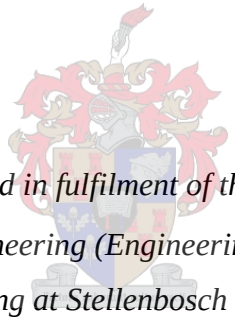
Determining Appropriate Compensation for Third-Party Logistics in Africa

Rudolf Peens Loots



Thesis presented in fulfilment of the requirements

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Declaration

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December 2017

Abstract

This study aims to illuminate the important role of third-party logistics (3PL) within the distribution network of fast moving consumer goods, specifically beverage products, in the African market. The high level of poverty in Africa leads necessities, such as food and beverages, to dominate the consumer's spending power. Consequently, the alcoholic beverage industry in Africa has grown significantly over the last decade. Africa is filled with an abundance of challenges when it comes to the distribution of products. With numerous routes to market available, 3PLs have risen to become one of the key routes suppliers use. If a 3PL is running inefficiently, the whole supply network will suffer. It is important to build a lasting relationship between suppliers and 3PLs to help both parties to grow more efficient and stay in business. This led to the research question of how a 3PL should be compensated for the services they provide. This research question resulted in two main research objectives: (1) designing a detailed break-even model to determine the appropriate compensation for a smaller 3PL; and (2) creating a simple 3PL compensation plan streamlining the compensation process for large 3PLs. Thus, this research focuses on finding the ideal method of compensating various 3PLs based on their performance, unique circumstances and how closely they operate to the industry standards.

The research approach included a detailed literature review followed by identifying and quantifying several 3PL standards and inputs. Then an in-country visit to Nigeria was conducted followed by an in-depth survey regarding 3PL operations in Nigeria by a third-party surveyor. Extensive analysis of the surveyed data was then conducted which allowed the 10-year break-even model to be created leading to the identification of key performance indicators and determination of a compensation approach for different 3PLs. The first approach advises that smaller 3PLs be analysed individually. By taking into consideration the five highlighted inputs from the sensitivity analysis combined with the specific challenges each small 3PL face, a compensation rate can be determined for each small 3PL in turn. This will result in a sustainable route to market to remote and poor areas. For large 3PLs a set compensation rate must be put in place to drive 3PLs to improve the service they deliver to a certain standard. If not, they will be replaced by one of their competitors who can make a profit at the set compensation rate. The validity of the compensation approaches was tested by means of a margin analysis which found the modelled margins to be aligned with the actual margins the suppliers indicated. The main benefactors of the research are organisations who hire 3PLs across underdeveloped countries. 3PLs will also benefit from the findings of this research as they can then use the tool themselves to ensure that they are being compensated adequately for the services they provide.

Opsomming

Hierdie studie beoog om die belangrike rol wat derdepartylogistiek (3PL) speel in die verspreidingsnetwerk van vinnigbewegende verbruikersgoedere uit te lig, veral ten opsigte van drankprodukte in die Afrika mark. Die hoë vlak van armoede in Afrika lei daartoe dat noodsaaklikhede, soos kos en verversings, die verbruikers se koopkrag oorheers. Gevolglik het die drankindustrie in Afrika oor die afgelope dekade aansienlik gegroei. Afrika is gevul met 'n oorvloed van uitdagings wanneer dit kom by die verspreiding van produkte. Met talle roetes tot die mark beskikbaar, het 3PL'e uitgestyg om een van die mees gebruikte metodes vir die verskaffing van produkte te word. As 'n 3PL oneffektief bestuur word, sal die hele verskaffingsketting ly. Daarom is dit noodsaaklik om 'n goeie verhouding tussen verskaffers en 3PL'e te kweek wat beide partye sal help om groei en in besigheid te bly.Dus ontstaan die navorsingsvraag van hoe 'n 3PL vergoed moet word vir die dienste wat hulle lewer. Hierdie vraag het gelei tot twee hoof navorsingsdoelwitte: (1) die ontwerp van 'n gedetailleerde gelyk-breek model om die toepaslike vergoeding vir 'n kleiner 3PL te bepaal; en (2) die skep van 'n eenvoudige 3PL vergoedingsplan wat die vergoedingsproses vir groot 3PLs vereenvoudig. Hierdie navorsing soek na die ideale metode om verskeie 3PL's te vergoed, gebaseer op hul resultate, unieke omstandighede en hoe naby hulle opereer aan die bedryf se standaarde.

Die navorsingsbenadering sluit in 'n gedetailleerde literatuuroorsig, waarna verskeie 3PL standaarde en insette geïdentifiseer en gekwantifiseer was. Daarna is 'n besoek aan Nigerië uitgevoer, gevolg deur 'n opname oor 3PL-bedrywighede in Nigerië gedoen deur 'n derdeparty-maatskappy. Uitgebreide analise is toe verrig op die ingesamelde data wat dit moontlik gemaak het om die 10-jaar gelyk-breek model te skep. Dit het gelei tot die identifisering van kernresultate en die bepaling van 'n vergoedingsbenadering vir verskillende 3PLs. Die eerste benadering vir kleiner 3PLs beveel aan dat elkeen individueel ontleed moet word deur die vyf kern resultate van die sensitiwiteitsanalise gekombineer met die spesifieke uitdagings van elke klein 3PL in ag te neem. Dit maak dit moontlik om 'n vergoedingskoers te bepaal vir elke klein 3PL, wat 'n volhoubare roete vir produkte na markte in afgeleë en arm gebiede sal verseker. Vir groot 3PL'e moet 'n vaste vergoedingskoers ingestel word om groot 3PL'e te dryf om hul dienslewering te verbeter tot by 'n vasgestelde standaard. Indien hulle nie kan kompeteer nie sal hulle vervang word deur 'n mededinger wat 'n wins kan maak met die vasgestelde vergoedingskoers. Die geldigheid van die vergoedingsbenaderings is getoets deur middel van 'n marge-analise wat gevind het dat die gemodelleerde marges in lyn is met die werklike marges wat die verskaffers aangedui het. Die organisasies wat die meeste sal baat by die navorsing is organisasies wat gebruik maak van 3PL'e in onderontwikkelde lande. 3PL'e sal ook baat vind by die bevindinge van hierdie navorsing, aangesien hulle die model self kan gebruik om te verseker dat hulle voldoende vergoeding ontvang vir die dienste wat hulle verskaf.

Acknowledgements

I would like to express my sincere gratitude to the following people and organisations:

- Hunting Dragons Consulting, for affording me the opportunity to be part of the project presented in my thesis and the guidance received from them.
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Glossary

3PLs	-	Third Party Logistics
ABC	-	Activity Based Costing
AHP	-	Analytical Hierarchy Process
APT	-	Accounts Payable Turnover
ART	-	Accounts Receivable Turnover
C2C	-	Cash-to-Cash
EVA	-	Economic Value Added
FMCG	-	Fast Moving Consumer Goods
GDP	-	Gross Domestic Product
INVT	-	Inventory Turnover
KPIs	-	Key Performance Indicators
LSP	-	Logistic Service Provider
MCDM	-	Multi-Criteria Decision-Making
NOPAT %	-	Net Operating Profit After Tax Percentage
PIs	-	Performance Indicators
PPET	-	Property, Plant and Equipment Turnover
RIs	-	Result Indicators
ROA	-	Return on Assets
ROE	-	Return on Equity
ROI	-	Return on Investment
RTM	-	Route-to-Market
SCC	-	Supply Chain Council
SCOR	-	Supply Chain Operations Reference
SKU	-	Stock Keeping Unit
TOPSIS	-	Technique for Order Preference by Similarity to Ideal Solutions
CSCMP	-	Council of Supply Chain Management Professionals

Chapter 1: Introduction

1.1 Background

Over the past few years, the fast-moving consumer goods (FMCG) industry has faced many new opportunities and challenges. With the ever-changing wants and needs of consumers, it is challenging to accurately estimate the demand of FMCG, especially with beverage products in the African market. Owing to globalisation, competition in this market has grown fiercer than ever before. Every link in the supply chain must be optimised to stay competitive. This study focuses on the importance of third-party logistics (3PL) and the role they play in the distribution network of FMCGs. The role that distribution systems play in maximising the sales and market share of any FMCG company is essential for deeper market penetration, efficient product availability, and promotion [1].

The high-level of poverty in Africa leads necessities, such as food and beverages, to dominate the consumer's spending power. Therefore, the FMCG sector continues to do well in an economic downturn, when consumers rather cut back on luxury products. Despite the economic downturn, the beverage industry in Africa has grown significantly over the last decade, where large multinational companies such as SABMiller, Heineken, Pepsi, and Coca-Cola have already attained substantial market shares in the African markets [2]. These private labels are fierce rivals and are therefore constantly looking for competitive advantage.

The main difficulty of the FMCG industry in Africa is getting products into the hands of customers. When operating in African countries various difficulties arise, some of which are seldom encountered in first world countries. The unique logistical challenges in Africa occur because of inadequate transportation, communication, and electricity infrastructures [3]. There are numerous other factors which help to complicate Routes-to-Market (RTM) in Africa even further:

> *"Clearance of goods at ports can be slow, cumbersome, and highly bureaucratic. Countries in Africa still have high logistics costs due to inefficiencies and lack of skilled supply chain personnel. Significant deficits in physical transport infrastructure are estimated to depress productivity by 40%."*
>
> Capgemini Consulting el al. [4]

These factors highlight the importance of identifying the differences faced when operating in Africa compared to the rest of the world. These challenges make it critical to have a distribution network in

place which can accommodate and adapt to any issues. Distribution networks are a lot more problematic in Africa compared to their counterparts in first world countries. In Africa, organisations are more dependent on 3PL, as well as micro distribution centres (MDCs) [5]. Without 3PL the supply chain would be non-existent in Africa. In urban areas, the traditional model of utilising delivery trucks and contracting 3PL for supplying large retailers is used. In areas which are hard to reach, small-scale 3PLs are used to deliver products to small-scale retailers. It is essential to have a supplier who can consistently provide the 3PLs. If a 3PL is running inefficiently, the whole supply network will suffer. It is therefore important to build a lasting relationship between suppliers and 3PLs in order to help both parties grow and stay in business.

1.2 Problem Statement

Even though some research on how to select an ideal 3PL is available in the literature, the literature review highlighted a lack of research looking specifically at 3PLs based in Africa, especially with regards to the unique circumstances some of them face compared to similar 3PLs on other continents. It is important to determine what an ideal 3PL looks like in an African context and what factors must be considered when choosing between 3PLs. Large organisations make use of many 3PLs, and there are various criteria to consider when choosing a 3PL [6]. The most important criteria to consider are cost, relationship, services, quality, information systems, flexibility, and delivery. These criteria are based on 67 previous studies conducted across the globe. However, these studies were mainly carried out in developed countries [7]. It is important to consider the environment in Africa and the effects it may have on these factors. It follows that an African organisation may not necessarily look at the same criteria as elsewhere; thus an ideal 3PL in Africa will most likely be different from an ideal 3PL anywhere else in the world. Due to the widely varying conditions which 3PLs in Africa work in it is important to differentiate between each 3PL. A 3PL who operates in an urban area, which is developed, will be able to deliver more products at a smaller expense. His counterpart, who delivers to the countryside which is hard to reach due to a lack of infrastructure, and with customers who also order in smaller quantities, will deliver fewer items at a greater expense. This difference illustrates the different circumstances in which 3PLs operate making it clear that a one glove fits all solution is not an ideal option. Therefore the main research question which must be answered through the course of this thesis is:

How should a 3PL be compensated for the services they provide?

1.3 Research Objectives

With the research question in section 1.2 answered it would then be necessary to create a tool or model which can: firstly, determine how an ideal 3PL operates under different circumstances; and secondly, determine how to appropriately compensate different 3PLs for the service they provide with regards to the different circumstances they face. Such a model would be a great asset to many organisations and help to ensure a lasting relationship where both parties can grow. This model will benefit suppliers as well as the 3PLs since a supplier will know how much they must pay a 3PL to ensure that they are both making enough profit to grow sustainably. This tool will ideally be used to help create long-term relationships between suppliers and 3PLs as it will ensure that neither side unduly benefits at the cost of the other. If a supplier underpays a 3PL, the latter will not make enough profit to remain in business and lead to the supplier having to hire a new 3PL, provided another 3PL is available in the area.

Smaller 3PLs operate in various environments with unique challenges. Thus they should be viewed on their own, which will require a model that can take into consideration each 3PL's unique circumstances and determine the best compensation. From an organisational viewpoint, it is beneficial to undertake extra steps to ensure that smaller 3PLs are compensated appropriately to ensure their continued success. However, when working with many 3PLs, it becomes increasingly challenging and expensive to undergo a detailed study of each 3PL to determine a personalised compensation plan. Furthermore, it is important to draw a line between compensating a 3PL based on its circumstances and challenges, as opposed to compensating them based on a set, structured compensation plan based on the 3PL's size and volume. This research fulfils two main research objectives:

1. A detailed break-even model to determine the appropriate compensation for a smaller 3PL.
2. A simple 3PL compensation plan streamlining the compensation process for large 3PLs.

1.4 Relevance of the Research

To gain an understanding of the relevance of the research, it is essential to see how the various factors discussed previously interact and effect each other on a larger scale. As an aid to the discussion that follows, Figure 1 below illustrates an overarching view.

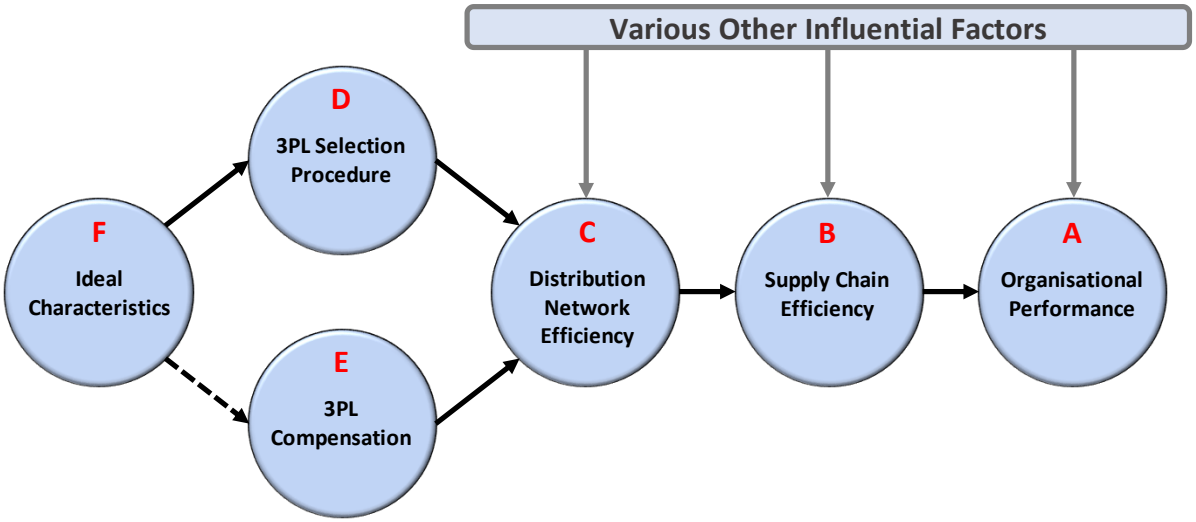


Figure 1: How various factors relate to an organisations performance.

In the global market, it becomes increasingly difficult to gain a competitive advantage. Optimising organisational performance is essential to stay competitive (A). An organisation is a system consisting of various interconnected sub-systems. The performance of each of these sub-systems is affected by several factors. An important factor which influences organisational performance is supply chain efficiency (B). Supply chain efficiency is entwined deeply with distribution network efficiency (C), both of which are affected by various other influential factors. 3PLs play a major role in the effectiveness of any distribution system. The research objective indicates two main outcomes of this thesis which will result in an increase in the efficiency of the distribution network by optimising the 3PL selection procedure (D) and setting in place guidelines for 3PL compensation (E). It is essential to understand how an ideal 3PL operates to create an optimal 3PL selection procedure, thus identifying the ideal 3PL characteristics (F). Compensation of a 3PL can relate to how closely a 3PL operates to these ideal characteristics. This research focuses on finding the ideal method of compensating various 3PLs based on their performance, their unique circumstances and how closely they operate according to the ideal characteristics. By optimising these processes, the research will ultimately drive organisational performance.

