematical model, more specifically as a permutation matrix. The services continuum is a conglomeration of various models and serves to classify the models into functional categories of analysis. Nine models were reviewed in accordance with the services continuum. Each model was plotted against the services continuum and was consolidated into an abridged reference table (see Table 4.5, page 105) for application purposes. The plotting of the various models was done against the four variables in order to provide an optimal solution for the requirement.

Chapter 3 focussed on the third and fourth secondary objectives (see Subsection 1.3.2), to establish and refine the unit of analysis, to review risk, and to develop an outsourcing risk matrix (the second development). Elements have been classified as enablers or outcome elements for each unit of analysis: collaboration and integrated planning, performance measurement, and B-BBEE. It was confirmed that collaboration and integrated planning would vary according to the four permutation results, as will performance measurement. B-BBEE is a concept specific to South Africa and warrants review when approaching the outsourcing decision. Supply chain risk was reviewed and an outsourcing risk matrix was established. The matrix utilises perceived risk elements and assigns both impact and probability criteria to arrive at a matrix indication of risk level (Table 3.8, page 95 and Table 3.9, page 96). The outcome risk level was assigned to a level of authority within the organisation, which the organisation has to manage. Should the output of the risk matrix indicate a result which is not favourable, a placement on the services continuum warrants a review.

Chapter 4 focussed on the fifth and sixth secondary objectives of the study (see Subsection 1.3.2), to establish a generic application of the services continuum with the objective to arrive at an abridged reference table for each of the four permutation results, and to define a strategic decision-making methodology process path, specifically for application in relation to Sasol's outbound final packaged product supply chain. Drawing on the four permutation results, possible abridged reference tables were established. Subsection 4.2.5 indicated the universality of the permutation results via the abridged reference table (see Table 4.5, page 105). The abridged reference table categorised each permutation result according to the applicable outsourcing models and placement area on the services continuum, followed by the risk level and risk owner, and finally, the pricing model that is most appropriate for each category. The abridged reference table indicates the universality from permutation results one to four, each being capable of being populated with scenario specifics to enable application.

A strategic decision-making model path was established, following research into the outsourcing methodology process paths of Mahmoodzadeh *et al.* (2009); Schoenherr *et al.* (2008); and Momme (2002). The methodology process path was established as having three phases, which constitute an overarching approach to the application of the strategic decision-making model (see Subsection 4.3.4). Phase one reviewed outsourcing models and elements as deemed necessary for the outsourcing venture. Phase two had as its purpose to utilise the inputs to design the outsourcing solution between shipper and 3PL provider. Phase three served to ensure continuous performance management between shipper and 3PL provider by ensuring KPIs are understood and performance is at the required level. The methodology process path served to consolidate the various aspects into a unified whole for operationalising the application of the strategic decision-making model.

Chapter 5 focussed on seventh and eighth secondary objectives (see Subsection 1.3.2), to research and confirm parameter alignment with outbound final packaged product supply chain of Sasol by means of structured interviews, and to research and to conduct a value analysis of prospective 3PL providers, respectively. A value analysis was conducted on six potential 3PL providers, according to the

research parameters. In Table 5.12 (page 150), the researcher indicated the findings of the value analysis of the six 3PL providers.

Chapter 6 followed through on the primary research objective to develop a workable, end-to-end supply chain strategic decision-making model for optimal alignment between prospective 3PL providers and the outbound final packaged product supply chain of Sasol. The strategic decision-making methodology process path formed the outline for the study, with phase one and part of phase two serving as input into the model. Phase two was primarily focussed on designing the solution, and phase three on ensuring performance management and continued success of the outsourcing venture.

The application of the strategic decision-making model provided for supplier selection, integrated performance measurement, unified systems requirement, the basis for relationship management, coordinated communication, strategy selection, and costing methodology. The strategic decision-making methodology served to review outsourcing models and elements as part of the outsourcing venture.

7.3 CONCLUSIONS REGARDING THE APPLICATION OF THE STRATEGIC DECISION-MAKING MODEL FOR SASOL

The strategic decision-making model application relating to the outbound final packaged product supply chain of Sasol found that:

- Sasol should outsource, based on the SCSI16 outsourcing approach.

  This is due to the large and complex operations that require a sufficiently large and capable 3PL provider to take over the Sasol outbound final packaged supply chain according to the design in Chapter 6.

- The 3PL provider to be outsourced to, according to the value analysis, is Barloworld Logistics. In Table 7.1, the researcher indicates the 3PL provider element capability and procurement advantage, based on the value analysis in Chapter 5.

Table 7.1: 3PL provider element capability and procurement advantage

Prospective 3PL provider	Element capability – according to Table 7.2	Procurement spent advantage to Sasol at R3.5 billion per annum
Katoen Natie	42%	R0
SACD	72%	R4 375 000 000
Barloworld Logistics	81%	R4 375 000 000
Imperial Logistics	59%	R3 850 000 000
Sammar Investments	77%	R4 725 000 000
GTWLS	18%	R0

Sammar Investments, Barloworld Logistics and SACD are the top three organisations according to the B-BBEE procurement advantage to Sasol. Between Sammar Investments and the closest competitors, Barloworld Logistics and SACD, there is a R350 million difference. However, this difference is offset against the lower element and capability of Sammar Investments against Barloworld Logistics. In Table 7.2, the researcher indicates the value analysis of the element capability for the six prospective 3PL providers.

Table 7.2: 3PL provider value analysis on element capability

Prospective 3PL provider	Organisation profile (size, turnover and geographical spread) – 9%	3PL provider service – 20%	B-BBEE status (qualifying element level 3 or higher) – 51%	Elements review (expanded outsourcing, etc.) – 20%	Total
Katoen Natie	9%	15%	0%	18%	42%
SACD	9%	15%	34%	14%	72%
Barloworld	9%	20%	34%	18%	81%
Imperial Logistics	9%	18%	16%	16%	59%
Sammar Investments	5%	10%	51%	10%	77%
GTWLS	3%	10%	0%	5%	18%

From the value analysis of element capability (see Table 7.2), it is clear that Barloworld is ranked the highest (81%), followed by Sammar Investments (77%). The litmus test of the Hayes–Wheelwright framework illustrated the capability of the prospective 3PL provider organisations to operate at different levels. For

Sasol, the requirement is SCSI16, which translates to a high capability requirement across the four tests. Barloworld satisfies this requirement. Sammar Investments has limited capability across the four tests, and the 77% is primarily made up from the high B-BBEE rating (66% of the 77% is due to the B-BBEE rating). Barloworld scored considerably lower on the B-BBEE rating (41% of the 81% is a result of B-BBEE). This demonstrates that Barloworld Logistics have a stronger result on the remainder of the aspects when compared with Sammar Investments. SACD only operates at a moderate capability across the four tests. Imperial Logistics satisfies the required output level, but the procurement benefit is R525 million less per annum than that of Barloworld Logistics is. Barloworld Logistics was selected, given the Sasol scope, and was matched to the capabilities of a 3PL provider after following the strategic decision-making model.

- According to the strategic decision-making model, Sasol and the 3PL provider engage actively and review the monthly performance and business to ensure an iterative process of outsourcing, with both organisations benefit from the outsourcing venture over an extended period of time of more than 10 years.