The main benefactors of the research are organisations who hire many 3PLs across underdeveloped countries. 3PLs will also benefit from the findings of this research as they can then use the tool themselves to ensure that they are being compensated adequately for the services they provide.

1.5 Methodology

The research was based on identified problems from previous studies that focused on the profitability of the "final mile" in the delivery of goods to customers, and the "cost to serve" within an African context where the infrastructure and supply networks are not always geared to large-scale logistics operations. The initial research started off by pulling information from academic research based on RTM and other relevant supply chain fields. This led to six initial logistic service provider (LSP) types to be identified. While researching these LSPs an opportunity arose to study the RTM process of alcoholic beverages in Nigeria. This opportunity resulted in the research focus shifting towards the operations of 3PLs, which was one of the initial six LSPs. Thus, a partnership was formed between the researcher, the SU, and a company in SA which provided funding and resources to conduct the research with. A lack of research and information regarding 3PL operations in Africa was found, which highlighted the need for additional information regarding 3PL operations in Africa to be collected. Thus, after collecting all the available information on 3PL operations in Africa, an in-country visit was arranged which consisted of visiting several locally operating 3PLs and distribution centres in Nigeria. This information was then used to compile a detailed survey which was later conducted by a third-party surveyor surveying a total of 2,249 outlets. The collected data was then analysed and processed to build an initial break-even model which aligned with the outcomes of both the thesis and the partnership. The initial model highlighted additional literature fields needing to be reviewed, including specific 3PL operating data required to populate and simulate the model. The results of this research then led to a third and final round of data collection in Nigeria. After analysing this additional data, the final iteration of the model could be developed and thus all the required information to complete the thesis was obtained. Figure 2 visually illustrates the methodology.

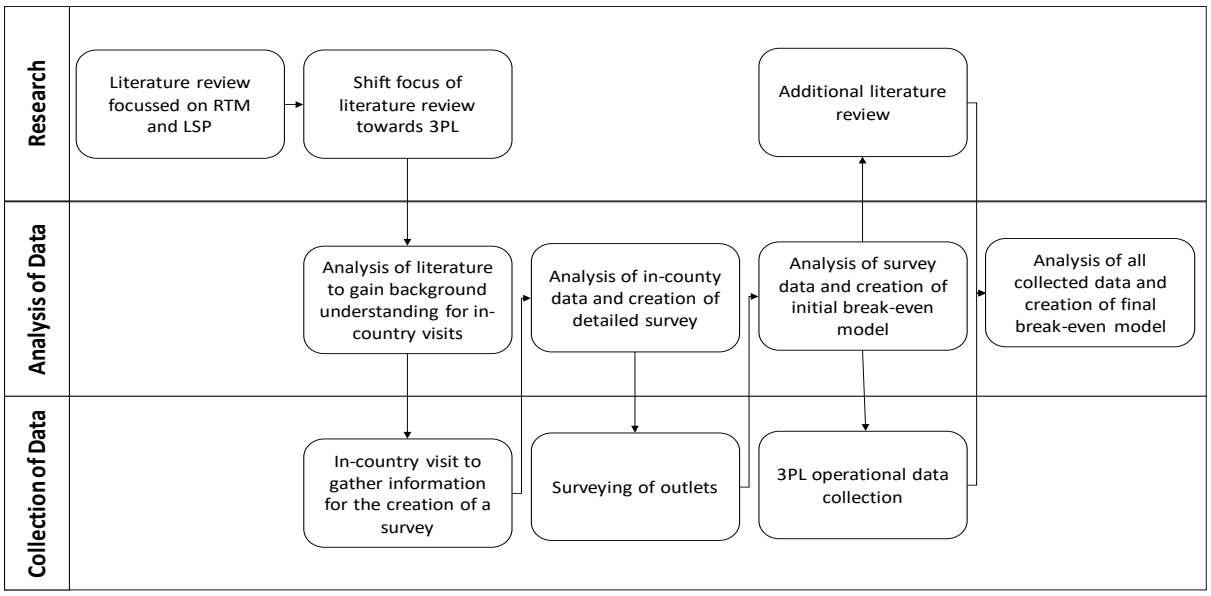


Figure 2: Flow diagram of the methodology.

1.6 Limitations and Assumptions of the Study

This study will focus on 3PLs which are based in Africa alone. It is not recommended to apply the findings of this research to developed countries; it must only be implemented in African context, and possibly in other under-developed countries in Asia and South America. However, similar research conducted outside Africa could differ from this research owing to the unique conditions faced in other less developed countries.

Working in Africa leads to numerous difficulties which most other regions will not have to face. Some key issues in Africa which limit the ease of research and data collection:

- Lack of Infrastructure: Due to poor infrastructure in most African countries, many places are difficult to reach and to make deliveries in [8].
- Mobile networks usage in Africa has grown significantly, from 10% of the population in 1999 to 46% at the end of 2015 [9] [10]. Even with this growth, there is still a serious lack of coverage and reliability which severely hampers communication with many 3PLs.
- Many 3PLs have inadequate facilities, lacking warehousing and cooling. Therefore, suppliers must be concerned with supplying 3PLs as well as considering ways of increasing a 3PL's ability to receive and hold stock [11].
- It is important to be aware of safety risks due to political conditions, corruption and unrest. Stock may be stolen while in transit and employees may be endangered when entering certain areas when making deliveries [12].
- A rich variety of languages and cultures add to the difficulties faced when operating in Africa. In Nigeria alone more than 400 languages are spoken, which can result in increased tensions and conflict owing to miscommunication between communities [13].

An in-country visit was arranged to Nigeria where personal interviews were conducted in two towns to validate the model and findings. A third-party organisation specialising in data collection using surveying conducted these interviews. The limitation of the survey is explained in detail in section 3.3.1. The initial survey was followed by a smaller additional survey focussing specifically on outstanding data required in 3PL operations. Data collection was limited to Nigeria based on the availability of funding and time constraints. Ideally, more countries would have been included, as factors influencing 3PL operations will differ between countries. When applying this research on other countries it is important to take account of the environmental, economic and cultural differences between countries.

1.7 Ethical Considerations for the Research

The first ethical obligation of the author is to give due credit to anyone whose work is referred to throughout the thesis. This is achieved in the form of citations and references which give the proper credit to authors for their work and gives readers the chance to check the validity of the thesis by following up on the references. Before any form of data collection commenced a strict ethical clearance application, from the University of Stellenbosch, was completed to ensure that the rights, interests, privacy and dignity of research participants are protected [14].

When gathering data, especially in Africa, great care was undertaken to ensure that it was collected legally; i.e. ensuring permission is granted by the right authorities when conducting studies and not resorting to paying bribes to get sensitive data. It is important to make sure that any data obtained through the survey is kept confidential. Therefore, no personal data was collected from any of the interviewees and any company or brand-specific information was used anonymously or is omitted from the thesis.

Finally, it is important for the author to state all limitations of the research and address any reliability issues found throughout writing the thesis. The author must indicate when and where the model works and can how reliable it is under stated conditions. An Excel add-in named @risk was incorporated into the model to accommodate the reliability issues by taking into consideration the distributions of the collected data.

1.8 Document Structure

The document structure of this thesis can be categorised into three areas focusing on the why, the how and the what of the research. The why section consists of Chapter one and focuses on the justification behind the research and aims to give the reader an understanding of why the research is important and indicating the relevance it has for various stakeholders. The how section consists of the second chapter which deals with methodology and the application of the relevant literature fields to give the reader the required background knowledge on the relevant literature fields touched upon throughout the thesis and how these fields can be utilised to help reach the research objectives. Lastly, the what section consists of chapters three to five which explain what was done throughout the research. This stretches from the data collection and surveying process in chapter three, the analysis of the collected data in chapter four, to the modelling in chapter five.

Chapter 2: Theory and Literature Analysis

When approaching the topic of 3PL several studies have been conducted. To fully understand the concept of 3PL, a substantial amount of background information is required. Although the literature covers a wide variety of relevant fields, this review will cover three main areas which repeatedly emerged throughout the literature. By examining these areas, a solid conceptual platform is created for the reader;

1. An in-depth review of logistics and supply chain management, focussing on its relevance to distribution.
2. The review specifically directed at 3PLs covering information on the environment in which 3PLs operate and relevant literature fields associated with 3PLs.
3. Additional areas of importance not covered previously namely; incentive and compensation methods, fleet mix, and activity-based costing.

2.1 Logistics and Supply Chain Management Review

Before focusing on solving the problem of how to compensate a 3PL for the services they provide, it is important to understand the environment in which they work, and their end goals. The three most important fields which are addressed and discussed in this subsection are; logistics, supply chain management (SCM), and supply chain operation reference (SCOR). It is essential to understand these fields when working with 3PLs as it provides all the required background which may be needed in these areas.

2.1.1 Logistics

A fundamental characteristic of logistics is its holistic view of all the activities that it encompasses. The main activities are procurement, inventory management, transportation management, warehouse management, and distribution. Logistics is primarily concerned with the integration of these activities to provide maximum value to the overarching system. This section starts off by defining logistics and then discussing some of the key relationships and components found in logistics. The importance of logistics is reviewed, and attention is given to how logistics operate on a global scale.

2.1.1.1 Defining Logistics

When attempting to define logistics, it is not possible to come up with an all-encompassing definition, as logistics is diverse and dynamic in its nature and changes according to the environment in which it is observed. In the literature, many terms have been used to describe logistics. The following definitions have been carefully selected which suite the purpose of this study:

> *"Logistics management is. . . the planning, implementation and control of the efficient, effective forward and reverse flow and storage of goods, services and related information between the point of origin and the point of consumption to meet customer requirements."*
>
> The Council of Supply Chain Management Professionals [15]

> *"Logistics is. . . the management of all activities which facilitate movement and the co-ordination of supply and demand in the creation of time and place utility."*
>
> Hesket et al. [16]

> *"Logistics is... the positioning of resource at the right time, in the right place, at the right cost, at the right quality."*
>
> Chartered Institute of Logistics and Transport [17]

It is interesting to observe how different industry sectors place empathise on the various aspects of logistics. An appropriate definition which applies to most industries, including FMCG is:

> *"the efficient transfer of goods from the source of supply through the place of manufacture to the point of consumption in a cost-effective way whilst providing an acceptable service to the customer."*
>
> Rushton et al. [18]

2.1.1.2 Key Relationships and Components of Logistics

The focus on cost-effectiveness and customer service is an important aspect when working with different 3PLs. Rushton et al. [18] goes on to describe one of the key relationships found in logistics as follows:

Logistics = Materials Management + Distribution

Taking this idea further, the supply chain is illustrated as an even broader scope of the business area encompassing the supply of raw materials and components through to the delivery of products. Thus:

Supply Chain = Suppliers + Logistics + Customers

Therefore, when speaking of logistics and supply chain, it refers to the physical and information flows from raw materials received from suppliers through to the distribution of the final product. Material management represents the storage and flows into the production process, and distribution represents the storage and flows from the final production point all the way through to the end user. Figure 3 illustrates the different flows found in a FMCG manufacturer.

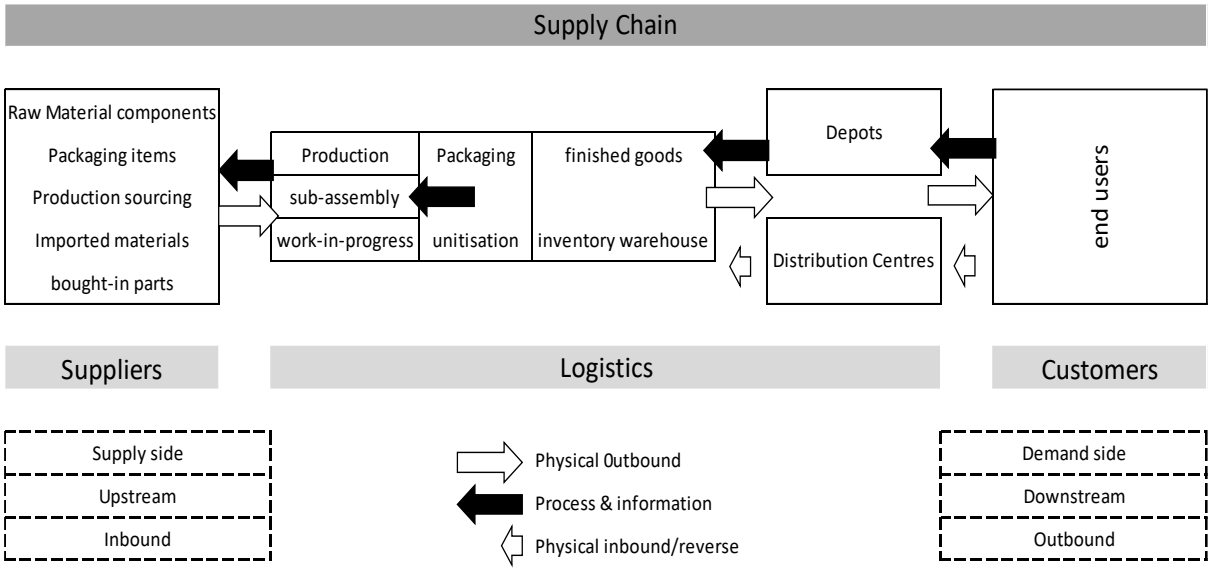


Figure 3: Flow of logistics, FMCG manufacturer, adapted and redrawn [18]

The most common key areas representing the major components of distribution and logistics will always include information, transport, warehousing, packaging and inventory. This list can be expanded to reveal more detailed aspects of each of these key areas as can be seen in Figure 4 below.

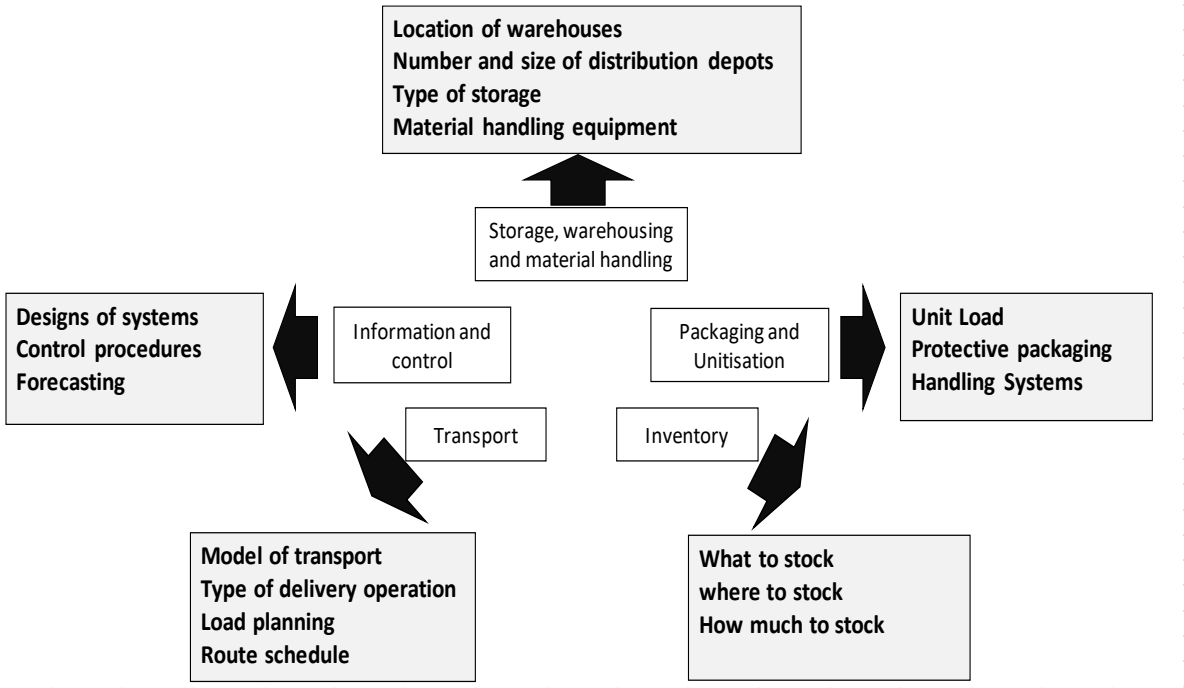


Figure 4: Key components of distribution and logistics, adapted and redrawn [18]

2.1.1.3 Importance of Logistics

Logistics is an important activity which makes extensive use of human and material resources in a country which impacts the entire economy of countries. This makes it important to consider logistics not just in industry, but in context with business and the economy which can be measured by the economic value added (EVA) to the supply chain. Logistics affects EVA in 4 main areas namely [19];

- Revenue
- Operating costs
- Working capital
- Fixed assets

The scale to which logistics affects a country's economy is much larger than expected. Global 3PL market estimates have been measured [20] for over a decade and the percentage of a regions gross domestic product (GDP) which is spent on logistics, has been summarised in Figure 5 below. These numbers serve to illustrate how important it is to understand the nature of logistics costs and to identify means of keeping these costs to a minimum.

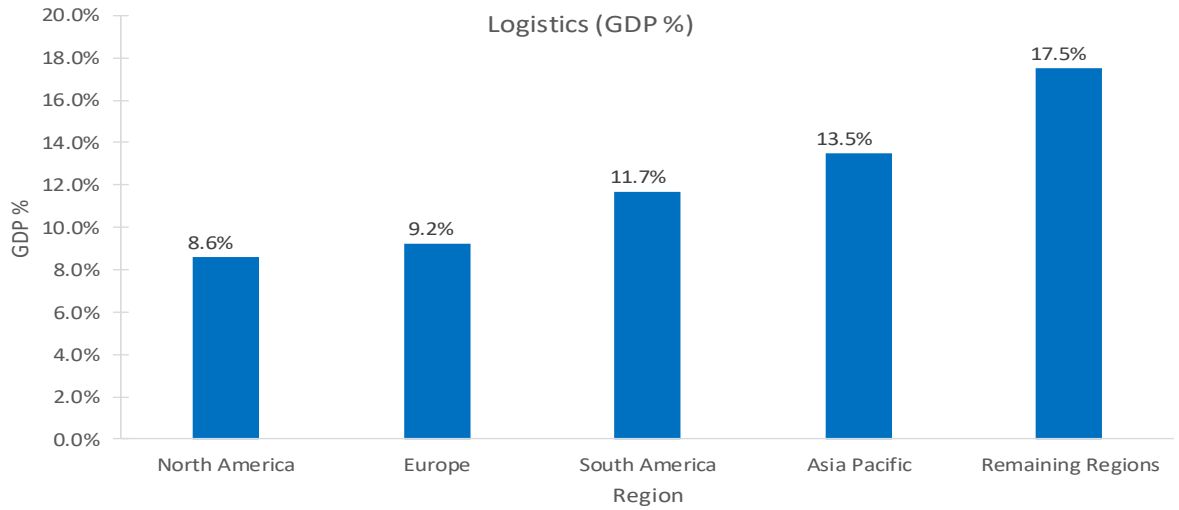


Figure 5: Logistics as a % of a regions GDP, adapted and redrawn from [20]

Another similar study was conducted [21] in 2007 which focused on the cost of logistics. The average cost was calculated as a mean of all the participants in the study, thus all the regions mentioned in Figure 5. The results of these studies between 2002 and 2015 are illustrated in Figure 6 below. Figure 6 indicates the costs of these elements as a percentage of sales. This study found transportation to be 48.3% of expenses, followed by inventory carrying cost at 22.9%, warehousing at 22.6%, customer service at 3.9% and last administration at 2.3%. Over the past few years, logistics costs have grown when observing the industry. This highlights the importance of implementing an effective logistics company as it is expected that costs should decrease as better technology and methods become available.

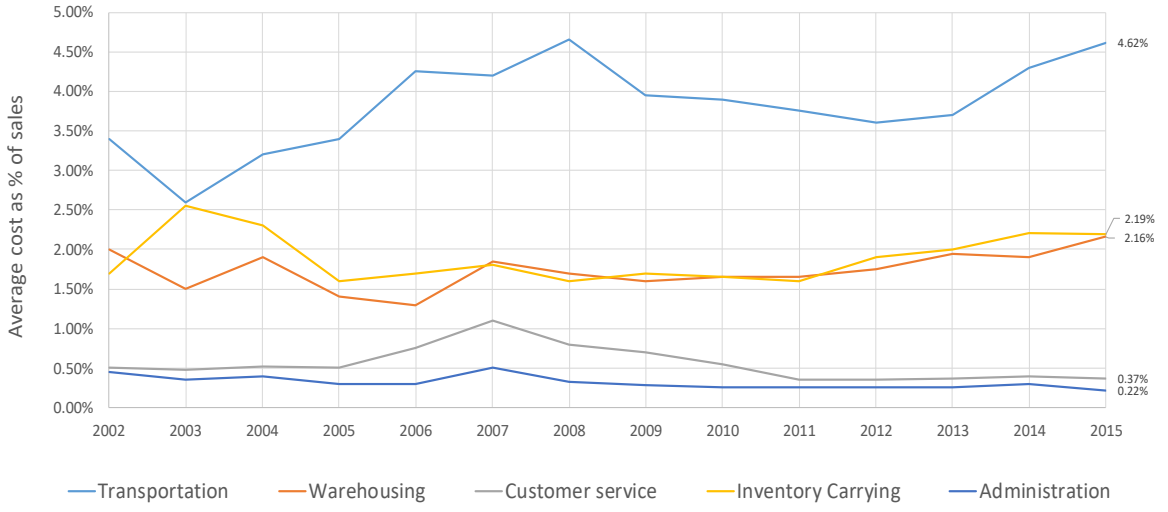


Figure 6: Breakdown of Average Cost as a Percentage of Sales, adapted and redrawn from [21]

2.1.1.4 Global Logistics

Logistics have been identified as an important management function by several successful international organisations. Public awareness has increased significantly over the past few years regarding the importance of logistics as well as the influence logistics has on strategic decision making. Many organisations are still unclear about the scope and responsibility of their logistics departments and are behind in gearing their service networks towards the logistical needs of their customers [22]. Logistics has a challenging market environment due to the ever-increasing global linkages of economic systems. This lead to more complex value chain systems which makes future developments more difficult. Possible future developments must be forecasted and understood early on to aid in facing global challenges efficiently and competitively. Leading to organisations having to develop strategies which must take advantage of existing and upcoming trends. Scope and duration are the core characteristics of a trend. The scope of trends can be classified into three main types [23]:

1. *Social Trends*: Trends that describe cultural and social changes.
2. *Consumption Trends*: Trends that show the impact of social trends on goods and services.
3. *Industry Trends*: Trends that reveal developments within an industry sector.

When observing economic and social developments which have a scope, on a global scale, and often occur over a long duration, possibly over a decade, it will be classified as a megatrend. The term mega-trend is adequately described as follows:

> *"A mega-trend is defined as a major shift in environmental, social and economic conditions that will substantially change the way people live. Megatrends are relevant to contemporary decision making and may prompt a rethink of governance models, business processes and social systems. A megatrend occurs at the intersection of many trends. A trend is defined as an important pattern of social, environmental and economic activity that will play-out in the future"*
>
> Hajkowicz [24]

Cross-border economic activities have increased drastically over the past century which has led to an extraordinary amount of goods traded globally resulting in the creation of numerous global value chains. With modern information systems and technology, transportation costs are decreasing, leading to global interconnected production systems appearing everywhere. Leading to organisations focussing on internationalisation of procurement, production, and sales to achieve growth in new markets, and

to gain a cost advantage over their competitors in new locations. When expanding globally, time is of major strategic importance for a successful company. The internationalisation process faces enormous time pressure, making it difficult to keep costs low, and essential to utilise assets as quickly as possible while implementing business strategies. A framework of the internationalisation process which breaks down the process into a series of activities focussed on gaining access to new foreign markets can be seen in Figure 7.

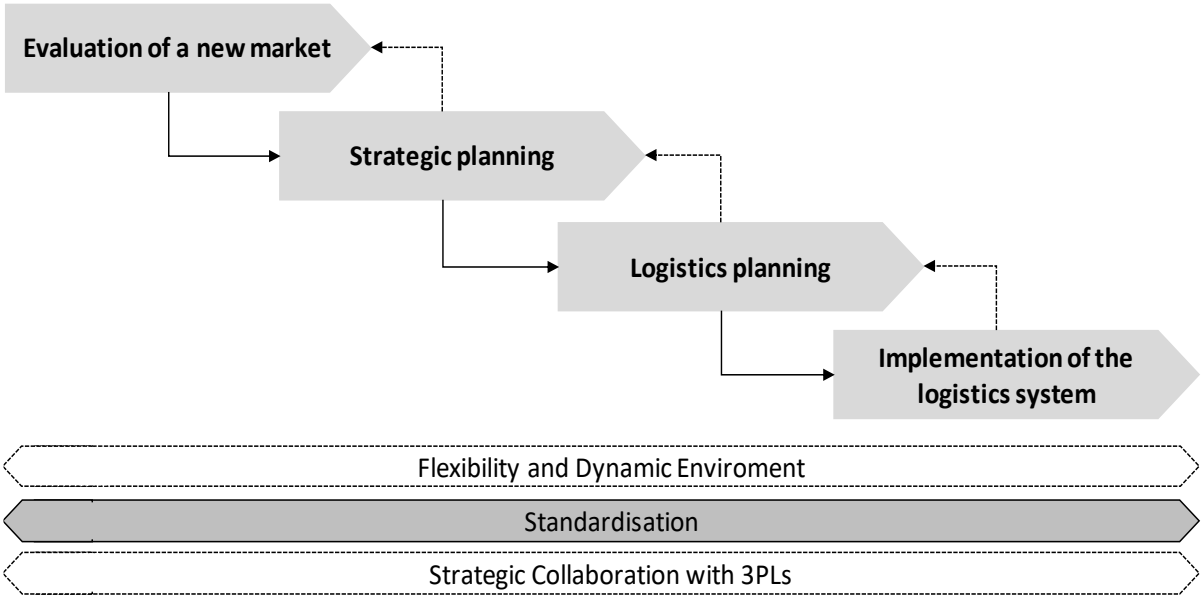


Figure 7: Framework of the internationalisation process, adapted and redrawn from [25]

The internationalisation process is much more complex than Miller's framework suggests as it also includes several business functions and interdependencies which are at play and difficult to analyse. A study of internationalisation of logistic systems was conducted [26] on how several German and Chinese companies enter foreign markets based on the four steps in Figure 7:

1. *Evaluation of a New Market*: This step begins with the idea of starting to work in a new region or area. The first step in internationalisation consists of a comprehensive market analysis evaluating the overall conditions of a proposed new market. If this analysis yields possible results with regards to the respective objectives of the organisation, the first step is concluded, and a decision to enter the new market will be made. It took the German and Chinese companies between five and six months on average to complete this step, resulting in it being the longest of all the steps
2. *Strategic Planning*: This step views entering the foreign market as a project. Thus, a schedule is created with defined milestones, budgets and objectives set in place. This step will result in a framework which will guide the various divisions of the organisation in developing approaches

to achieve the objectives to enter the foreign market. This is a much shorter step compared to the evaluation of a new market step as it on average took the companies less than four months to complete.

3. *Logistics Planning*: All logistic aspects such as inbound, in-house and outbound functions are defined, and an implementation approach is planned in this step. This step is reported to take the shortest time of only two months on average, which results in immense time pressure under which these often highly complex logistics structures must be planned.
4. *Implementation of the Logistics System*: This is the final step where the plans and decisions made in the previous steps are put to the test to see if they can meet the requirements and challenges faced in the real world. All the work undertaken in this step occurs at an operational level. It is important for the organisations to have a well-balanced team able to adapt to unexpected difficulties which always appear. The final step is complicated and volatile to unexpected changes which make it challenging and time-consuming resulting in an average duration reported to be between four and five months.

Overall the study reported German companies taking slightly longer to complete their internationalisation process lasting an average of 18 months, while the Chinese companies completed their internationalisation process in 14 months on average. Both companies agreed that global logistics is a complex challenge. Thus, it is important to consider methods which can reduce the complexities faced. One proven method of reducing the complexity is through standardisation of the relevant processes [23]. Due to differences in market conditions and requirements in different regions and countries, it is essential to adapt globally standardised procedures to cater for local factors which may influence them.

2.1.2 Supply Chain Management (SCM)

The term 'supply chain' was briefly touched in the previous section, but is important to have more than a conceptual understanding of the phrase and to exactly understand what exactly the term 'supply chain' refers to. This section firstly attempts to give an understanding of supply chain management and then the specific focus will be placed on the drivers and metrics commonly used within SCM.

2.1.2.1 Understanding SCM

In the 1990s service providers and manufacturers realised that they could not effectively compete in a global market while operating in isolation from their supply chains. It became essential to improve their

procurement and supply functions by integrating other functions such as physical distribution and logistics which resulted in a new concept known as SCM [27]. A supply chain consists of every party which is involved in fulfilling a customer's requests, be this directly or indirectly. Therefore, a supply chain does not just include manufacturers and suppliers, but all other role-players such as the warehouses, transporters, retailers and finally the customers themselves. The supply chain also includes all the functions involved with completing a client's request. These features are numerous and include, amongst other, marketing, product development, finance, customer service, distribution and operations.

> *"Supply chain management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers. Supply chain management integrates supply and demand management within and across companies."*
>
> The Council of Supply Chain Management Professionals [15]

A typical supply chain involves a variety of stages which most commonly includes the following:

- Suppliers
- Manufacturers
- Distributors (3PL)
- Retailers
- Customers

Each of these stages has one or more independent firms which are involved from the manufacturing of a product to delivering it to the consumer at the end of the supply chain. A supply chain can be viewed as an integrated manufacturing process in which raw materials are transformed into sellable products which are then finally delivered to the end user. At its highest level, a supply chain consists of two cohesive processes [28]:

1. *The Production Planning and Inventory Control Process* which focusses on the manufacturing and storage sub-processes. Production planning encompasses the design and management of the manufacturing processes. Inventory control encompasses the development and administration of the storage facilities.

2. *The Distribution and Logistics Process* plans and manages how products are transported from the warehouses to distribution centres or directly to retailers.

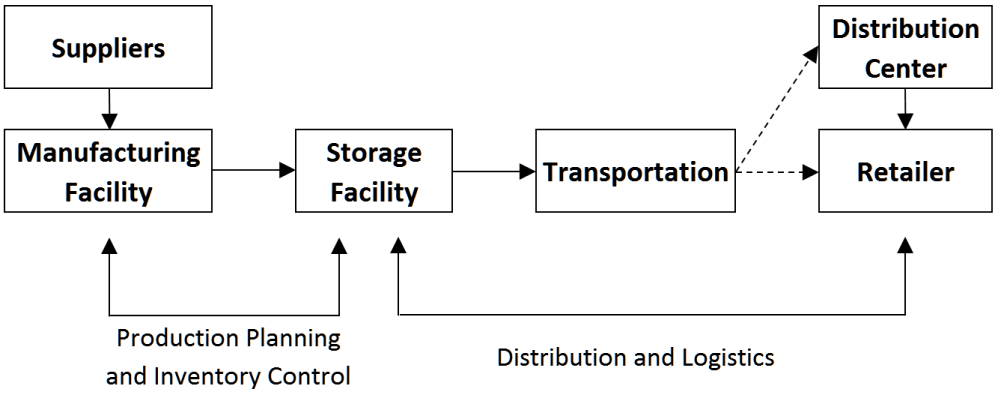


Figure 8: The Supply Chain Process, adapted and redrawn from [24]

Each stage of the supply chain is connected through the flow of goods, information and funds. A supply chain is not a linear process. Instead, the flow occurs in both direction and is managed by one of the stages themselves or an intermediary. A supply chain can consist of multiple organisations of the same stages interacting with each other. Figure 9 represents the stages in a supply chain; it is not essential for each link in Figure 9 to be present within a supply chain.