- By optimally aligning Sasol and Barloworld Logistics, Sasol stands to gain process efficiency, according to the RACI matrices discussed in Chapter 6; gains access to proficient service delivery (elements alignment); faces limited risk (managed by means of the outsource risk matrix); experiences a B-BBEE spend benefit of 125%; and gains access to the Barloworld Logistics integrated supply chain network.

7.4 CONTRIBUTIONS, CONFIRMATIONS AND LIMITATIONS OF THE STUDY

This study has assisted the strategic decision-making process as it relates to outsourcing to 3PL providers. Of particular importance is the dualistic development, namely the services continuum and the outsourcing risk matrix. The services continuum is a conglomeration of models and provides for a permutation

matrix, which in turn delivers optimal results per type of service requirement, type of 3PL provider, capital requirements, and strategic involvement. The outsourcing risk matrix classifies the probability of an event occurring, coupled to the severity of the result of such an event. Once the initial risk is established and the risk is not acceptable, it serves as a warning that the shipper is required to review the chosen category of 3PL provider. The objective of the outsourcing risk matrix was to ensure that a level six risk is both attained and maintained by means of classification and continual management of the outsourcing venture. This means that mitigating actions were identified to ensure that risk is managed to the desired degree. The overarching strategic decision-making methodology process path combined the various aspects, inclusive of the dualistic development, into a unified whole for application.

A confirmation of the study was a requirement for a basis of evaluation as it related to the methodological analysis of models concerning the 3PL provider on the services continuum. Once the 3PL provider models had been classified, the services continuum could not function on its own, and a risk model was developed to work in tandem with the services continuum, namely the outsourcing risk matrix. The study confirmed a universal approach to the outsourcing decision.

Limited knowledge and narrow understanding are available concerning Sasol's outbound final packaged product supply chain. A limitation of the study was that the solution developed for Sasol has not been implemented for the outbound final packaged product supply chain of Sasol.

7.5 FUTURE RESEARCH

It is suggested that it will be beneficial if future research could be directed towards refinement of the services continuum into a single model services continuum for the outsourcing decision. The single model services continuum would combine the various models and would develop a single model that could operate on all four optimum permutation results. The application of the single model services continuum should be done according to degrees of the four variables (service type, category of 3PL provider, strategic alignment, and investment). Based on the

degree of services required, the model should provide an optimal permutation result. The optimum permutation result, which is a predetermined output of the single model services continuum, would then be applied accordingly.

7.6 RECOMMENDATIONS

The strategic decision-making model is a universal approach, and can be considered a suitable mechanism for any shipper within any industry which attempts to outsource. The recommendations arising from the study are indicated as:

- The application of the three-phased, strategic decision-making model relating to Sasol's outbound final packaged product supply chain should be implemented by Sasol.

- a software application of the strategic decision-making model should be created, whereby the inputs could be captured into the application and the optimum result, coupled to the preferred model application, would be given as the output. The application should fully encapsulate the three-phased strategic decision-making methodology process path. By creating the software application, which enables shippers to consider various scenarios, based on different inputs, the commercialisation of the strategic decision-making model would be made possible. Furthermore, the reach of the strategic decision-making model, as a useful strategic decision-making mechanism, would be extended as a result the creation of a software application of the model.

7.7 CONCLUSION

The contribution of the study is the ability that it offers to sort through outsourcing models and classify them according to four areas of importance by way of a services continuum.

The continuum dictates, based on key criteria for each category, a set of deliverables that are necessary for optimal alignment between a shipper and a 3PL provider. Once an optimal solution is derived, the result is modelled against an outsourcing risk matrix by identifying impact areas and the probability of an event occurring, which could hamper the successful outsourcing between the shipper and the 3PL provider. The services continuum and outsourcing risk matrix comprise a dualistic development, supplemented by a strategic decision-making methodology process path, which serves to bring the various elements and two developments together into a unified whole for application. The model proves to be universal in nature and was specifically tested against Sasol's outbound final packaged product supply chain.

LIST OF REFERENCES

Adelante SCM. 2016. *The Biggest Mistake When Selecting a 3PL*. Available from: <https://talkinglogistics.com/2016/02/03/the-biggest-mistake-when-selecting-a-3pl/> [Accessed 01 May 2018].

African Advice. 2018. *Sammar Investments*. Available from: <https://www.africanadvice.com/1040723/Cartage_And_Transport_Contractors/Durban/Sammar_Investments/> [Accessed 15 April 2018].

African Decisions. 2017. *Load Up*. Available from: <http://www.africandecisions.com/infrastructure/load-up/> [Accessed 15 December 2017].

Aguezzoul, A. 2014. 'Third-Party Logistics Selection Problem: A Literature Review on Criteria and Methods', *Omega*, 49: 69-78.

Alsuwaiyel, M.H. 2010. *On Computing an Optimal Permutation of Ranks for Multiselection*. Elsevier Available from: <http://ac.els-cdn.com/S0898122110005328/1-s2.0-S0898122110005328-main.pdf?_tid=2ee4d48c-8af4-11e7-80d9-00000aab0f27&acdnat=1503816882_5e8b968a26c9fb55fabe4597b17a9427> [Accessed 27 August 2017].

Armstrong & Associates. 2013. *Armstrong & Associates, Inc.* Available from: <www.3PLogistics.com> [Accessed 28 February 2015].

Arroyo, P., Gaytan, J. & de Boer, L. 2006. 'A Survey of Third Party Logistics in Mexico and a Comparison with Reports on Europe and USA', *International Journal of Operations & Production Management*, 26(6): 639-667.

Awino, Z.B., and Mutua, J.M. 2014. 'Business Process Outsourcing Strategy and Performance of Kenyan State Corporations', *Journal of Emerging Trends in Economic and Management Sciences*, 5(7): 37-43.

Barloworld Logistics. 2014. *2014 Supply Chain Foresight: The Rise and Fall of Customers and Companies*. [Online] Available from: <http://www.barloworld-logistics.com/wp-content/uploads/2013/11/supplychainforesight-report-2014.pdf> [Accessed 28 February 2015].

Barloworld Logistics. 2016a. *Warehousing and Distribution*. [Online] Available from: <http://www.barloworld-logistics.com> [Accessed 13 June 2016]. (First accessed 08 August 2015).

Barloworld Logistics. 2016b. *Barloworld Logistics Earns Top Honours at 2016 Logistics Achiever Awards*. Available from: <http://www.barloworld-logistics.com/blog/2016/10/31/barloworld-logistics-earns-top-honours-at-2016-logistics-achiever-awards-2/> [Accessed 08 April 2017].

Baziotopoulos. 2008. An investigation of logistics outsourcing practices in the Greek manufacturing sector. PhD thesis.

BCR. 2018. *1PL to 5PL: The Differences Between A 3PL Logistics Provider And Other Logistics Service Providers*. Available from: <http://logistics.bcr.com.au/blog/1pl-to-5pl-the-differences-between-a-3pl-logistics-provider-and-other-logistics-service-providers> [Accessed 29 April 2018].

BEE Scorecard (Pty) Ltd (BEE Scorecard) 2016. *BEE Info*. [Online] Available from: <http://www.bee-scorecard.co.za/bee_information.html> [Accessed 07 June 2016].

Bloem, N., and Bean, W.L. 2015. 'The application of outsourcing decision-making methods in a logistics context in South Africa', *Journal of Transport and Supply Chain Management*, 9(1): 168-182.

Bolumole, Y.A. 2003. 'Evaluating the Supply Chain Role of Logistics Service Providers', *The International Journal of Logistics Management*, 14(2): 93-107.