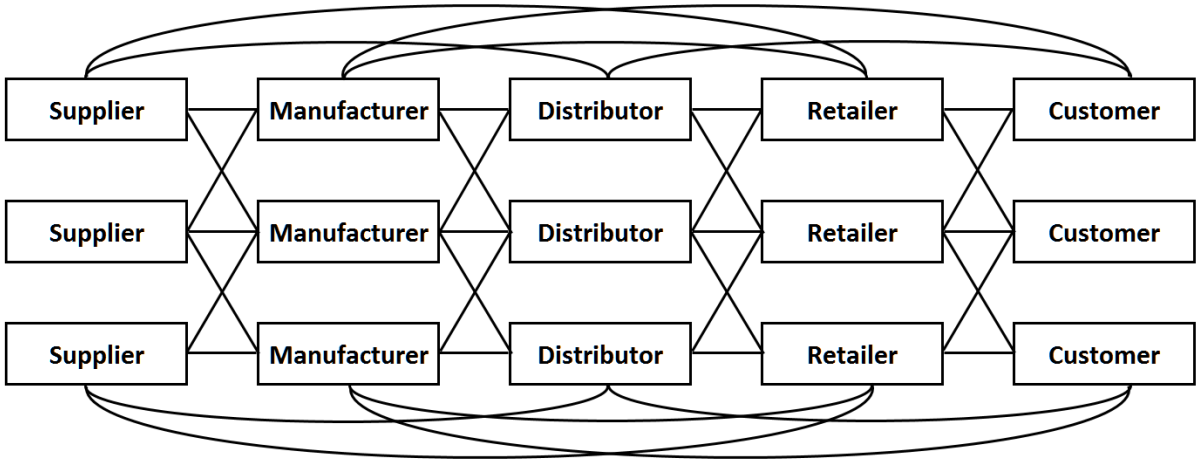


Figure 9: Supply Chain Stages, adapted and redrawn from [29].

The objective of any supply chain is to maximise the overall value generated throughout the supply chain. The generated value of a supply chain is the difference between the value of the final product delivered by the supply chain and the costs incurred by the supply chain throughout the process of completing the product. The value of the final product will differ for each customer based on how much they are willing to pay for it. Supply chain profitability is the total profit which is shared across all the

supply chain stages. The more successful the supply chain is, the higher its profitability will be. It is important not to measure the cost-effectiveness of a supply chain at an individual stage but over the whole extent of the supply chain.

A supply chain represents a sequence of processes that take place between and within a stage. There are two ways these processes are commonly viewed in a supply chain. The first view divides the processes that occur between stages into process cycles. Given the five stages in a supply chain, all the processes can be divided into four process cycles as seen in Figure 10. Each one of these cycles occur between two successive stages in the supply chain. It is possible for a supply chain to not have one of these cycles. For example, some 3PLs may sell directly to customers and thus bypass the replenishment cycle. When considering operational decisions, a cycle view becomes useful as it specifies the roles of each member in the supply chain as well as the desired outcome for each process.

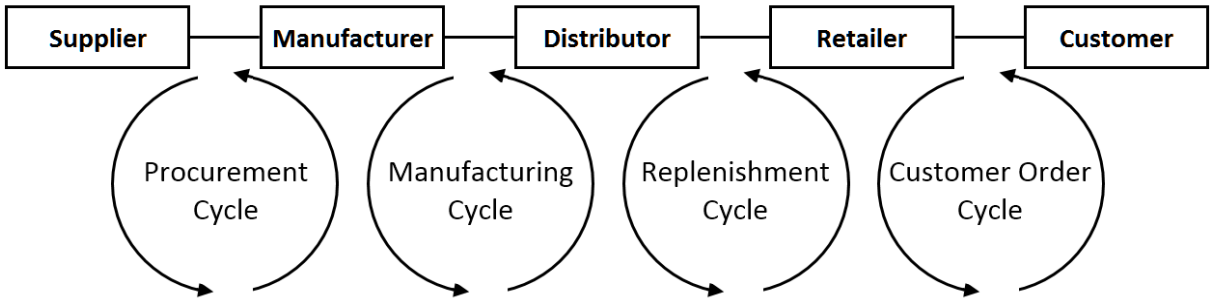


Figure 10: Cycle View of a Supply Chain, adapted and redrawn from [29]

The second view simplifies the processes supply chain into two categories depending on whether they are implemented in anticipation of a customers' order or in response to a customers' order. This is called the Push/Pull view, illustrated in Figure 11. Pull processes occur when customers place orders whereas push processes are implemented in anticipation of customer orders. The point in a supply chain which separates the push and pull processes is called the push/pull boundary. Push processes operate in an uncertain environment as customer demand is fickle and can change easily. Pull processes already know the customer demand. However, they are often constrained by inventory and capacity decisions that were made in the push phase. An example of a push environment is a make-to-stock setup, and an example of a pull environment is a build-to-order configuration. For these different setups, the push/pull boundary will shift to a side depending on the environment and setup. A make-to-stock setup will shift the border to the right whereas a build-to-order setup will shift the boundary to the left.

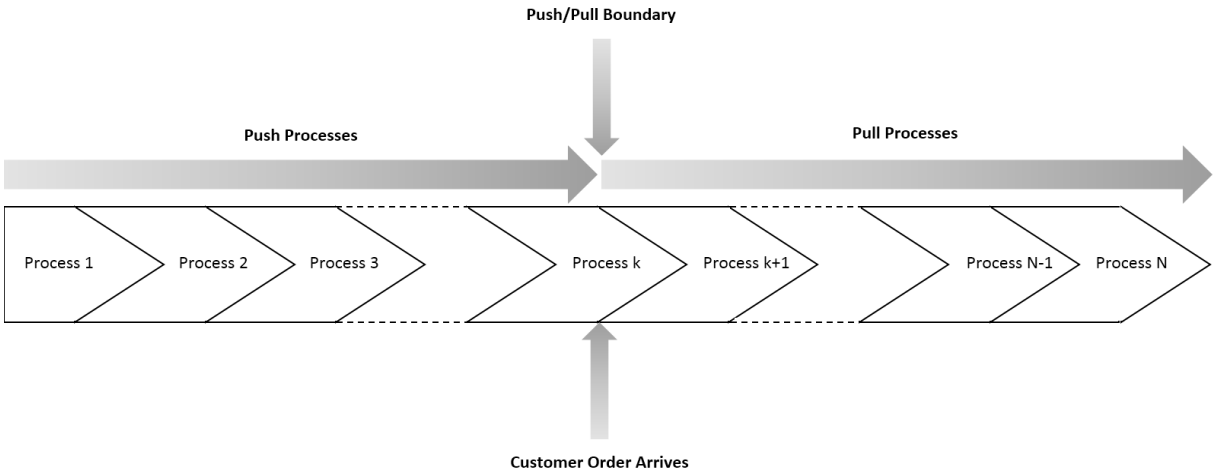


Figure 11: Push/Pull View of a Supply Chain, adapted and redrawn from [29]

Apart from the stages and functions already discussed SCM requires many decisions to be made. These decisions influence the how the flow of information, products and funds will happen. Decisions in SCM are categorised into three decision phases depending on the frequency of each decision and the time frame during which a decision phase has an impact [29]:

- *Supply Chain Strategy or Design*: Also, known as the configuration phase, in this phase the company will decide how they want to structure their supply chain over the next several years. This includes decisions concerning the company's allocation of resources, which processes will be performed in which stage, whether to make use of out-sourcing, location and capacities of production and warehousing facilities and much more. These decisions are typically done for the long term and are expensive to change on short notice.
- *Supply Chain Planning*: Also, known as the planning phase, decisions made in this phase typically have a time frame between a quarter or whole year. This means that any decision made in the configuration phase is already fixed. The planning phase is started with a forecast for the coming year consisting of expected demand, costs, prices and other predictable factors. This phase will then consist of making decisions regarding which markets will be supplied from which locations, subcontracting of manufacturing and transportation, inventory policies to be followed, and timing and size of marketing and price promotions. Working with a smaller time frame, planning decisions are more flexible and attempt to optimise performance.
- *Supply Chain Operation*: Known as the operational phase, the period for these decisions is less than a month. Companies will decide regarding individual customer orders. On this level, the supply chain configuration is fixed, and planning policies should be in place. Decisions in this phase will include allocation of inventory and production for single orders, setting of dates when orders must be fulfilled, organising of picking process in warehouses, setting delivery

schedules for trucks amongst other. With the given constraints from the configuration and planning phase, the operational phase attempts to exploit the reduction of uncertainty and optimise performance.

2.1.2.2 Drivers and Metrics for SCM

The goal of a supply chain is to add value to the product, therefore to increase profit while decreasing expenses. This makes it important to have several methods available to measure the financial performance of a supply chain. Many financial measures which impact supply chain performance are regularly reported by companies. The key financial measures can be determined in any business [29]. The first important financial measure is the return on equity (ROE) ratio, equation (1). ROE measures the return on investments made by a company's shareholders and is the main measure of a company's performance. If the ROE ratio increases, it indicates an increase in the return of shareholders' funds which is preferable to a negative ratio which indicates a decrease of shareholders' funds.

$$\boldsymbol{ROE} = \frac{\boldsymbol{Net\ Income}}{\boldsymbol{Average\ Shareholder\ Equity}} \tag{1}$$

Return on Assets (ROA) ratio, equation (2), is used to measure the return earned on each dollar invested by the company in assets. ROA can be rewritten as the product of two other ratios, profit margin and asset turnover which is more commonly reported by companies thus leading to equation (3). The higher the ROA of a company, the better it is at utilising its assets.

$$\boldsymbol{ROA} = \frac{\boldsymbol{Net\ Income} + [\boldsymbol{Interest\ expense} \times (\boldsymbol{1} - \boldsymbol{Tax\ Rate})]}{\boldsymbol{Average\ Total\ Assets}} \tag{2}$$

$$\boldsymbol{ROA} = \frac{\boldsymbol{Earings\ Before\ Interest}}{\boldsymbol{Sales\ Revenue}} \times \frac{\boldsymbol{Sales\ Revenue}}{\boldsymbol{Total\ Assets}} \tag{3}$$

Accounts payable turnover (APT) refers to an amount that still must be paid to suppliers for goods already sold, equation (4). This ratio is a good indicator of a company's financial leverage.

$$\boldsymbol{APT} = \frac{\boldsymbol{Cost\ of\ Goods\ Sold}}{\boldsymbol{Account\ Payable}} \tag{4}$$

Another important measure is the cash-to-cash (C2C) cycle, equation (5), which can be used to roughly measure the average amount of time from when cash enters the process as a cost until in returns as revenue. The shorter the C2C cycle is, the better a company's financial leverage will be. A shorter C2C cycle will result in a better APT ratio which allows the company to operate without having to take on

debt in the form of loans as they can make use of the money they have not paid to their suppliers yet. Key components needed when working with C2C is the assets receivable turnover (ART), inventory turnover (INVT), and property, equipment turnover plant and (PPET), which can be seen in equation (6), (7) and (8) below respectively.

$$\boldsymbol{C2C} = -\frac{\boldsymbol{Weeks\ Payable}}{\boldsymbol{APT}} + \frac{\boldsymbol{Weeks\ in\ Inventory}}{\boldsymbol{INVT}} + \frac{\boldsymbol{Weeks\ Recievable}}{\boldsymbol{ART}} \tag{5}$$

$$\boldsymbol{ART} = \frac{\boldsymbol{Sales\ Revenue}}{\boldsymbol{Accounts\ Recievable}} \tag{6}$$

$$\boldsymbol{INVT} = \frac{\boldsymbol{Cost\ of\ Goods\ Sold}}{\boldsymbol{Inventories}} \tag{7}$$

$$\boldsymbol{PPET} = \frac{\boldsymbol{Sales\ Revenue}}{\boldsymbol{PP\&E}} \tag{8}$$

Equation (1) through until equation (5) were extracted from Correia et al. [30]. An important ratio which is not discussed by Correia et al. is return on investment (ROI). ROI is the net profit after tax divided by the total capital invested. ROI is used to measure a company's efficiency when it comes to utilising the invested capital. Thus, it is used to express the company's ability to generate the required return based on their effectiveness in using the invested the resources of the various stakeholders [31]. The equation for ROI can be seen below in equation (9).

$$\boldsymbol{ROI} = \frac{\textbf{Net Profit After Taxes}}{\boldsymbol{Total\ Invested\ in\ Capital}} \tag{9}$$

Another important consideration to take account of when working with a supply chain is the balance between efficiency and responsiveness. By examining the logistical and cross-functional drivers of a supply chain, it becomes possible to improve the supply chains performance based on finding an ideal balance between the efficiency and responsiveness of the supply chain. The drivers for supply chain performance is; facilities, inventory, transportation, information, sourcing, and pricing [29]. These drivers interact with each other and determine supply chain performance based on efficiency and responsiveness as well as influencing the financial measure discussed earlier. Each of these drivers has a specific role in the supply chain which has a certain effect on the performance of the supply chain, this relationship and the definition of each driver is discussed below:

- *Facilities*: Physical locations within a supply chain network where products are assembled, created or stored. The supply chains performance is influenced significantly by decisions surrounding the role, location, capacity, and flexibility of facilities. When looking at the role facilities play in the supply chain, inventory is 'what' is being moved through the supply chain,

transportation is 'how' it gets moved along, and then facilities are the 'where' of the supply chain. In the facilities, either inventory is transformed into another state (manufacturing facility), or it is stored until needed (storage facility).

- *Inventory*: Comprehends all forms of raw materials, work in progress, and finished goods in a supply chain. Any changes made to the inventory policies can have a drastic effect on the supply chain's performance, because being under or overstocked will result in extra expenses and loss in revenue. The only reason inventory exists in a supply chain is due to a mismatch between demand and supply. This mismatch is intentional as it is used to increase the demand that can be satisfied by having extra products available when customers order more than expected. It also increases customer satisfaction as they get their orders quickly and it allows costs to be reduced by exploiting the economies of scale during production and distribution. A high level of inventory will be more responsive while a lower level of inventory will be more efficient.
- *Transportation*: Involves all processes of moving inventory from one point to another within a supply chain. Transformation can be formed out of many combinations of routes and modes, each with its performance characteristics. Different transportation options will have a large effect on the performance of the supply chain. Faster transportation will result in a supply chain becoming more responsive but less efficient. The type of transportation also influences the facilities and inventory. The setup required between having trucks deliver goods or making use of trains is enormous.
- *Information*: Is comprised of data regarding surrounding facilities, inventory, transportation costs, prices, and customers throughout the supply chain. Information is one of the biggest drivers of performance as it directly affects all the other drivers. An excellent information network is priceless. It can help to improve the utilisation of all the assets in the supply chain and improve the coordination of supply chain flows to increase responsiveness and reduce costs.
- *Sourcing*: Is the decision of who will perform a specific activity within a supply chain such as production, storage, or transportation activities amongst others. These decisions determine what function will be done by whom, selecting the right or wrong people to do a job will have a massive effect on the overall performance of the supply chain. It is important to decide whether a task must be performed efficiently or responsively, then it needs to be determined whether it is required to do the task internally or make use of a third party.
- *Pricing*: Regulates how much will be charged for the services provided or goods created in a supply chain. Pricing directly affects the behaviour of buyers, this makes it crucial to not over, or under charge for service or products, hence it has a significant influence on the supply

chain's performance. Pricing is a powerful lever that can be utilised to match supply and demand which is especially useful in a supply chain which is not very responsive. Short-term discounts and sales can be used to get rid of surpluses, and the price can be increased when shortages of certain products occur.

The aim of managing supply chain drivers is to achieve a balance between efficiency and responsiveness which will minimise costs and thus help to maximise profit. Each one of the discussed drivers affects this balance.

2.1.3 Supply Chain Operation Reference (SCOR) Model

When working with SCM, SCOR is seen by many as the most promising model for supply chain strategic decision-making [32]. SCOR is well-known and respected globally with 70 of the world's leading manufacturing companies utilising it, and as such is one of the first reference materials in SCM [33]. The supply chain council (SCC) developed SCOR and claim that SCOR integrates the many well-known concepts of business processing re-engineering, benchmarking, and measurement into a multifunctional framework which defines the processes rather than the functions [34]. SCOR is a reference model. Therefore its purpose is to describe the processes of business in such a way that it can be understood by any role-players in the industry. It looks at the architecture of business, how processes interact with each other, how good processes perform, how each process is configured and what skills are required of staff to operate the process. The SCOR model consists of four main sections;

1. *Performance*: gives a clear description of process performance and defines strategic goals.
2. *Processes*: describes how processes relate as well as management processes.
3. *Practices*: indicates what management practices will produce better process performance.
4. *People*: defines the skill requirements to perform the processes.

2.1.3.1 Performance

The performance section focuses on the outcomes achieved by the supply chain and how to go about measuring them. The performance section consists of two elements namely attributes and metrics. Performance attributes are used to different group metrics which influence strategic direction. Thus, attributes cannot be measured, but only provide strategic direction. There are five performance metrics in SCOR which are discussed in Table 1 below.

Table 1: SCOR Performance Attributes, adapted and redrawn from [35].

Performance Attribute	Definition
Reliability	The aptitude to complete a task as anticipated by the customer. Reliability is mainly concerned with how close to the expected results a task can be completed. Common metrics used to measure reliability include; completing a task on time with the right quantity and quality products produced.
Responsiveness	How quickly a task can be completed. Responsiveness focusses on the speed that can be accomplished by a supply chain to provide products to its customers. Thus, it will mainly concentrate on optimising various cycle times.
Agility	How well a company is structured to react to external influences. Meaning the ability to adapt to changes in the marketplace to maintain or increase their market share. Adaptability and flexibility are the main metrics for agility.
Costs	All expenses associated with operating a supply chain. Costs include management, transportation, labour, and material costs. An example of a cost metric is a cost of raw materials.
Asset Management Efficiency	Assets management includes insourcing vs outsourcing and inventory reduction within a supply chain. Common metrics will include the utilisation of available capacity and the inventory days of supplies.

Metrics are used by SCOR as a standard to measure the performance of a process. These metrics are structured hierarchically which consists of three levels which are defined as follows:

- Level 1 metrics are used to diagnose the overall performance of a supply chain. These metrics are known as key performance indicators (KPI)
- Level 2 metrics diagnose level 1 metrics. This helps to identify areas which are under performing in level 1 metrics.
- Level 3 metrics serve the same purpose as level 2 metrics, but just on a lower level to provide an even more in-depth analysis.

When looking at the scope of SCOR it does not attempt to stipulate how a company should run, but it rather gives guidelines for the company to follow to improve operations. It is advised to tailor the SCOR model at least to the fourth level using attributes unique to the enterprise. Table 2 indicates how SCOR operates on the stated levels.

Table 2: SCOR Hierarchical Structure, adapted and redrawn from [35].

#	Description	Examples	Comments
1	Process Types (Scope)	Plan, Source, Make, Deliver, Return and Enable	Level 1 defines the scope and content within a supply chain. At level 1 the basis-of-competition performance targets for a supply chain are set.
2	Process Categories (Configuration)	Make-to-Stock, Make-to-Order, Engineer-to-Order, Defective Products, MRO Products, Excess products	Level 2 defines the operations strategy. Here the process capabilities for the supply chain are set.
3	Process Elements (Steps)	Schedule Deliveries, Receive Products, Verify Product, Transfer Products, Authorise Payment	Level 3 defines the configuration of the processes individually. Here the ability to execute is set, this level focusses on; processes, inputs and outputs, process performance, practices, technology capabilities, and skills of the staff.
4	Activities (implementation)	Industry-, company-, location-, and/or technology specific steps	Level 4 describes the activities which are performed in a supply chain. Companies implement Industry-, company-, location-, and/or technology specific processes and practices to achieve the required performance

SCOR identifies ten key strategic, level 1, metrics within the five attributes as can be seen in Table 3.

Table 3: Strategic Metrics, adapted and redrawn from [35].

Attribute	Level 1 Metric
Reliability	Perfect Order Fulfilment
Responsiveness	Order Fulfilment Cycle Time
Agility	Upside Flexibility
	Upside Adaptability
	Downside Adaptability
	Overall Value-at-Risk
Cost	Total Cost to Serve
Asset Management Efficiency	Cash-to-Cash Cycle Time
	Return on Fixed Assets
	Return on Working Capital

2.1.3.2 Processes

This section consists of a set of clear descriptions of various activities aimed at helping a company to execute their supply chains effectively. The activities in this section are performed by most companies. These activities are organised around six primary management processes discussed in Table 4.

Table 4: Level 1 Processes in SCOR, adapted from [35].

Process	Description
Plan	Describes any activity which associates with the development of plans regarding how the supply chain should operate. This process includes the gathering of information on resources and requirements. Finding ways to balance these resources and needs while determining the gaps and capabilities in the resources and demands and finally identification of actions which can fill the gaps.
Source	Describes all processes regarding the scheduling, ordering and receiving of services and goods. This process is compromised of the purchasing of orders, scheduling of deliveries, the receiving, checking and storage of supplies, and accepting and checking the invoices from suppliers.
Make	Describes any activity which associates with the creation of content for services or conversion of material for products. The term 'conversion of materials' is used instead of make or manufacture as the 'Make' process encompasses every type of material conversion: Refurbishments, overhaul, maintenance, assembly, remanufacturing, recycling, repair and any other common material conversion process. These processes are recognised by the fact that one or more items go in and one more different items will then come out.
Deliver	Describes any activity which associates with the creation, maintenance and completion of a customer's order. Thus, this process is an embodiment of the receipt, authentication, creation of a customer's order, delivery schedule, pick and pack, shipment, and finally invoicing the customer.
Return	Describes any activity which associates with the process of returning goods to a supplier. This process is concerned with identifying the need to return items, the decision making around this, the schedule and shipment of returned goods, and obtaining receipts for returned goods.

Figure 12 shows the relationships between these six management processes. By using these processes, it is possible to describe a complex or simple supply chain with a common set of definitions. This makes it possible to compare supply chains from various industries with each other. It establishes a standard for companies to use on a global scale which reduces miscommunication and simplifies the process.

This approach includes all processes regarding interactions with customers and suppliers, all material transactions from supplier's suppliers to customer's customer, and all market interactions. It is important to note that all business processes such as research and development, product development and sales and marketing are not covered.

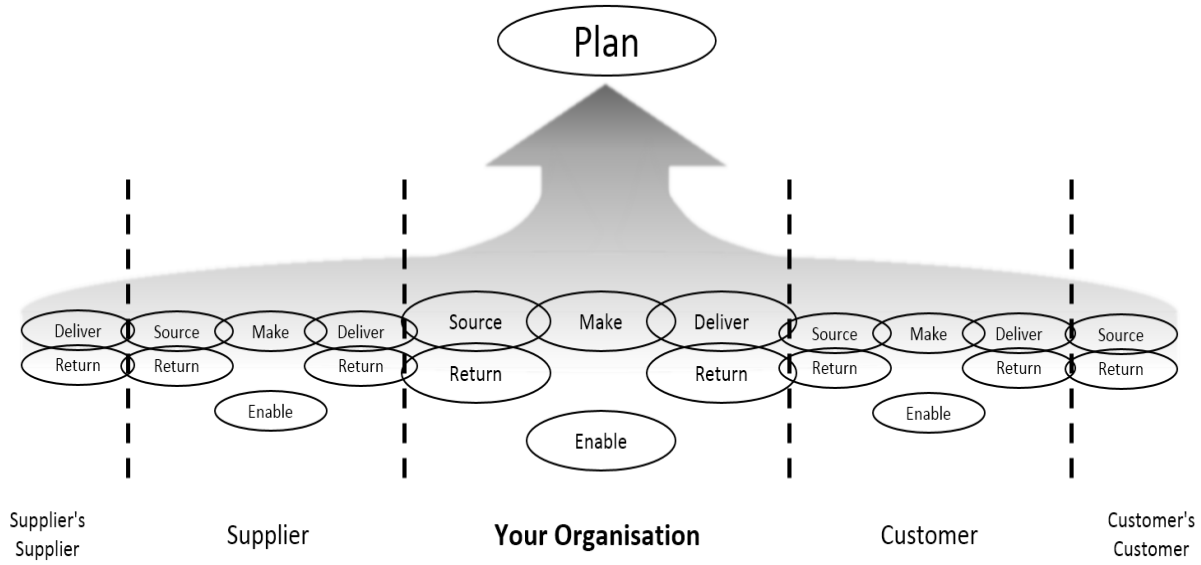


Figure 12: Management Processes of SCOR, adapted and redrawn from [35].

2.1.3.3 Practices

Practice refers to the unique way in which a process or a set of processes are configured. There are many factors which contribute to the uniqueness of a practice. The different technologies which are applied in the process. The unique sequences which are followed when performing a practice. Special skills which are applied to the process. The level of automation in the process. Lastly, the unique method used when connecting and distributing processes between different organisations. All the practices are closely linked to at least one or more processes. SCOR recognises that several different practices exist as can be seen in Table 5.

Table 5: Practices Found in SCOR, adapted and redrawn from [35].

Practice	Description
Emerging	Emerging practices present new technologies, knowledge or radically different ways to organise processes. By introducing new ideas to an organisation, emerging practices can lead to changes in steps in 'Performance'. It is commonly difficult to adopt emerging practices because new technologies and methods are commonly trademarked by other organisations or due to complicated methods which require specially trained personnel. Emerging practices commonly still need to be proven in the new environments and organisations it finds itself in. Emerging practices have a high-level of risk, but also a high-level of results.
Best	Best practices are the time-tested practices which have proven themselves to have a positive impact on the supply chains performance. There are four types of best practices to be found; • *Proven*: Demonstrated that they work and are linked to key metrics. • *Current*: Work and are not yet outdated. • *Repeatable*: Proven in different industries and organisations. • *Structured*: A stated goal, scope, process, and procedure is featured. Best practices have a moderate-level of risk and a moderate-level of results.
Standard	Standard practices refer the practices which companies have been using over an extended period. These practices are well-established over time and do the job, they are not expensive or complicated to use, but they also won't provide a company with a competitive advantage compared to other practices. Standard practices normally have a low-level of risk and subsequently also a low-level of results.
Declining	Declining practices represent different ways of doing business that has proven over the years to result in inadequate supply chain performance as indicated by key metrics. Declining practices have a high-level of risk with a low-level of results.

It is important for an organisation to find the right balance between results and risk. Best practices are believed to have achieved this balance by finding the ideal middle ground between emerging, standard and declining practices. Figure 13 shows this relation.

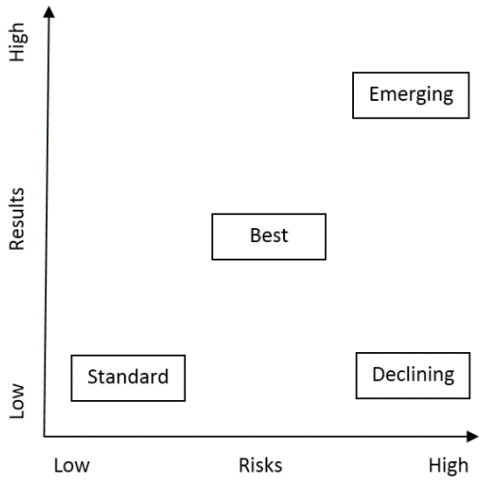


Figure 13: Results VS Risk of Different Practices, illustration from [31]

2.1.3.4 People

SCOR introduces various standards for managing talent in a supply chain within its people section. The practice reference, process reference, and metrics reference are complimented by the people section with its integrated view of supply chain skills categorised into four areas. The first category focusses on the baseline skills necessary for the overall and individual process areas, thus planning and sourcing. Then there is the critical skills category which when identified in a person differentiates them from those who only perform at a baseline level; these people will end up in leadership positions. The next category makes use of performance measures by using SCOR metrics that can relate to the continuous growth? Of an employee work performance in each process area. The last category is the credentialing of supply chain skills; this includes certification and training programs which relate to the specific process areas that indicate a superior job performance. Each of these categories consists out of four elements which are used to measure each one, the elements are discussed in Table 6.

Table 6: Key Elements in SCOR's People Section, adapted and redrawn from [35].

Element	Description
Skill	Skill is the ability to with minimal input of time and effort achieve a set of pre-determined objectives. Skill is further defined by experience, aptitude and training. **Examples: Risk mitigation, production planning and master scheduling**
Experience	Through active participation and observation people build up knowledge or the ability to do something, this is called experience. Experience can only be acquired by working in a real-life environment where one undergoes changing situations which require different actions. Experience cannot be learned but must be lived. **Examples: Hazardous materials handling, cross docking and cycle counting.**

Element	Description
Aptitude	This is the ability to perform a certain task at a certain level which comes naturally to a person, or it can be learned, developed and acquired. **Examples: Accuracy, analytical, and natural leadership.**
Training	A skill or behaviouristic is developed through instruction. **Examples: Formal training, certification, courses and on-the-job training.**

SCOR also makes use of competency level to describe how competent an employee is to perform a certain role based on each of the elements mentioned above. SCOR has five commonly accepted competency levels:

- Novice level
- Beginner level
- Competent level
- Proficient level
- Expert level

2.1.4 Routes-to-Market (RTM)

RTM in its most basic understanding allows a company to take their goods or services to market in the most efficient method available. With a clear understanding of logistics, SCM, and SCOR, the theory of RTM can be explored and understood. RTM consists of the processes undergone by which a product or service is selected, purchased, ordered, and finally received by a customer [36]. Therefore, RTM is a representation of the channels used to reach a customer base. It is therefore important to understand the concept of RTM and how it can be applied in Africa specifically. As production costs have decreased over the past few years, the distribution costs have increased. This has resulted in almost half the market price a consumer ends up paying, now comes from the expenses associated with getting the products to market [37]. It is essential for organisations to adopt RTM practices to reduce costs and improve their overall efficiency. RTM is characterised by four main qualities [38]:

1. *Market Driven*: Customer satisfaction is one of the key focus areas of RTM. RTM considerations are developed with the end customer in mind to ensure that customer satisfaction does not lose out to other factors such as ease of implementation. To fully understand the customer base, customers are carefully characterised according to their market segment, location, sales volume, stock capacity, profitability and potential growth.
2. *Coherent*: RTM makes use of a framework which makes use of both bottom-up and top-down logic to ensure customer satisfaction. This framework can be seen below in Figure 14. Decisions flow down from the strategic goals to guide development and operational

capabilities. The operational capabilities support the flow from the bottom-up shaping the model and value offerings thereby determining the strategic aims of the company. This results in a synergy between operational capabilities and strategic goals of the company.

3. *Balanced*: Economic feasibility must be balanced with customer service to ensure maximum efficiency. The cost to service a certain market segment of a customer must be the main factor which decides if the segment or customer is worth servicing. It is important also to consider the potential and revenue growth of a segment or customer. Both mentioned factors are driven by customer satisfaction. In short, the success of RTM is determined by how well it can balance a multitude of influential factors.
4. *Flexible*: Numerous external factors create several additional complexities which cannot always be foreseen. Any competitors force companies to adapt and stay innovative, or they will be left behind. As a company grows so too will its customer base grow and develop different needs. All these factors make it abundantly clear that one of the most important qualities of a RTM must be its flexibility. Flexibility will allow a company to be responsive to any change in strategy, customer needs and internal growth.