Bottani, E., and Rizzi, A. 2006. 'A Fuzzy TOPSIS Methodology to support outsourcing of logistics services', *Supply Chain Management: An International Journal*, 11(4): 294-308.

Business Partners Ltd (Business Partners) 2016. *A short introduction to calculating B-BBEE Scorecards*. Available from: <http://southafrica.smetoolkit.org/sa/en/content/en/2992/A-short-introduction-to-calculating-B-BBEE-scorecards> [Accessed 07 June 2016].

Capgemini Consulting. 2012. *2012 third-party logistics study: the state of logistic outsourcing.* Capgemini Consulting Available from: <http://www.panalpina.com/content/dam/internet/publications/3pl_study/2012_3PL_Study.pdf> [Accessed 28 February 2015].

Capgemini Consulting. 2014. *2014 Third-party logistics study: the state of logistic outsourcing. Results and findings of the 18th annual study*. [Online] Available from: <https://www.capgemini.com/resource-file-access/resource/pdf/3pl_study_report_web_version.pdf> [Accessed 28 February 2015].

Capgemini Consulting. 2015. *2016 third-party logistics study: the state of logistic outsourcing. Results and findings of the 20th annual study*. Capgemini Consulting Available from: <https://www.kornferry.com/media/sidebar_downloads/2016_3PL_Study.pdf> [Accessed 25 April 2018].

Capgemini Consulting. 2016. *2017 third-party logistics study: the state of logistic outsourcing. Results and findings of the 21st annual study*. Capgemini Consulting Available from: <https://jda.com/-/media/jda/knowledge-center/thought-leadership/2017stateoflogisticsreport_new.ashx> [Accessed 25 April 2018].

Cerasis. 2013. *The Essential Guide to Third Party Logistics: What is a #PL, Considerations for Hiring, & How to Select & Implement a 3PL*. [Online] Available from: <http://cerasis.com/2013/09/16/3PL/> [Accessed 31 January 2016].

Cerasis. 2014. *Third Party Logistics Services Explained, The Different Types of 3PLs, and the Various Levels of Outsourcing*. Available from: <http://cerasis.com/2014/02/07/third-party-logistics-services/> [Accessed 29 April 2018].

Chen, R., Melamed, B., Sokolinskiy, O. & Sopranzetti, B. 2017. 'Cash Conversion Systems in Corporate Subsidiaries', *Journal of Corporate Finance*, 19(4): 604-619.

Christopher, M.G., and Lee, H. 2004. 'Mitigating supply chain risk through improved confidence', *International Journal of Physical Distribution & Logistics Management*, 34(5): 388-396.

Chron. 2018. *Explaining the Advantages & Disadvantages of Free Market Economies*. Available from: <http://smallbusiness.chron.com/explain-advantages-disadvantages-market-economies-70553.html> [Accessed 28 January 2018].

Competition Tribunal Republic of South Africa. 2009. *Case no: 31/CR/May05*. Available from: <http://www.saflii.org/za/cases/ZACT/2009/33.pdf> [Accessed 29 January 2018].

Coyle, J.J., Langley, C.J., Gibson, B.J., Novack, R.A. & Bardi, E.J. 2009. *Supply Chain Management: A Logistics Perspective*. 8th ed. USA: South-Western Cengage Learning.

Council of Supply Chain Management Professionals (CSCMP) 2013. *Supply chain management terms and glossary*. [Online] Available from: <https://cscmp.org/sites/default/files/user_uploads/resources/downloads/glossary-2013.pdf> [Accessed 19 April 2015].

D'amato, A.A., Kgoedi, S., Swanepoel, G., Walters, J., Drotskie, A. & Kilbourn, P.J. 2015. 'Convergence of logistics planning and execution in outsourcing', *Journal of Transport and Supply Chain Management*, 9(1): 159-168.

Datta, S., Samantra, D., Mahapatra, S., Mandal, G. & Majumdar, G. 2013. 'Appraisement and Selection of Third Party Logistics Service Providers in Fuzzy Environment', *Benchmarking: An International Journal*, 20(4): 537-548.

Diabat, A., Khreishah, A., Kannan, G., Panikar, V. & Gunasekaran, A. 2013. 'Benchmarking the interactions among barriers in third-party logistics implementation', *Benchmarking: An International Journal*, 20(6): 805-824.

Dovetail. 2016. *Why Outsourcing Could Save Your Business! 7 Benefits of Third Party Logistics*. Available from: <http://www.dovetail.co.za/why-outsourcing-could-save-your-business-7-benefits-of-third-party-logistics/> [Accessed 28 April 2018].

Department of Trade and Industry (dti). Anon. 2013. *Framework for Measuring Broad-Based Black Economic Empowerment; Section 9 Act of 2003*. Pretoria: dti.

Duan, C., Grover, V. & Balakrishnan, N. 2009. ‘Business Process Outsourcing: an Event Study on the Nature of Processes and Firm Valuation’, *European Journal of Information Systems*, 18(5): 442-457.

Durrani, M.F.A.K. 2017. ‘Analysis of Business Process Outsourcing in Pakistan’, *Journal of Information Communication Technologies and Robotic Applications*, 2(1): 49-57.

Emmett, S., and Crocker, B. 2016. *The Relationship-Driven Supply Chain: Creating a Culture of Collaboration Throughout the Chain*. CRC Press.

Esper, T.L., Fugate, B.S. & Davis-Sramek, B. 2007. ‘Logistics learning capability: Sustaining the competitive advantage gained through logistics leverage’, *Journal of Business Logistics*, 28(2): 57.

Explorable. 2017. *Non-Probability Sampling*. Available from: <https://explorable.com/non-probability-sampling> [Accessed 09 April 2017].

Farahani, R.Z., Rezapour, S. & Kardar, L. 2011. *Logistics Operations and Management Concepts and Models*. San Diego, CA: Elsevier Science.

Focus on Transport and Logistics. 2018. *Down with Logistics Costs*. Available from: <http://www.focusontransport.co.za/index.php/features/featured-may-2017/3271-down-with-logistics-costs.html> [Accessed 28 January 2018].

Frazelle, E. 2002. *Supply chain strategy: the logistics of supply chain management*. New York: McGraw-Hill.

Gattorna, J., Ogulin, R. & Reynolds, M.W. 2003. *Gower Handbook of Supply Chain Management*. 5th ed. England: Gower.

Gilley, K.M., and Rasheed, A. 2000. 'Making more by doing less: an analysis of outsourcing and its effects on firm performance', *Journal of Management*, 26(4): 763-790.

Gooley, T.B. 1997. 'The state of third party logistics in Europe', *Logistics Management*, 36(1): 80A-1A.

Graham, A. 1994. *Statistics: an introduction*. London: Hodder & Stoughton.

Grand View Research, Inc. 2017. *Third Partly Logistics (3PL) Market Size to Reach $1.24 Trillion By 2025*. Available from: <https://www.grandviewresearch.com/press-release/global-third-party-logistics-market> [Accessed 28 April 2018].

Hai, L., and Yirong, S. 2002. *An Approach Towards Overall Supply Chain Efficiency – A Future Orientated Solution and Analysis in Inbound Process*. Göteborg: Göteborg University, Elanders Novum AB Pub.