Figure 14: High-level framework for RTM, adapted and redrawn from [38]

2.1.4.1 3PL role to its customers

3PL are utilised as the key link in the RTM channel. Therefore 3PL is regarded as a go-between that services other smaller go-betweens, such as retailers or wholesalers, in-between the supplier and customers. 3PL act as a one-stop for their customers as they satisfy several needs of their customers at once. Many of their customers are small retailers, wholesalers and independent traders who cannot

manage the complexity and afford the cost of sourcing stock from numerous 3PLs. Therefore, it is more efficient for them to build lasting relationships with a small number of 3PLs who can satisfy all their needs. For the 3PL, several service opportunities exist [39]:

- *Breaking Bulk*: Embedded in the value offering of the 3PL is the benefit to the 3PLs supplier and customer in the form of bulk breaking. It is standard practice for 3PLs to break down bulk into smaller quantities as required by the end-customers, such breaking down pallets of beverages into cases.
- *Credit*: One of the core benefits of 3PL is the ability to provide their customers with credit which enables them to stock-up on products without requiring the initial capital to finance the whole enterprise. It is common for traders to source from various 3PLs to maximise the available credit from each 3PL and thus further decrease their required capital.
- *Technical Support*: Technical support is commonly provided by most 3PLs and usually on a free and pre-sale basis. These systems are used to simplify the ordering process and ensure that the right products are delivered in the right volumes.
- *Logistics*: 3PLs will handle logistics differently depending on the industry and size of the 3PL. A small number of 3PLs require goods to be collected. When a 3PL is out of stock, and an order is received, they will order directly from their supplier and ship directly to the customer. It is hard for 3PLs to determine their exact shipping costs. Thus the amount charged is commonly an arbitrary figure which is designed so that it does not estrange customers.
- *Order Consolidation*: Order consolidation refers to giving customers the option to minimise their delivery cost by only sending out an order after all the goods from various suppliers are received and not sending it as it arrives piece for piece.

All the factors mentioned in the above section forms part of the price the customer pays when purchasing products. Any additional services required by the customers go beyond the core services which are expected and will thus attract extra costs. The additional services typically appear as competition increases, and the margin on the core business decreases forcing the company to find new sources of income to increase its profitability.

2.1.4.2 3PL role to its suppliers

The 3PL's primary role is to serve as a RTM for the supplier. The effectiveness of the 3PL will play a vital role for its suppliers in reaching a certain market segment or the whole market. The roles 3PLs play for

a supplier is characterised into three types [39] based on their business model, which is indicated visually in Figure 15:

1. *Value Added 3PL*: These 3PLs work with products which have large margins but move slowly. Therefore, the distribution channels for these products are limited to very few 3PLs operating in this specific market due to the small market size. This results in the 3PLs having to be highly proactive when it comes to building demand for the product through effective marketing and pushing sales of the product with a well-trained team in the sales and support areas. This results in the 3PL having to allocate time and resources into ensuring that they fully understand the product from both a marketing and technical side. With all the effort and time invested into these products, the 3PL expects a large margin on their sales especially due to the low initial volume.
2. *Broad Line 3PL*: These 3PLs work with products which have good margins and are in demand, thus not difficult to move. 3PLs such as this, who have significant market coverage with regards to a variety of products they move and size of the market they service are called broad line 3PL. These 3PLs focus on offering their clients a service which covers most, if not all, market segments which allow their products to be widely available. Several 3PLs will be found competing in a market segment which drives a price-competitive environment which leads to the lower margins compared to value added 3PLs. As a specific market matures, different broad line 3PL will consolidate with each other reducing the number of competitors and result in a shift of power to the 3PLs allowing them to negotiate discounts and rebates from the suppliers.
3. *Fulfilment 3PL*: These 3PLs work with products which have low margins and in high demand, commonly FMCG. Margins for these products are low resulting in the 3PLs running a high-volume and highly efficient operation, cutting costs wherever possible. For fulfilment 3PL to become profitable, they need to drive large volumes at small margins. Marketing is not part of the services offered by the 3PL, sales are mainly driven by price, availability and convenience of attaining the products. These 3PLs operate almost as logistical machines for their suppliers, whom themselves create brand awareness and demand for their products. Fulfilment operators differ in two main ways from a logistics company. Firstly, they balance supply and demand themselves through their inventory expertise to manage their stocking risk. Secondly, they make use of their local market expertise to manage their credit risks.

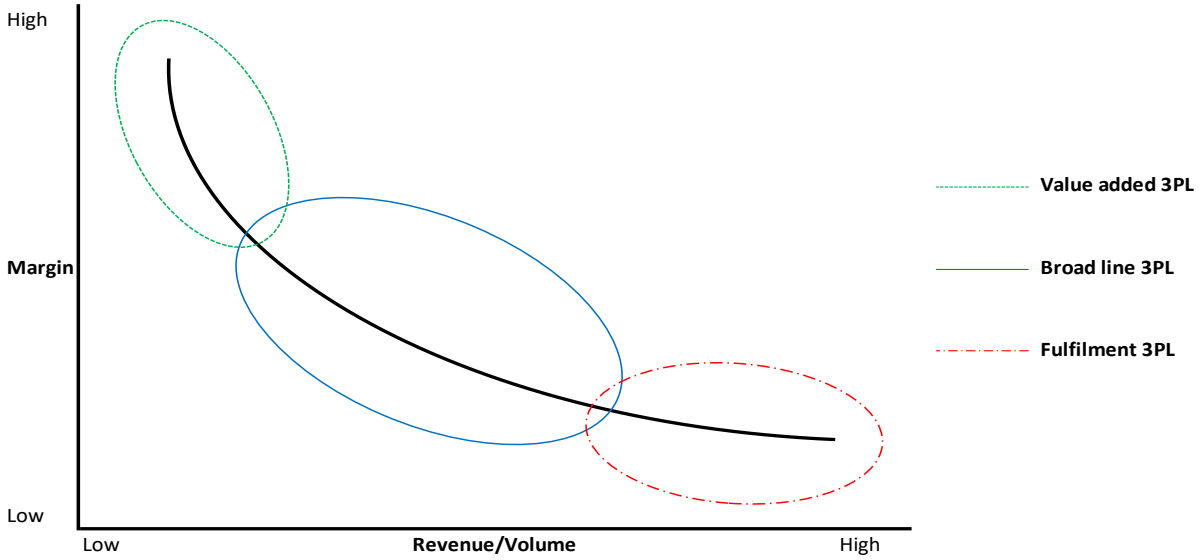


Figure 15: Spectrum of 3PLs defined by business model, adapted and redrawn from [39]

When suppliers start to move towards focusing on their core activities, they start outsourcing their non-core activities to 3PLs who become their logistical partners. This covers a broad range of activities which have varying costs and margins leading to 3PLs segmenting their business to focus on optimising specific segments. By choosing which segments to focus, 3PLs can align their business model and thus price to become more competitive. 3PLs perform many roles for their suppliers; these roles become clear when observing the different distribution types discussed above [39]:

- *Generation of Demand*: 3PLs can play an active part in the creation of demand depending on the product and territory, by creating awareness of the product and creating selling capability among its customers, who in turn drive sales amongst the end users. 3PLs are rewarded through means of discount or rebates when attaining sales targets set by their suppliers.
- *Fulfilment of Supply*: A supplier expects its 3PLs to carry most if not all its products to ensure its supply fulfilment. Certain products will have larger profit margins and higher demand than others, leading to a 3PL only wanting to stock certain products, but contracts may specify that most products must be stocked and pressed down the line as the higher margin on some products will cover the lower margin on others. This is a clear example of Pareto's law, which states that 20 percent of stock keeping units (SKU) will account for over 80 percent of the revenues generated [40].
- *Credit Risk*: By supplying numerous customers the 3PL takes the credit risk instead of the supplier. This firstly removes the credit risk for the supplier and the cost of implementing and maintaining their credit management structures, thus decreasing costs and bad debt for the supplier.

- *Market Information*: Accurate information is essential for any supplier who wishes to manage their supply channels efficiently. Therefore, it is essential for 3PLs to have information systems in place monitoring their sales and stock levels to gather the required information for their suppliers.

2.1.5 Logistic Service Providers (LSP)

The categorisation of LSPs is complicated by conflicting definitions and perspectives. One solution is to classify LSPs according to their scope of services offered. Therefore, the breadth of outsourcing opportunities is explored. The one extreme is identified by "total internal asset management". The opposing extreme is determined by "total external asset management". An example of the outsourcing continuum is further explored in Figure 16.

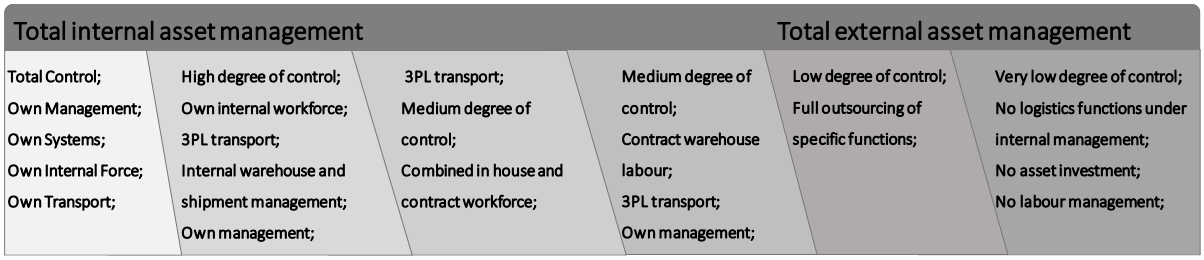


Figure 16: Continuum of logistics outsourcing, adapted and redrawn from [18].

The relinquishing of control poses an essential barrier to outsourcing. As the scope of outsourced functions grows, companies retain less control. Therefore, within the outsourcing continuum, control serves as a necessary differentiator among types of LSPs. Broadly LSPs can be classified as dedicated or multi-user operations [18] [43]. The choice between the two actions presents another crucial differentiating factor:

1. *Dedicated operation*: A complete logistics or distribution operation is provided by an external LSP. The sourced LSP offers the client all the necessary capabilities and resources. Additionally, the entire process is exclusive to the client company.
2. *Multi-user operation*: With a multi-user process, the service provider's process is comprised of multiple clients. Generally, LSPs attempt to group clients with similar needs to improve operational efficiencies.

Six unique arrangements have been identified within the outsourcing continuum. The methods are described as:

1. Own fleet.
2. Owner-driver.
3. Crowdsourced.
4. Distributor.
5. Third-party logistics (3PL).
6. Fourth-party logistics (4PL).

Companies can invest in their own fleet to perform logistics and distribution functions. This arrangement is characterised by total internal asset management and control. The first partial outsourcing arrangement is described as an owner-driver operation. It is like operating an own fleet, as it retains a significant proportion of logistics functions in-house. However, the responsibility for the delivery vehicle is shifted towards the owner-driver. An owner-driver operation provides ownership opportunities while retaining a high level of control over the delivery function.

Crowdsourcing refers to an Uber model tailored towards distributing products. Like owner-driver operations, the responsibility of the delivery vehicle is outsourced. Crowdsourcing describes an on-demand service, free of contracts. Therefore, the degree of control retained by the company is drastically diminished. However, the flexibility of the distribution function is substantially increased. With no formal contracts, the arrangement becomes a multi-user operation.

A 3PL service provider specialises in the integration of logistics activities. Activities typically include warehousing and transportation but may include value-added activities such as the procurement of goods. A distributor, 3PL and 4PL do not offer substantially different services. However, with regards to control and operation type, distinctions can be made. The highest degree of outsourcing is attained by employing a 4PL service provider. It is a non-asset service provider that manages a multitude of LSPs on behalf of the client company. High efficiencies are achieved through economies of scale and consolidation. Additionally, the cost of the entire operation is split among multiple clients. Similarly, distributors take over the entire logistics section of the company. However, distributors remain exclusive and only manage a small percentage of the total product output. This allows companies to still retain a degree of control. Companies can either partially or entirely outsource their scope of logistic functions to a 3PL. This creates a clear distinction between 3PLs and 4PLs, as 4PLs take over the entire logistics function. Although 3PLs are multi-user operations, they do not consolidate loads. A 3PL provides each of its clients a unique and exclusive service. Companies can choose the degree of control retained, by choosing which functions to outsource.

2.2 Third Party Logistics (3PL) Review

With Logistics, SCM and SCOR discussed in the previous sections, it is possible to take an in-depth look at 3PL. When working with logistics, outsourcing is one of the key factors an organisation must consider, due to the efficiency and benefits gained from outsourcing, especially allowing the company to focus on its core business practice [44]. This decision to outsource logistics activities resulted in the existence of businesses who solely concentrate on providing logistical services such as transportation and warehousing. This form of logistical outsourcing is not a new trend as it dates to the 1950s and 1960s where it was common practice to outsource warehousing and transportation [45]. At that time outsourcing was a simple commodity transaction, with logistics hardly forming part of an organisations business strategy. By the 1970s different organisations started to emphasise the value of cost reduction and improved productivity which led to a need for service providers who could offer more than just the basic services. The value of a lasting long-term relationship with service providers became apparent which led to service providers dedicating facilities for specific clients and giving a more personalised service. These service providers were then operating as a 3PL. In the 1980s supply chain optimisation became a new focus, but only within separate operations within an organisation. In the 1990s with the appearance of the internet and start of global sourcing a new form of logistics providers was introduced called fourth- and fifth-party logistics [46]. Figure 17 indicates the different types of logistics partners.

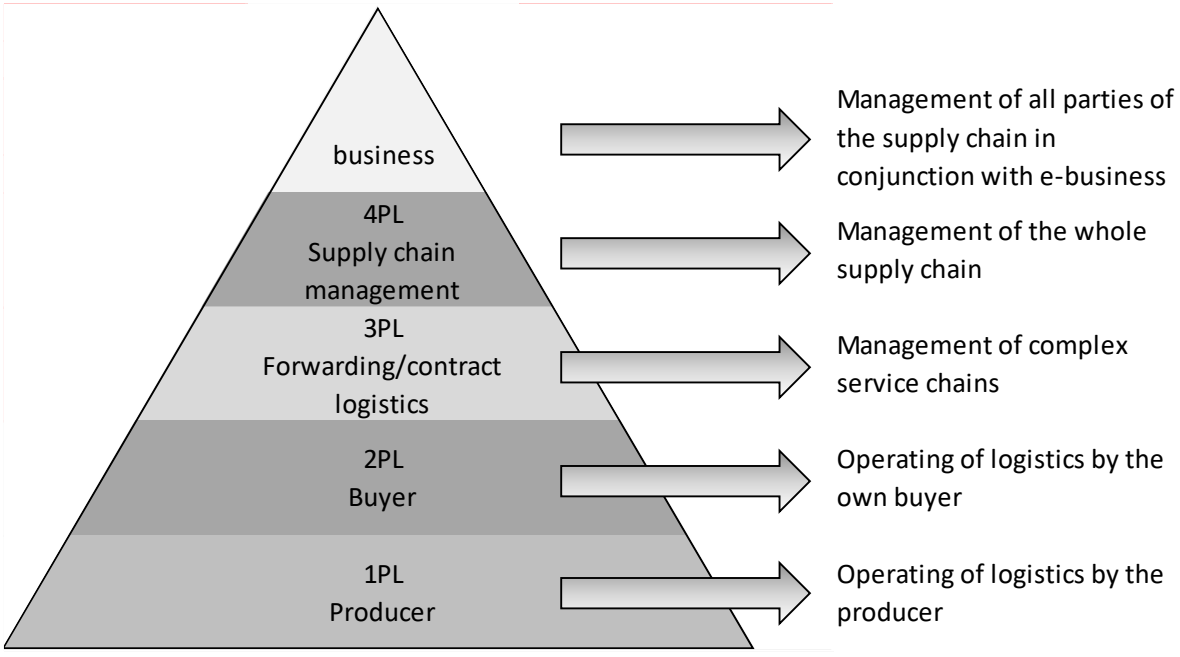


Figure 17: Types of logistics parties, adapted and redrawn from [46]

An accurate definition which describes 3PL for this thesis is:

> *"3PL is the function by which the owner of goods outsources various elements of the supply chain to a third-party logistics company that can perform the management function of the client's inbound freight, customs, warehousing, order fulfilment, distribution, and outbound freight to the clients."*
>
> Akman & Baynal [47]

A 3PL mainly specialises in the integration of several logistics services. The five main services they provide are; transportation, warehousing, distribution, value added services, and SCM services [48]. Consequently, it is important to initially gather a good understanding and background on each of these five services and what they entail. In recent years, much research was undertaken on 3PL [49], this research is mostly empirical-descriptive, and that usually lacks a theoretical foundation. A second study of 67 related articles on 3PL where 55 (82.09%) of the articles were found to be empirical compared to only 12 (17.91%) theoretical studies reinforce the claim that there is a lack of theoretical research done on 3PL [7].

2.2.1 3PL Types & Relationships

Before starting a relationship with a 3PL, it is important to investigate the different types of 3PLs to determine which one would be best suited to the business objectives. A classification for 3PLs regarding customer adoption is described below [11]:

- *Standard 3PL Providers*: This is the most basic form of a 3PL provider. The most basic functions of logistics are performed by them which includes picking, packing, warehousing and distribution amongst other.
- *Service Developers*: Advanced value-added services are provided by service developers to their customers in the form of services such as tracking and tracing, cross-docking and specific packaging amongst other.
- *Customer Adapters*: Thorough control of a company's logistics is taken over by a customer adapter. They provide specific services at the request of the customer. These 3PL providers improve the services which are in place but do not add new services. They often have a quite small customer base.
- *Customer Developers*: Seen as the highest form of 3PL providers, customer developers integrate themselves with their customers while taking over the whole logistics function. They

will perform extensive and very detailed tasks for their customers, but will only service a small number of customers.

It is essential for organisations to invest in the relationships they have with 3PLs with whom they contract. By building strong relationships, both organisations can help each other to grow sustainably, each having a reliable business partner who can help in troubling times. It is also crucial for organisations to support small businesses in remote areas, as the risk of losing a portion of the available market is high if they were to close. Good communication between both parties is crucial which is why information services and financial resources must flow back and forth between both sides if optimal efficiency it to be reached. Therefore, ssuccessful 3PL relationships doesn't happen by chance, these relationships must worked on. The success of a 3PL relationship depends on six key elements [50]:

1. *Mapping Out a Clear Process*: All parties must agree on the expectations of the relationships; thus, the first step is to have a discussion and agree upon these points. Both sides must agree on results and by when they must be achieved. It is important that both sides understand how decisions are to be made which will result in the best outcome for the relationship.
2. *Meeting with Senior Management*: It is essential for an internal alignment to be in place with senior management regarding what value is to be gained from the 3PL relationship. Thus, meetings between senior management of the different parties are crucial for successful onboarding.
3. *Creating a Formal Plan for Managing Relationships*: It should be made clear from the start what is expected to be done by which party and when. In hand with this, a strategy must be in place which manages the relationships between executive, managerial and operational representations from both sides.
4. *Having the Capability to Scale Operations to Demand*: It is important to test the ability of the 3PL to scale their operations up or down depending on the demand. Any foreseeable changes in demand must be communicated between both parties as quickly as possible.
5. *Drafting Mutual Agreements*: Dispute resolution procedures must be put in place and agreed upon as soon as possible. Non-disclosure agreements should be understood, accepted and signed by both parties.
6. *Understanding Roles and Relationships with Asset-Based Service Providers*: A formal plan should be put in place for managing relationships with asset-based 3PLs. When using non-asset owning 3PLs, it is important to understand how other asset-based 3PLs will be used to execute logistical activities.

As mentioned in point six above, 3PLs can be sub-classified into asset-based and non-asset owning 3PLs. Asset-based 3PLs own some, not necessarily all assets, especially related to transportation assets such as trucks and warehouses. Non-asset owning 3P'Ls do not own any assets, but rather make use of sub-contractors. However, non-asset owning 3PLs may still possess desks, computers and so on [51].

2.2.2 Key Performance Indicators (KPI) of 3PLs

KPIs are used to give a clear understanding of what is important in a business or enterprise. By using KPIs, information becomes available which help management to make more informed decisions and reduce uncertainty by managing risks. KPIs are most commonly displayed in either dashboard, scorecards or reports. A KPI is defined as follows for business orientated tasks:

> *"A KPI is a metric measuring how well the organization or an individual performs an operational, tactical or strategic activity that is critical for the current and future success of the organization."*
>
> Eckerson [52]

The need for KPIs is simple: if something gets measured it gets done. When efficiency and effectiveness must be improved, it is important that the KPIs reflect factors that can be controlled and change efficiency and effectiveness. It is useless to measure activities if the user can not alter them. Historically the only KPIs which were tracked were closely related to cost and time, but it has become clear that these are not the only factors which have to be tracked. Thus, the need has arisen for additional KPIs to be considered. It is possible for several smaller metrics to form part of a single KPI. An example of this is a customer satisfaction KPI which can exist from a mixture of time, cost, quality and service metrics. KPIs will often be determined by a formula which demonstrates how to combine metrics into a single KPI, weighing the different metrics as needed for a specific industry or company. There are three main categories of metrics [53]:

1. *Result Indicators (RIs)*: Indicates what has been accomplished thus far.
2. *Performance Indicators (PIs)*: Indicates what must be done to increase or decrease the current performance.
3. *Key Performance Indicators (KPIs)*: Indicates the critical PIs that can have a major effect on the performance.

Organisations use an inappropriate mix of these three indicators, and all of them will be mislabeled as KPIs. By using too many KPI's, excessive measuring and reporting will occur resulting in decreased efficiency and making it difficult to see what is happening. Too few KPI's will cause a lack of critical information resulting in delays and misinterpretation. It is conventional to have too many KPI's compare to having too few. Thus, it becomes clear that it is important to identify the right amount of KPI's. The 10/80/10 rule should be applied when selecting the number of indicators with typically around 6 to 10 measures being standard [53]:

- RIs: 10%
- PIs: 80%
- KPIs: 10%

As stated previously, one of the most important characteristics of a KPI is that it must be actionable. A set of characteristics for KPIs as can be seen in Table 7 below. It is important when selecting KPI's that they match the characteristics mentioned in Table 7.

Table 7: Twelve Characteristics of effective KPI's [52]

Characteristic	Description
Aligned	KPIs must be aligned with the company's strategy and objectives.
Owned	Someone must take ownership of each KPI and be held accountable for its outcome.
Predictive	KPI's measure the drivers of business value, therefore they act as leading indicators of the desired performance of the company.
Actionable	KPIs must consist of accountable data which enables users to intervene where necessary to improve overall performance.
Few in number	A few high-level KPI's should be identified and focussed upon instead of spreading attention between too many less important KPIs.
Easy to understand	KPI's must be easily understandable to ensure users know how to influence them directly when necessary.
Balanced and linked	KPI's must support and balance each other to optimise results.
Trigger changes	By measuring a KPI's, it should eventually trigger a result of positive changes.

Characteristic	Description
Standardised	KPI's should be standardised so they can be used and understood by different users and stakeholders.
Context-driven	By setting performance targets and thresholds, KPI's put performance into context by making it possible to measure their progress over time.
Incentives	The impact of KPI's can be further increased by attaching incentives to reaching set goals.
Relevant	It is important to periodically review KPI's as they may lose their impact over time resulting in them having to be changed or replaced.

There are five criterions PIs should consist of to transform into KPI's [54]:

1. *Quantitative KPIs*: Have some form of numerical values.
2. *Practical KPIs*: Should Interface with company process.
3. *Directional KPIs*: Should change, become better or worse.
4. *Actionable KPIs*: Must be able to affect some change.
5. *Financial KPIs*: Consist of some form of performance measures.

When a list of PI's is at hand, they should be checked with each of the above-mentioned criterions. If their characteristics correlate to some degree with each of the aforementioned criterions they can henceforth be viewed as KPIs.

2.2.3 3PL in Africa

The previous two sections give the reader the necessary understanding of 3PL operations. However, it is essential to understand that 3PLs will operate differently in Africa compared to the rest of the world, primarily developed countries. Conducting research in Africa is problematic due to several practical difficulties faced when conducting studies.

> *"Practical difficulties associated with infrastructure, systems for information and communication, travel, foreign exchange, and safety may also influence the establishment and maintenance of scientific interaction."*
>
> Volmink and Dare [55]

Two of the main requirements to produce research are money and technology. Due to extreme poverty in many African countries, sufficient funds for researchers are rarely obtained from government

infrastructures, which leads to researchers having to spend time and effort on fundraising and dealing with foreign grant organisations instead of focussing on their research output. Research capacity is viewed as the institutional and regulatory frameworks, infrastructures, investments and skilled people who can conduct and publish research. The World Bank reported that the African countries ranked highest on their research output according to their national investment in productivity in science and technology are South Africa, Mauritius, and Egypt who did reasonably well compared to the rest of the world, while the remaining countries placed at the bottom of the rankings [55]. When observing the average GDP spent on research and development, Africa on average spent only 0.8% of their GDP whereas developed countries spent an average of 2.23% in 2015 [56] [57]. This makes it clear that there is a lack of commitment to research in Africa, which greatly decreases the research output throughout Africa. It is important to note that some African countries yield excellent research, just not on the same scale as developed countries, but overall research in Africa is lacking [55].

In a further effort to determine if there really is a lack of relevant research on 3PL in Africa, Google Scholar was utilised. An analysis was conducted which searched for 3PL results in Google Scholar for five main regions which can be seen in Table 8. For each of these regions 3PL was added to the search line inserted in a different format each time, e.g. “third party logistics Africa” and “third-party logistics Africa” yielded a substantial difference in hits. From Table 8 it is clear that the least amount of 3PL research that has been done per region is in Africa.

Table 8: Search hits from google scholar for different 3PL formats.

Region	3PL	third party logistics	third-party logistics	third party logistics providers	Average weight
Africa	5,240	62,700	36,900	44,200	15.04%
Europe	9,740	109,000	68,600	72,500	26.22%
Asia	7,830	75,100	41,400	51,400	17.73%
America	9,110	106,000	63,600	69,900	25.08%
Australia/Oceania	6,308	60,390	39,290	51,970	15.94%

Even though Africa has the least amount of hits, Table 8 still indicates a significant amount of data which may be applicable. Therefore, it was necessary to take a detailed look at the research available on 3PL. Five online libraries were used to determine what percentage of literature reviews on 3PL has any connections to Africa. For each of these online libraries the term “3PL” was initially entered followed by the term “3PL Africa”, thus the results in Table 9 were obtained. The similarity in most of the online libraries was small excluding Sabinet with a similarity rating of 80,72%. The reason for Sabinet having such a high similarity rating is purely the fact that it is a South African database. Thus, it is expected that

most of its data should be connected to Africa. Table 9 indicates that an average of only 6.82% of 3PL research has connections to Africa, which further decrease to 4.82% when removing the South African focused data from Sabinet. An evident lack of research done on the operation of 3PL in Africa compared to developed countries can thus be discerned.

Table 9: Results from different online libraries for search term "3PL" and "3PL Africa".

Online Library	3PL	3PL Africa	Similarity
IEEE Xplore digital library	126	1	0.79%
Emeraldinsight	402	35	8.71%
Wiley Online library	1,648	108	6.55%
Sabinet SA e-publications	223	180	80.72%
ScienceDirect	6,887	309	4.49%

2.3 Additional review

After completing the first two sections of the literature review, three additional areas stood out which require a better understanding Firstly; more information is needed on best practices concerning incentives and compensation models for a 3PL. Secondly, a difficult problem to solve when working with 3PLs is determining the right number and type of vehicles. The fleet mix problem supplies valuable insights into solving such an issue. Lastly, activity-based costing (ABC) supplies the reader with a better understanding when observing various costs associated with an operation.

2.3.1 Incentives and Compensation

One of the key challenges faced by organisations is how to improve the performance of its employees and service providers [58]. It is a well-known fact that incentives play a vital role in any organisation. When considering the widespread use of incentive strategies, and analysing its success and failures, it becomes clear that there is a relationship between pay and performance [59]. Several studies containing empirical evidence have proven that employees do indeed respond positively to incentives [60] [61]. Thus, incentives play a vital role in any organisation. When it comes to the implementation of incentives several complexities arise. One important factor affecting organisational behaviour is the internal incentive structure which includes management of human resources and compensation

policies. Many common features of organisational incentive systems are difficult to explain; therefore, it is essential to gather an understanding of the different incentive and compensation systems which are used. An in-depth study was conducted on several economic systems which focus on incentives and compensation [62]. This study discusses four important points when working with compensation systems:

1. Pay-for-performance compensation systems.
2. Promotion-based incentive systems.
3. Profit-sharing plans.
4. Biased and inaccurate performance evaluations.

2.3.1.1 Pay-for-Performance Compensation Systems

Most compensation models assume that greater effort must be exerted to achieve higher performance. These models create a reward system which structures compensation with the aim to increase a worker's utility when observing their productivity. These rewards take several different forms varying from implicit promises of future promotion opportunities, praise from colleagues and superiors, increased self-esteem due to superior achievement, and recognition through current and future cash rewards. Economists recognise that non-monetary rewards can be substantial, but organisations tend to focus on monetary rewards as most individuals are willing to substitute nonmonetary rewards for monetary rewards. Monetary rewards can be a powerful determinant of an employee's motivation and performance, which can lead to significant returns for a firm regarding performance. However, studies have proven that monetary rewards do not always lead to the desired outcome [63]. Evidence from research on compensation indicates that explicit financial rewards seldom account for an increase in performance, several studies have failed to detect a positive pay-performance relationship, but rather found that performance-related pay tends to produce temporary compliance rather than sustained improvement [64] [65]. This leads one to ask if pay can be viewed as an effective motivator?

The potential benefits of paying based on performance are apparently obvious, but organisations resist introducing purely bonus-based compensation plans. It is important to note that monetary incentives are only weak reinforcers in the short run and negative reinforcers in the long term. In the long term, monetary incentive schemes may backfire by undermining an employee's confidence in their abilities and decreasing the value of the task which they have been rewarded for [66]. There are three main reasons why monetary incentives are viewed as counterproductive [67]:

1. Rewards encourage people to focus narrowly on the task at hand and to do it as quickly as possible, resulting in them taking minimal risks and not doing anything more than is minimally required from them.
2. Extrinsic rewards tend to erode any intrinsic value a task may have to an employee as the focus is solely placed on the reward.
3. When only working for a rewards people will eventually come to see themselves as being controlled by the reward.

When working with pay-for-performance compensation systems, the measurement process plays a crucial part in its success. Pay-for-performance systems can be based on one of two measures; objective measures such as sales, profits or number of tasks performed, or subjective measures such as the estimated value of an employee to the organisation [62]. Some jobs lean more towards objective measurement especially in more practical jobs such as sales or production. However, performance is difficult to measure objectively in most jobs due to it being linked to various factors, and large parts being unobservable due to the outputs not being quantifiable. Excluding the difficulties which arise when attempting to measure performance, there are two main categories which lead to organisations avoiding strong pay-for-performance systems. Firstly, a lack of trust between supervisors and their employees. Secondly, a distaste of conflict due to the subjective performance evaluation of these systems.

2.3.1.2 Promotion-Based Incentive Systems

In most organisations promotions are used as the primary incentive device. It is common practice to tie wage levels in an organisation to job levels and not to individuals. The average increase in an employee's compensation can often be traced directly to promotions. Promotions in an organisation are used to achieve two distinct goals simultaneously; firstly, it helps to place the right employee into the job for which they are best suited. Secondly, promotions provide an incentive for lower level employees who value the higher pay and prestige which comes with a higher rank in the organisation [68]. Studies have obtained empirical evidence that display the effects promotion based incentives have on the performance rates [69]:

- Service quality is higher in the pre-promotion period in markets where promotions do occur.

- The service quality decreases immediately after the occurrence of a promotion in the same market segment.
- Service quality remains higher overall in markets where promotions occur compared to other markets without promotions.