Hamzah, S.B., and Sutanto, J.E. 2016. *The Role of Marketing Mix (7P) for Consumer Buying Decision Pastry Cake in Malang City*. Available from: <http://hdl.handle.net/123456789/687> [Accessed 20 August 2017].

Havenga, J.H., Simpson, Z.P., King, D., de Bod, A. & Braun, M. 2016. *Logistics Barometer South Africa 2016*. Stellenbosch: Stellenbosch University.

Hertz, S., and Alfredsson, M. 2003. 'Strategic Development of Third Party Logistics Providers', *Industrial Marketing Management*, 32(2): 139-149.

Hillson, D. 2004. *Effective opportunity management for projects: Exploiting positive risk*. New York, Basel: Marcel Dekker, Inc.

Honeycomb Worldwide Inc. 2015. *Transactional Outsourcing and Strategic Partnerships: An Insider's Perspective*. Available from: <https://xtalks.com/outsourcing-and-strategic-partnerships-1/> [Accessed 28 April 2018].

Hum, S.H. 2000. 'A Hayes-Wheelwright framework approach for strategic management of third party logistics services', *Integrated Manufacturing Systems*, 11(2): 132-137.

Huo, B., Selen, W., Yeung, J.H.Y. & Zhao, X. 2008. 'Understanding Drivers of Performance in the 3PL Industry in Hong Kong', *International Journal of Operations & Production Management*, 28(8): 772-800.

Husdal. 2011. *3PL Outsourcing – Challenges and Benefits*. Available from: <http://www.husdal.com/2011/05/13/3pl-outsourcing-challenges-and-benefits/> [Accessed 01 May 2018].

Hwang, C.L., and Yoon, K. 1981. *Multiple Attribute Decision Making Methods and Applications*. New York, NY: Springer.

IDG. 2016. *5 Reasons Most Outsourcing Projects Fail*. Available from: <https://www.cio.com/article/3021822/application-development/5-reasons-most-outsourcing-projects-fail.html> [Accessed 28 April 2018].

Imperial Logistics. 2016a. *Warehousing and Distribution*. [Online] Available from: <http://www.imperiallogistics.co.za/> [Accessed 13 June 2016]. (First accessed 08 August 2015).

Imperial Logistics. 2016b. *Transformation*. Available from: <http://www.imperiallogistics.co.za/transformation> [Accessed 08 April 2017].

Inbound Logistics. 2015. *Inbound Logistics*. [Online] Available from: <http://inboundlogistics.com> [Accessed 21 March 2015].

Instafreight. 2018. *Logistics Models Explained: 1PL through 5PL*. Available from: <https://instafreightblog.de/2018/01/23/logistics-models-explained-1pl-5pl/> [Accessed 01 May 2018].

Institute of Directors Southern Africa. 2016. *King IV: Report on Corporate Governance for South Africa*. Available from: <http://c.ymcdn.com/sites/www.iodsa.co.za/resource/resmgr/king_iv/King_IV_Report/IoDSA_King_IV_Report_-_WebVe.pdf> [Accessed 28 August 2017].

International Chamber of Commerce. 2018. *Incoterms rules 2010*. Available from: <https://iccwbo.org/resources-for-business/incoterms-rules/incoterms-rules-2010/> [Accessed 29 January 2018].

ISO. 2015. *A Practical Guide for SMEs: ISO 31000 Risk Management*. Available from: <https://www.iso.org/publication/PUB100367.html> [Accessed 19 October 2016]

Janicak, C.A. 2007. *Applied Statistics in Occupational Safety and Health*. Lanham, Md: Government Institutes/Scarecrow Press.

Joo, S., Keebler, J.S. & Hanks, S. 2013. 'Measuring the longitudinal performance of 3PL branch operations', *Benchmarking: An International Journal*, 20(2): 251-262.

Jothimani, D., and Sarmah, S.P. 2014. 'Supply chain performance measurement for third party logistics', *Benchmarking: An International Journal*, 21(6): 944-963.

Kapitol. 2018. *About Us*. Available from: <https://www.infobel.com/en/southafrica/greater_than_warehousing_logistic_services_pty_ltd/vanderbijlpark/ZA100381765-0169869740/businessdetails.aspx> [Accessed 21 April 2018].

Karrapan, C., Sishange, M., Swanepoel, E. & Kilbourn, P. 2017. 'Benchmarking Criteria for Evaluating Third-Party Logistics Providers in South Africa', *Journal of Transport and Supply Chain Management*, [Online] Available from: <https://jtscm.co.za/index.php/jtscm/article/download/305/565> [Accessed 28 April 2018].

Katoen Natie. 2016. *About Us*. [Online] Available from: <http://www.katoennatie.com> [Accessed 13 June 2016]. (First accessed 08 August 2015).

Katsogianni, T., and Vouzas, F. 2017. *Similarities and Differences between a 3PL and a Company with a Logistics Department in-house in Quality of Services*. Available from: <http://www.hk5sa.com/icit/6.3~Greece-Theano+Fotis.pdf> [Accessed 28 April 2018].

Key Differences. 2017. *Difference Between Inbound and Outbound Logistics*. Available from: <https://keydifferences.com/difference-between-inbound-and-outbound-logistics.html> [Accessed 01 May 2018].

Knemeyer, A.M., and Murphy, P.A. 2005. 'Is the glass half full or half empty?: An examination of user and provider perspectives towards third-party logistics

relationships', *International Journal of Physical Distribution & Logistics Management*, 35(10): 708-727.

Koch, R. 2013. *New World Business Solutions*. Available from: <http://www.newworld.com.au> [Accessed 8 March 2015].

Kotler, P., Armstrong, G., Wong, V. & Saunders, J. 2008. 'Marketing Defined: Principles of Marketing, 7'.

Krstic, B., and Kahrovic, E. 2015. *Business Process Outsourcing as a Tool for Improving Enterprise Efficiency*. Available from: <https://ageconsearch.umn.edu/bitstream/212935/2/3.pdf> [Accessed 29 April 2018].

Kuehne Nagel. 2007. In: Rushton, A. and Walker, S. eds. *International Logistics and Supply Chain Outsourcing from Local to Global*. 299.

Langley, C.J. 2016. *The 21st Annual, 2017 Third-Party Logistics Study*. Available from: <https://3plstudy.com/media/downloads/2016/10/2017-report> [Accessed 27 August 2017].

Large, R.O., Kramer, N. & Hartmann, R.K. 2011. 'Customer-specific Adaption by Providers and Their Perception of 3PL-Relationship Success', *International Journal of Physical Distribution & Logistics Management*, 41(9): 822-838.

Li, S. 2005. ‘A web-enabled hybrid approach to strategic marketing planning: Group Delphi+a web-based expert system’, *Expert Systems with Applications*, 29: 393-400.

Lieb. 2014. *25 Years of Third Party Logistics Research*. Available from: <http://www.supplychain 247.com/article/25_years_of_third_party_logistics_research> [Accessed 7 March 2015].

Lloyd’s. 2016. *Globalisation and Risks for Business: Implications of an Increasingly Interconnected World*. Available from: <www.lloyds.com/./news-and-insight/risk-insight/2015/business-blackout/business-blackout20150708.pdf> [Accessed 28 April 2018].

Luo, A., Roach, S. & Jiratchot, D. 2016. *The Effect of the 7P’s of the Marketing Mix on Air Freight Customer Satisfaction and Repurchase Intention*. Available from: <http://www.aujm.au.edu/index.php/JSCM/article/view/301> [Accessed 20 August 2017].

Mahmoodzadeh, E., Jalalinia, S. & Yazdi, F.N. 2009. ‘A business process outsourcing framework based on business process management and knowledge management’, *Business Process Management Journal*, 15(6): 845-864.

Manotas-Duque, D.F., Osorio-Gomez, J.C. & Rivera, L. 2016. *Operational Risk Management in Third Party Logistics (3PL)* Handbook of Research on

Managerial Strategies for Achieving Optimal Performance in Industrial Processes. Hersey, PA: IGI Global.

Marttonen, S., and Karri, T. 2012. *A Conceptual Model for Assessing the Profitability of a Maintenance Outsourcing Decision*. Available from: <https://www.researchgate.net/publication/236619488_A_conceptual_model_for_assessing_the_profitability_of_a_maintenance_outsourcing_decision> [Accessed 01 May 2018].

McIvor, R.T., and Humphreys, P.K. 2000. 'A case based reasoning approach to the make or buy decision', *Integrated Manufacturing Systems*, 11(5): 295-310.

Mellat-Parast, M., and Spillan, J.E. 2014. 'Logistics and Supply Chain Process Integration as a Source of Competitive Advantage', *The International Journal of Logistics Management*, 25(2): 289-314.

Momme, J. 2002. 'Framework for outsourcing manufacturing: strategic and operational implications', *Computers in Industry*, 49(2002): 59-75.

Monczka, R., Trent, R. & Handfield, R. 2005. *Purchasing and supply chain management*. 3rd ed. USA: South-Western Cengage Learning.

Moser, R. 2007. *Strategic purchasing and supply management: A strategy based selection of suppliers*. Wiesbaden: Dt. Univ.-Verl.

Murphy, C.O., and Davidshofer, K.R. 2004. *Psychological testing: Principles and applications*. 6th ed. Upper Saddle River, NJ: Pearson/Prentice Hall.

Neely, A., Mills, J., Platts, K., Gregory, M. & Richards, H. 1994. 'Realising strategy through measurement', *International Journal of Operations & Production Management*, 14(3): 140-152.

Ngulube, P., and Ngulube, B. 2015. 'Mixed methods research in the South African Journal of Economic and Management Sciences: an investigation of trends in the literature 2015', *South African Journal of Economic and Management Sciences*, 18(1): 1-13.

National Institute of Environmental Health Sciences (NIEHS) 2011. *What is ethics in research & why is it important?* [Online] Available from: <http://www.niehs.nih.gov/research/resources/bioethics/whatis/> [Accessed 09 March 2014].

Núñez-Carballosa, A., and Guitart-Tarrés, L. 2011. 'Third-party Logistics Providers in Spain', *Management & Data Systems*, 111(8): 1156-1172.

Ordoobadi, S.M. 2009. ‘Outsourcing reverse logistics and remanufacturing functions: A conceptual strategic model’, *Management Review News*, 32(9): 831-845.

Oren, I., and Smilansky, U. 2014. *Spectral Statistics of Permutation Matrices*. Available from: <http://rsta.royalsocietypublishing.org/content/roypta/372/2007/20120508.full.pdf> [Accessed 28 April 2018].

Perçin, S. 2009. ‘Evaluation of Third-Party Logistics (3PL) Providers by Using a Two-Phase AHP and TOPSIS Methodology’, *Benchmarking: An International Journal*, 16(5): 588-604.

Prockl, G., Pflaum, A. & Kotzab, H. 2012. ‘3PL factories or lernstatts? Value creation models for 3PL service providers’, *International Journal of Physical Distribution & Logistics Management*, 42(6): 544-561.

Qureshi, M.N., Kumar, D. & Kumar, P. 2007. ‘Modeling the Logistics Outsourcing Relationship Variable to Enhance Shippers’ Productivity and Competitiveness in Logistical Supply Chain’, *International Journal of Productivity and Performance Management*, 56(8): 689-714.

Qureshi, M.N., Kumar, D. & Kumar, P. 2008. ‘An Integrated Model to Identify and Classify the Key Criteria and Their Role in the Assessment of 3PL Service Providers’, *Asia Pacific Journal of Marketing and Logistics*, 20(2): 227-249.

Rahman, S. 2011. ‘An Exploratory Study of Outsourcing 3PL Services: An Australian Perspective’, *Benchmarking: An International Journal*, 18(3): 342-358.

Reitz, A. 2016. *The Role of Architecture Modularity for Business Process Outsourcing – Developing a Research Model*. Association for Information Systems.

ReportsnReports. 2012. *Global Third Party Logistics 3PL Market 2014-2018*. Available from: <www.reportsnreports.com/reports/295207-global-third-party-logistics-3pl-marker-2014-2018html> [Accessed 3 April 2015].

Research Methodology. 2016. *Interpretevism (interpretivist) Research Philosophy*. Available from: <http://research-methodology.net/research-philosophy/interpretivism/> [Accessed 08 April 2017].

Rodriguez, T.F.E., and Robaina, V.P. 2006. ‘A review of outsourcing from the resource- based view of the firm’, *International Journal of Management Reviews*, 8(1): 49-70.

Rossi, S., Colicchia, C., Cozzolino, A. & Christopher, M. 2013. ‘The logistics service providers in eco-efficiency innovation: An empirical study’, *Supply Chain Management: An International Journal*, 18(6): 583-603.

Rousseau, A., Kotze, J. & Fitzcharles, R. 2015. *To Outsource or not to Outsource*. Available from: <https://www2.deloitte.com/content/dam/Deloitte/lu/Documents/financial-services/IM/lu-to-outsource-or-not-to-outsource-11052015.pdf> [Accessed 28 April 2018].

Republic of South Africa (RSA)Anon. 2003. *B-BBEE Act*. Pretoria: Government Printer.

Rushton, A., and Walker, S. 2007. *International Logistics and Supply Chain Outsourcing from Local to Global*. London: Kogan Page.

Saaty, T.L. 1980. *The analytic hierarchy process*. 3rd ed. New York, NY: McGraw-Hill.

Saaty, T.L. 1994. 'How to make a decision: The analytic hierarchy process', *Interfaces*, 24(6): 19-43.

SACD. 2016. *SACD*. [Online] Available from: <https://www.sacd.co.za/> [Accessed 13 June 2016]. (First accessed 08 August 2015).

Sahay, B.S., and Mohan, R. 2006. '3PL Practices: An Indian Perspective', *International Journal of Physical Distribution & Logistics Management*, 36(9): 666-689.

Sasol. 2015. *Strategic Business Units*. [Online] Available from: <www.sasol.com> [Accessed 02 August 2015].

Sasol. 2016a. *Sasol Risk Matrix* Sasol Internal Report. Sasol.

Sasol. 2016b. *Our Global Presence*. Available from: <http://www.sasol.com/extras/AIR_2016/who-are-we/our-global-presence> [Accessed 11 September 2017].

Sasol. 2017. *Value Chain*. Available from: <http://www.sasol.co.za/innovation/gas-liquids/value-chain> [Accessed 21 August 2017].

Saunders, M., Lewis, P. & Thornhill, A. 2003. *Research methods for business students*. 3rd ed. England: Parsons Education.

Schoenherr, T., Tummala, V.R. & Harrison, T.P. 2008. 'Assessing supply chain risks with the analytic hierarchy process: Providing decision support for the offshoring decision by a US manufacturing company', *Journal of Purchasing & Supply Management*, 14(2008): 100-111.

Selviaridis, K., and Spring, M. 2007. 'Third party logistics: A literature review and research agenda', *The International Journal of Logistics Management*, 18(1): 125-150.

Spillan, J.E., McGinnis, M.A., Kara, A. & Yi, G.L. 2013. ‘A comparison of the effect of logistics integration on firm competitiveness in the USA and China’, *The International Journal of Logistics Management*, 24(2): 153-179.

Spring, M., Selviaridis, K. & Zografos, K. 2016. *Coordination in Service Supply Networks: Insights from Airport Collaborative Decision Making*. Available from: <http://eprints.lancs.ac.uk/80170/1/Euroma_2016_airport_CDM_submit.pdf > [Accessed 20 August 2017].

SSON. 2016. *The Top 10 Problems with Outsourcing Implementations (and how to overcome them)*. Available from: <https://www.ssonetwork.com/business-process-outsourcing/articles/the-top-10-problems-with-outsourcing-implementatio> [Accessed 28 April 2018].

Stephens, S. 2001. ‘Supply Chain Operations Reference Model Version 5.0: A new tool to improve supply chain Efficiency and achieve best practice’, *Information Systems Frontiers*, 3(4): 471-476.

Stock, J.R., and Lambert, D.M. 2001. *Strategic logistics management*. 4th ed. Boston: McGraw-Hill Higher Education.

SupplyOn. 2017. *Supply chain vs. supply chain – does the paradigm of competing supply chain really apply?* Available from: <https://www.supplyon.com/en/blog/supply-chain-vs-supply-chain-does-the-

paradigm-of-competing-supply-chains-really-apply/> [Accessed 28 April 2018].

Tan, A.W.K., Yifei, Z., Zhang, D. & Hiloma, O. 2014. 'State of Third Party Logistics Providers in China', *Industrial Management & Data Systems*, 114(9): 1322-1343.

The Economist. 2017. *Economies of Scale and Scope*. Available from: <http://www.economist.com/node/12446567> [Accessed 09 April 2017].

The World Bank. 2014. *Connecting to Compete: Trade Logistics in the Global Economy*. Washington, DC: The World Bank.

Thompson, J. 2007. *Crafting and executing strategy: The quest for competitive advantage, concepts and cases*. Boston: McGraw-Hill.

Tian, Y., Ellinger, A.E. & Chen, H. 2010. 'Third-Party logistics provider customer orientation and customer firm logistics improvement in China', *International Journal of Physical Distribution & Logistics Management*, 40(5): 356-376.

Transport World Africa. 2013. *Transportation Management Outsourcing*. [Online] Available from: <http://transportworldafrica.co.za/2013/09/27/transportation-management-outsourcing/> [Accessed 23 March 2016].

University of West England. 2017. *Research Observatory*. Available from: <http://ro.uwe.ac.uk/RenderPages/RenderLearningObject.aspx?Context=7&Area=1&Room=3&Constellation=24&LearningObject=104> [Accessed 08 April 2017].

Wang, Q., Huo, B., Lai, F. & Chu, Z. 2010. 'Understanding performance drivers of third-party logistics providers in mainland China', *Industrial Management & Data Systems*, 110(9): 1273-1296.

Waugh, B., and Luke, R. 2011. *Logistics Outsourcing by Manufacturers in South Africa*. Available from: <https://jtscm.co.za/index.php/jtscm/article/download/81/77> [Accessed 28 April 2018].

Wolfram Mathworld. 2017. *Eigenvector*. Available from: <http://mathworld.wolfram.com/Eigenvector.html> [Accessed 30 December 2017].

Yang, X. 2014. 'Status of Third Party Logistics: A Comprehensive Review', *Journal of Logistics Management*, 3(1): 17-20.

APPENDICES

Appendix A:

Ethical clearance certificate – Unisa

UNISA university of south africa

28 AUGUST 2016

Ref #: 2016_CEMS_ESTTL_002

DEPARTMENT OF ENTREPRENEURSHIP, SUPPLY CHAIN, TRANSPORT, TOURISM AND LOGISTICS MANAGEMENT RESEARCH ETHICS REVIEW COMMITTEE

This is to certify that the application for ethics clearance submitted by

Mr Dewaldt Johannes Rabie (student #45274061, dewaldt.rabie@sasol.com)

A Strategic Decision Making Model for Optimal Alignment of 3PL Providers with Sasol's Outbound Supply Chain

received Ethics Approval

The application for ethics clearance for the above mentioned research was reviewed by the Department of Entrepreneurship, Supply Chain, Transport, Tourism and Logistics Management Research Ethics Review Committee in August 2016 in compliance with the Unisa Policy on Research Ethics. Ethical Clearance for the project is granted.

You may proceed with the research project. The research ethics principles outlined by the Unisa Policy on Research Ethics must be adhered to throughout the project. Please be advised that the committee needs to be informed should any part of the research methodology as outlined in the Ethics application (Ref #2016_CEMS_ESTTL_002) change in any way or in case of adverse events. This certificate is valid for the duration of the project. The ESTTL Research Ethics Review Committee wishes you all the best with this research undertaking.

Kind regards,

Poole

Mrs C Poole
Chairperson

Executive Dean: CEMS

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

Appendix B:

Consent to participate

UNISA

CONSENT TO PARTICIPATE IN THIS STUDY

I, _____ (participant name), confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

- I have read (or had explained to me) and understood the study as explained in the information sheet.
- I have had sufficient opportunity to ask questions and am prepared to participate in the study.
- I understand that my participation is voluntary and that I am free to withdraw at any time without penalty (if applicable).
- I am aware that the findings of this study will be anonymously processed into a research report, journal publications and/or conference proceedings.
- I agree to the recording of the structured interview.
- I have received a signed copy of the informed consent agreement.

Participant name & surname…… (please print)

Participant signature……Date……

Researcher's name & surname……(please print)

Researcher's signature……Date……

Witness name & surname……(please print)

Witness's signature……Date……

Appendix C:
Participant information sheet

UNISA

PARTICIPANT INFORMATION SHEET

2016

Dear Prospective Participant

My name is Dewaldt Rabie and I am doing research with Prof Shahia and Prof van Zyl, in the Department of Transport Economics, Logistics and Tourism towards a Doctorate of Philosophy Degree at the University of South Africa. We are inviting you to participate in a study entitled 'A strategic decision making model for optimal alignment of Third Party Logistics Providers'.

WHAT IS THE AIM/PURPOSE OF THE STUDY?

The research objective is to develop a workable, end-to-end, supply chain strategic decision making model that enables alignment between Third Party Logistics Providers and Shipper Company business objectives. To satisfy this objective a Strategic Decision Making Model is developed to ensure business success i.e. the model is utilised as a strategic decision-making lever as to enable operations execution and continuous management of the Third Party Logistics partnership.

Sub-objectives

- Determine the mechanisms available in terms of collaboration, integrated planning and systems as well as performance measurement systems.
- Assimilate the data obtained from the research conducted in order to apply the Strategic Decision Making Model on Sasol's outbound final packaged product supply chain.

WHY AM I BEING INVITED TO PARTICIPATE?

You were chosen based on non-probability, judgement sampling due to your expert knowledge pertaining to the Sasol supply chain knowledge and/ or knowledge pertaining to 3PL Provider service renderings. The selection inclusion criteria are 1) knowledgeable in the specific field of 3PL Provider service renderings, 2) works for the Sasol supply chain. There are 10 structured interviews that will take place.

WHAT IS THE NATURE OF MY PARTICIPATION IN THIS STUDY /WHAT DOES THE RESEARCH INVOLVE?

Your participation is limited to discussion as per the structured interview. There are four sections of questions; the first being to gauge your experience and understanding as a subject matter expert classification. The second section of questions is specific to the development of the Strategic Decision Making Model in order to validate design requirements. The third section of questions is concerned with the 3PL Provider requirements and your perception with regards to the key role players within the Sasol 3PL Provider sphere. The final section of questions is devoted to gaining understanding for important outsourcing model requirements. The structured interview is anticipated to have duration of an hour.

CAN I WITHDRAW FROM THIS STUDY?

Being in this study is voluntary and you are under no obligation to consent to participation. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a written consent form. You are free to withdraw at any time and without giving a reason.

WHAT ARE THE POTENTIAL BENEFITS OF TAKING PART IN THIS STUDY?

Your presence will lead to important outsourcing model requirements being verified or rejected, which will lead to the successful development of a Strategic Decision Making Model for Sasol's outbound final packaged product supply chain.

WHAT IS THE ANTICIPATED INCONVENIENCE OF TAKING PART IN THIS STUDY?

There are no anticipated inconveniences by taking part in this study.

WILL WHAT I SAY BE KEPT CONFIDENTIAL?

Your name will not be recorded anywhere and no one will be able to connect you to the answers you give. Your answers will be given a fictitious code number or a pseudonym and you will be referred to in this way in the data, any publications, or other research reporting methods such as conference proceedings. Your answers may be reviewed by members of the Research Ethics Committee. Otherwise, records that identify you will be available only to people working on the study, unless you give permission for other people to see the records.

HOW WILL INFORMATION BE STORED AND ULTIMATELY DESTROYED?

Electronic information will be stored on a password protected computer for a period of five years. Future use of the stored data will be subject to further Research Ethics Review and approval if applicable. Once the five year period lapses the electronic files will be deleted from the password protected computer.

WILL I RECEIVE PAYMENT OR ANY INCENTIVES FOR PARTICIPATING IN THIS STUDY?

No payment or incentive will be given to participants of the structured interview process.

HAS THE STUDY RECEIVED ETHICAL APPROVAL?

This study has received written approval from the Research Ethics Committee of the College of Economic and Management Sciences, Unisa. A copy of the approval letter can be obtained from the researcher if you so wish.

HOW WILL I BE INFORMED OF THE FINDINGS/RESULTS?

If you would like to be informed of the final research findings, please contact Dewaldt Rabie on 083 457 6992 or e-mail dewaldt.rabie@gmail.com. The findings are accessible for a 2 month period. Should you require any further information or want to contact the researcher about any aspect of this study Dewaldt Rabie on 083 457 6992 or e-mail dewaldt.rabie@gmail.com. Should you have concerns about the way in which the research has been conducted, you may contact Professor M Shahia, mrad.shahia@gmail.com. Thank you for taking time to read this information sheet and for participating in this study.

Thank you.

Dewaldt Rabie

Appendix D: Outsource risk matrix

Outsource risk matrix (probability and severity)							Impact	R-value	Environment	Community	Sales & marketing/ customers	Government relations (B-BBEE recognition)	Reputation	Legislative	Human resources	Operations and upstream/ downstream supply chain	Information management
4	3	3	2	1	1	1	I7	> R4 500m	Very serious irreversible impact on national scale.	Prolonged and serious disputes with community.	Loss of significant number of key customers, causing significant market share loss.	Breakdown in relations with government on an international scale resulting in international political pressure and operating licenses being revoked.	Prolonged international and national condemnation that is difficult to defend and manage, resulting in long-term damage to reputation with potential for a prolonged drop in share price.	International legal/class action that may alter business model and reduce market share.	International and national strike action.	Total loss of production	Total loss of a data centre and information unrecoverable.
4	3	3	2	2	1	1	I6	R4 500m	Serious reversible impact on a national scale	Prolonged and serious disputes with a local community causing disruptions to operations.	Loss of one important customer that may affect market share.	Breakdown in relations with a government causing local licenses being revoked.	International and national criticism resulting in a medium-term drop in share price (< 5 years).	National legal action resulting in significant alteration to business practices and significant fines that may significantly affect cash flow.	Strikes at several facilities and difficulty in attracting appropriately qualified staff resulting in project delays.	Future operations unstable.	Loss of critical information that could prevent timely financial reporting.
5	4	3	3	2	2	2	I5	R1 500m	Serious reversible impact on a regional scale	Serious community disputes that require urgent management attention to resolve.	Significant number of customer complaints resulting in poor customer satisfaction.	Breakdown in relations, limited to specific government departments.	Serious negative criticism limited to one geographical area resulting in short-term drop in share price (< 1 year).	Legal action resulting in loss of operating permit and causing a business interruption and potentially impacting cash flow.	Strike at one facility or deterioration in workforce morale that lasts for up to 1 year.	Future operations at site seriously affected loss of production is negatively affected for more than 6 months.	Information security breach resulting in loss of trade secrets.
6	5	4	4	3	3	3	I4	R300m	Moderate reversible impact on a local scale	Numerous community complaints that have the potential to cause disruptions if not resolved.	Customer complaints that have the potential to deteriorate if not resolved.	Breakdown in relations at local government level.	Adverse national media public attention with a limited effect on share price.	Severe legal fines with a limited effect on cash flow.	Disputes.	Major damage to facility. Loss of production < 6 months.	Disruptions or non-availability of multiple critical systems/services for a period of 2–5 days.
6	5	5	4	4	3	3	I3	R150m	Moderate reversible impact off-site	Infrequent community complaints that can be resolved with timely management action and minimal investment.	Minor and infrequent customer complaints.	–	Local attention from media – no effect on share price.	Legal fines.	Isolated employee grievances.	Moderate damage to equipment and or facilities. Loss of production < 1 week.	Loss of information that severely disrupts or delays critical business processes or projects.
6	6	6	5	5	4	4	I2	R30m	Minor impact extending beyond operational boundary within site	–	–	–	Minor adverse local media attention and complaints.	Reportable incident.	Complaints amongst the workforce.	Minor damage to equipment. No production loss.	Loss of information that severely disrupts or delays critical business processes or projects.
6	6	6	6	6	6	6	I1	R3m	Minor impact within operations boundary	–	–	–	Public concerns restricted to local complaints	–	–	Easily addressed or rectified concerns.	Loss of information that disrupts or delays non-critical business processes or projects.

P1	P2	P3	P4	P5	P6	P7	
Unforeseen	Highly unlikely	Very unlikely	Low	Possible	Likely	Almost certain	Likely-hood
The event may occur less than once in 20 years	The event may occur once every 20 years	The event may occur once in every 10–20 years	The event may occur once in every 5–10	The event may occur within next 2–5 years	The event may occur within next 1–2 years	The event may occur at least once a year or is already occurring	Frequency

Appendix E:

Structured interview questions, sections one to four

Section one

Section	Question
1	1. What is your involvement within the supply chain and specifically the outbound final packaged product supply chain (inclusive of Explosives, Fertilizers, Polypropylenes, Wax, Solvents and Polyvinyl Chloride)? ▪ Years of experience? ▪ Qualification? ▪ Level of decision-making within Sasol (executive-, senior- or junior management)? ▪ Are you regarded as a SME?
	2. What is your understanding of the outbound final packaged product supply chain (processes and design)

Section two

Section	Question
2	1. What is the strategy employed per final packaged product supply chain for (low cost or differentiation)? ▪ Explosives ▪ Fertilizers ▪ Polypropylenes ▪ Wax ▪ Solvents ▪ Polyvinyl Chloride
	2. Given the strategy per final packaged product supply chain, what are the design specifics for each supply chain i.e. product to cash cycle – how is it achieved? ▪ Explosives ▪ Fertilizers ▪ Polypropylenes ▪ Wax ▪ Solvents ▪ Polyvinyl Chloride
	3. What is the market for each product supply chain (annual volumes, geographical spread of customers)? ▪ Explosives ▪ Fertilizers ▪ Polypropylenes ▪ Wax ▪ Solvents ▪ Polyvinyl Chloride
	4. What are the high-level processes involved with the final packaged product supply chain i.e. what do you classify as the final packaged product supply chain?
	5. The Sasol outbound final packaged product supply chain as a whole; please specify the geographical spread of facilities coupled to market integrations
	6. How do you view the production entity proximity to markets and how is production schedules aligned with market needs?
	7. Is there any special characteristics pertaining to market supply i.e. prolonged plant shutdowns, seasonal demand?

	8. What are the capacities per production entity? ▪ Explosives ▪ Fertilizers ▪ Polypropylenes ▪ Wax ▪ Solvents ▪ Polyvinyl Chloride
	9. What activities do you suggest outsourcing to 3PL provider?
	10. What type of outsourcing need do you believe exist at anyone of the final packaged product supply chain and why (based on the services continuum of 3PL provider service type; apprentice-, elementary-, intermediate-, or advanced service)? ▪ What type of pricing strategy will you suggest per the given service type outsourcing?
	11. Do you recommend a phased approach to outsourcing to 3PL provider i.e. starting from elementary service outsourcing progressing from a *standard service provider* to a *customer developer* provider i.e. advanced service offering?
	12. What do you perceive the risk in terms of outsourcing to a 3PL provider? ▪ Do you believe the risk will increase or decrease as per progression from a Standard Service 3PL provider to a *customer developer* 3PL provider? ▪ What do you believe the best approach to managing risk between 3PL provider and Sasol?

Section three

Section	Question
3	1. What are the current alignment models utilised by Sasol for 3PL provider alignment? ▪ If no, why not? ▪ Do you believe such an alignment model is necessitated? ▪ If yes, what is working? ▪ If yes, what could be done better?
	2. What do you believe to be the appropriate factors to consider for supplier accreditation i.e. what qualify a supplier to be rendering a service to Sasol?
	3. The elements according to the strategic decision-making model – please rate the importance of each; ▪ Collaboration and integrated planning systems; two-way information sharing, communication, ERP system integration, Commitment or trust, dependence, service recovery, top management support, reputation, customer referrals, direct assistance or participation, opportunistic behaviour, total quality management, just in time, investment, customer retention, coordination, system platform integration, long term contract, satisfactory prior outcomes, dedicated resources, expanded outsourcing and trust ▪ Performance measurement elements; customer satisfaction, customer service level, logistics cost saving, expanded outsourcing, enhanced value, productivity enhancement and competitive advantage, service variety, information availability, timelines, continuous improvement, operational challenges, local competition, international competition, functional involvement, low cost, differentiation, cost performance, service performance and financial performance. ▪ B-BBEE both for Sasol's benefit and utilising a 3PL provider rating effect on Sasol.
	4. What is the current approach to outsourcing (short term vs long term) and the results of each?
	5. What do you view as common practice with regards to outsourcing that is Sasol specific?

Section four

Section	Question
4	1. What are the most important aspects, as per your SME knowledge, that will ensure optimal outsourcing of Sasol's final packaged product supply chain to a prospective 3PL provider?
	2. Do you believe that a strategic decision-making model will ensure optimal alignment between Sasol's outbound final packaged product requirements and prospective 3PL providers?

Appendix F:

Sasol application of the evaluation of 3PL providers – Perçin (2009)

The evaluation process, according to Perçin (2009), is to –

- identify the evaluation criteria;
- establish a hierarchy of evaluation criteria;
- calculate the criteria weights;
- perform consistency test;
- Conduct TOPSIS procedure;
- calculate positive and negative ideal solution and separation measures; and
- rank the preference order for 3PL providers (Perçin, 2009).

The application of Perçin's (2009) model is discussed next.

Step one: identify evaluation criteria. These criteria are in the form of –

- organisation profile (size, turnover and geographical spread);
- 3PL provider service offerings in line with the serviced required by the Sasol-specific scope;
- B-BBEE status;
- review of the elements;
- expanded outsourcing;
- customer satisfaction;
- dedicated resources;
- logistics cost savings; and
- enhanced productivity.

Step two: Establish the evaluation criteria hierarchy – organisation profile adds 9%, 3PL provider services 20%, B-BBEE status 51%, and elements amount to 20%

Step three: Each criterion is given a weight as per the percentage.

Step four: Consistency testing

Step five: TOPSIS

Step six: Positive and negative ideal solution

Step seven: Rank preference order

Table 8.1 indicates the evaluation of 3PL providers as applied through Perçin's (2009) mathematical model.

Table 8.1: 3PL providers as applied through Perçin's (2009) mathematical model

Prospective 3PL provider	Organisation profile (size, turnover and geographical spread) (9%)	3PL provider service (20%)	B-BBEE status (qualifying element level 3 or higher) (51%)	Elements review (expanded outsourcing, customer satisfaction, dedicated resources, logistics cost savings & enhanced productivity) (20%)	Total
Sammar Investments	5%	10%	51%	10%	77%
SACD	9%	15%	34%	14%	72%
Katoen Natie	9%	15%	0%	18%	42%
Imperial Logistics	9%	18%	16%	16%	59%
GTWLS	3%	10%	0%	5%	18%
Barloworld	9%	20%	34%	18%	81%

Appendix G:

Sasol application of the evaluation of 3PL providers – Monczka *et al.,* (2005)

The supplier evaluation and selection process starts with the recognition of a need for a supplier. The second step is to identify key sourcing requirements, i.e. requirements from the outsourcing process.

Step three was intended to determine a sourcing strategy. The sourcing strategy was matched against the services continuum, based on the requirements of Sasol, which is indicated as being an advanced service delivery, *customer developer*, with high strategic involvement and investment. The Sasol scope indicates a single 3PL provider approach, matched against the services continuum.

The fourth step was to identify potential supply sources, i.e. potential 3PL providers. This was included as part of the identification of prospective 3PL providers, coupled with the reasoning for inclusion of the specific 3PL providers (secondary research).

Step five was to limit the potential suppliers in the selection pool, in accordance with the secondary data scope for 3PL provider inclusion/exclusion.

Step six was to determine the method of supplier evaluation and selection. This is satisfied via the services continuum placement. This allowed for the application of the strategic decision-making model process to align with the prospective 3PL provider.

The last step was to select a supplier and to reach mutual agreement on deliverables. In this step, the supplier/3PL provider was chosen and the deliverables were agreed to, as satisfied in the strategic decision-making model via parameter alignment and performance management programme.