The practical importance of promotion-based incentives, combined with the absence of pay-for-performance compensation policies discussed in the previous section, imply that promotion-based incentives must be less costly or more effective than monetary incentives. Promotion-based incentives also have several complexities and inherent disadvantages [62]. The incentives generated by a promotion-based incentive system depends on the probability of being promoted and the space to be promoted into. This leads to a decrease in effectiveness of promotion incentives for employees who have been passed up for promotion and for employees whose chance of future promotion is potentially small. This becomes especially problematic when an employee falls short of the promotion standards. It is also noted that promotion possibilities do not provide any incentive for employees to exceed the set standard or to outperform co-workers on the same job level. One of the biggest problems with promotion-based incentives systems is the fact that they require the organisation to grow. Otherwise, there will be no new high-end jobs for people to be promoted to. Thus, a promotion-based incentives system will only be effective in a growing successful organisation and will likely generate several problems in an organisation which is growing slowly or has matured. It is previously stated that one of the main goals of a promotion-based incentives system is to place the right employee in the right position. However, when tournament-based promotion incentives are used, which is standard practice, achieving this goal becomes problematic. Tournament-based promotion is described as:

> *Tournament theory is useful for describing behaviour when reward structures are based on relative rank rather than absolute levels of output. Accordingly, management scholars have used tournament theory to describe a wide range of inter-organisational competitions, such as promotion contests, innovation contests, and competition among franchisees.*
>
> Connelly et al. [70]

In a Tournament-based promotion system, the best performer at each level is promoted to a higher standard. A problem arises when an employee who is the performer at a certain threshold is not the best candidate for the next higher up level. For example, a good labourer will not necessarily make a good foreman. This also leads to skilled technical employees being lost to managerial roles. Thus, a tournament-based promotion system does not always achieve the first goal of a promotion-based incentive system. This problem is illustrated in Figure 18 below. This illustration indicates that Employee

B may perform better in middle management and will be promoted above Employee A who will perform better in a top management position than Employee B.

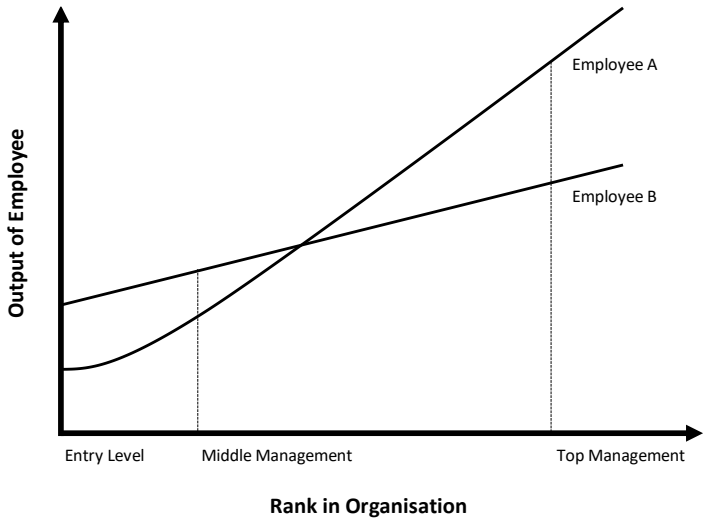


Figure 18: Relation between the output of employees in jobs at different ranks in an organisation, adapted and redrawn from [50].

Monetary incentives, on the other hand, do not have these same problems which appear in promotion-based incentives. In principal monetary incentives can provide incentives for all the employees in an organisation based in the organisations yearly performance regardless of the individual employee's ability, position or promotion potential. However, it is still argued that promotion-based incentives are more advantageous when they are only based on rank.

2.3.1.3 Profit-sharing Plans

Profit sharing is when an individual's compensation is tied to the overall performance of an organisation. There are two dominant theories on the benefits of profit sharing derived from a study of over 500 public companies [71];

1. *Productivity theory*: States that profit sharing improves performance by encouraging employees to cooperate with each other and share ideas and information.
2. *Stability* theory: Believes that profit sharing leads to fewer layoffs and greater employment and output stability for organisations.

The above mentioned study concludes that profit sharing boost productivity and profitability. It is believed that incentives based on individual performance are less efficient than profit-sharing or team-based bonuses. The biggest challenge organisations face with a profit sharing plan is the free-rider

problem. Employees who bear the full cost of working hard and putting in extra effort receive the same benefits as a colleague who slacks. Therefore, it is believed that when it is possible to measure individual performance pay should be tied to the individual's performance. When working with joint-production situations where it is no longer possible to measure individual performance, it becomes necessary to use team-based incentives. One of the main economic benefits of team-based incentives is the fact that these policies strongly encourage mutual monitoring [62]. A typical example would be when Employee A has an incentive to monitor colleagues because the performance of his colleagues affects the compensation Employee A receives and vice versa. A common problem which can arise is when employees start over-monitoring their colleagues instead of working themselves. Slacking behaviour by a single employee can be observed by several colleagues whom then all waste time observing and reporting the incident, thus appointing a single monitor may be more efficient. A crucial factor for this system to work is the requirement that punishment is based on individual performance and not strictly on the team's performance, without some form of repercussion for slacking this system will not work efficiently.

2.3.1.4 Biased and Inaccurate Performance Evaluations

There is an abundant amount of evidence that managers tend to apply biases in performance evaluations. These biases appear in two common forms [72]:

1. *Centrality Bias*: The tendency of managers to compress performance ratings which result in less variance in ratings than is justified by the actual performance of employees.
2. *Leniency Bias*: The tendency of managers who inflate the performance ratings of their employees.

The reluctance of managers to give their employees poor performance evaluations is consistent and well documented especially in the two mentioned forms, even so, it remains puzzling as to why this bias keeps occurring. It is argued that one of the reasons why managers have an aversion to giving their employees a poor evaluation is due to the biased perceptions employees have regarding their personal performance standard [62]. The argument claims that by telling an employee that they are performing in the bottom, 20 percent will induce more dissatisfaction than satisfaction which will be induced by telling an employee that they are in the top 20 percent, thus telling everyone that they are average will make no one happy. Therefore, by introducing forced ranking systems, a considerable amount of conflict will be created in the organisation. A similar occurrence will be the absence of pay-for-performance systems which provide substantial incentives for good performance and small ones for

average performance as this will force managers to hand out poor evaluations to many employees. Thus, visible rewards for excellent performance will not be handed out unless there is sufficient incentive for managers to undertake the unpleasant task of telling employees that they are under performing or even just average.

2.3.2 Fleet Mix

A distribution based organisation cannot operate without making extensive use of vehicles of several different types each for its own purpose. When considering the costs associated with new vehicles the importance of obtaining the optimal number and type of vehicles should be approached with great care and careful planning. Fleet mix planning is described as:

> *Vehicle fleet planning is a generic and broad class of practical decision-making problems, including the optimal fleet mix problem. Fleet mix planning involves the determination of a combination of assets (e.g. vehicles) that is expected to maximally fulfil the fleet's mission objectives subject to constraints on the acquisition, deployment and operation of the fleet.*
>
> Janjic & Vukasinovic [73]

Due to the many criteria which must be considered when working with a fleet mix problem, it becomes necessary to make use of multi-criteria decision-making (MCDM) analysis techniques. MCDM problems commonly involve the ranking of a finite set of terms in a finite number decision criterion, where these criteria are often in conflict with each other. Several different approaches have recently been used to solve different types of fleet mix problems:

- A MCDM model is used which assists service providers by optimising their sustainment activities through minimising costs and maximising the availability of their equipment. This is done by modelling and optimising the service logistics networks by incrementing the fleet size by the expected market expansion [74].
- A stochastic fleet estimation model is a Monte Carlo based model which optimises fleet size based on a set of requirements which the fleet must be able to perform. A non-dominated sorting generic algorithm is used to perform MCDM of the stochastic fleet estimation model. By using this sorting algorithm, several alternative solutions were found based on several costing evaluations [75].
- The same non-dominated sorting generic algorithm used in the stochastic fleet estimation model is also applied to a multi-objective transportation fleet mix problem. The stochastic fleet

estimation model is also used, but this time to determine the average annual requirements which the fleet must meet. Additionally, Pareto-optimal combination of platform-to-task assignments complete the stochastically generated scenarios. The solutions are evaluated based on three objectives, maximising flexibility of completing each task, minimising fleet costs, and minimising the total duration of the tasks [76].

- An optimal resource management tool is designed based on fuzzy analytical hierarchy process (AHP) integrated with a MCDM approach. This method makes use of ant colony optimisation to obtain the optimal solution for satisfying the required path planning criteria while also selecting the best-suited vehicle number and type [77].
- A more recent approach which using a more practical MCDM methodology and based on fuzzy logic and AHP to solve the fleet mix problem was lastly studied which incorporates the method behind the previous four approaches. This method is considered the better of the observed approaches and is to be used in this study? [73].

The AHP was originally devised to provide a framework for solving multi-criterion decision problems based on the priorities assigned to each criterion's role in achieving the stated objective [6]. The AHP can be used to assign weights to each of the criteria, and finally, the technique for order preference by similarity to ideal solution (TOPSIS) can be used to achieve final ranking results, this approach is suggested and tested for 3PL [78] [79].

2.3.3 Activity-Based Costing (ABC)

ABC was created as an accounting tool but has gradually evolved into a decision-making tool [80]. ABC is covered in some detail as it provides an interesting approach when it comes to analysing the costs of an operation. It helps to broaden the thought process as it approaches costing from a non-traditional angle. ABC was developed to provide a more precise method to include the cost of indirect and support resources to cost pools in an organisation. ABC fills the gaps of many traditional costing models by focusing on the fact that not all resources used in an organisation are employed in the physical production of products, but rather as support structures which ensure the products are produced and delivered efficiently. Therefore, ABC does not attempt to determine the cost of a product, but rather to measure the cost of each activity which supports the products from production all the way through to delivery and any services offered to the customers.

The first step ABC takes is to identify all activities which are performed by an organisations support structures. Every expense these support structures undertakes is traced to determine the total cost for

performing each activity. The next step is to link each of the activity costs to the various products, which is undertaken by identifying cost drivers for all the activities. A rate is then calculated for each of the activity cost drivers. Finally, for every product, the amount of each cost driver it has used during a given period is multiplied by the cost drivers rate. Figure 19 is an example of how a resource category is meant to be broken down into different activities and then linked with activity cost drivers to determine the cost of objects such as products, services, and customers. This approach allows an organisation to understand the costs associated with supporting the production of a product and gives them a better understanding of how expensive it is to produce a product.

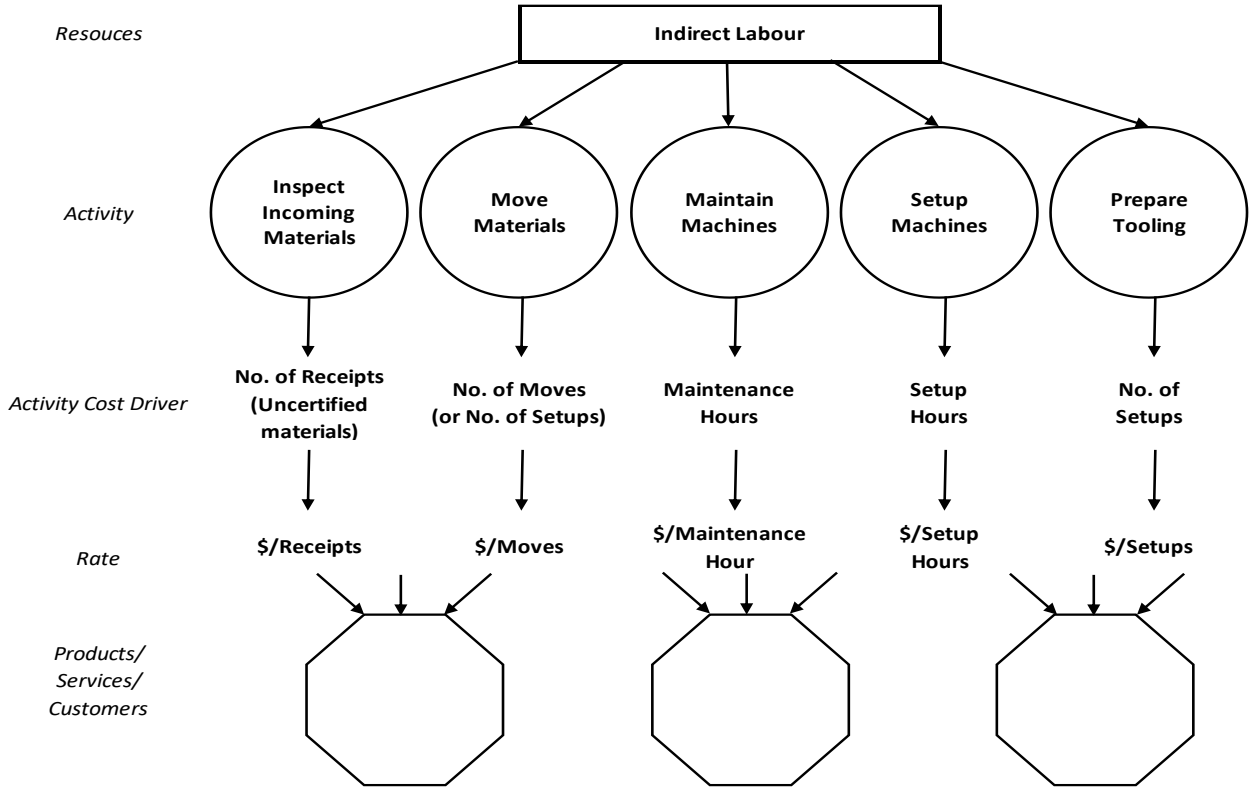


Figure 19: Activity-Based Costing: Expenses Flow from Resources to Activities to Products, Services, and Customers, adapted and redrawn from [81].

2.3.3.1 Identifying Activities and Managing Cost Allocations

When identifying activities its recommended to ignore small activities which collectively amount to less than 5% of the workload. It becomes cumbersome to collect data on these little activities which eventually have a negligible effect on the outcome. The most commonly used method to determine the main operations of an organisation is by making use of surveys for the regular employees, conducting interviews with the managers, and financial data stores. With the major activities identified,

it is then important to determine the total cost of all these activities and the percentage of time spent on an activity by employees. Before the activity cost per activity can be calculated, it is important to take into consideration several factors [81] which can influence the cost allocations:

- *The Skill Level of Workers:* in certain circumstances, it can become necessary to differentiate between workers based on their skill level and efficiency in performing a task.
- *Pay Level of Workers:* when comparing a floor worker and a trained professional who gets paid a lot more it becomes necessary to take this difference into account when calculating the costs of a task.
- *Special expenses:* if extra expenses are needed for a specific activity it is important to allocate all the extra expense to the specific activity rather than splitting it between all the activities.
- *Managerial Attention:* when certain activities require a substantial amount of a manager's time, or of any support structure, instead of splitting the costs of the resource equally between activities it becomes necessary to assign the respective majority of the cost to the specific activity.
- *Fixed VS Variable Resources:* resources such as employees are most commonly fixed, meaning they are hired full-time. It is possible for an organisation to hire additional seasonal workers at peak times. Thus, it is possible for the costs of certain activities to change over time which is important to take note of.

2.3.3.2 Activity Cost Drivers

Activity cost drivers are systems that allocate activity costs to products. This is undertaken by linking the performance of activity cost drivers to demands made by individual products. Simple drivers are needed such as units processed, machine hours, or labour hours to allocate costs to products effectively. In most instances, the number of products produced is proportional to the number of cost drivers that can be found, but in some cases, this can differ greatly due to most commonly indirect resources which come into play. It is possible for this method to result in an unusual amount of errors when determining the costs assigned to a specific product. To help avoid such errors four types of activities that link the number of units produced [80]:

1. *Unit-Level Activities*: representation of the work that is performed per unit for every product or service produced or provided.
2. *Batch-Level Activities*: represents the resources which are required to perform a batch-level activity. Traditionally cost systems would view the expenses of these resources as fixed.

3. *Product-Sustaining Activities*: representation of the work which is performed to allow the production of individual products to continue.
4. *Customer-Sustaining Activities*: represents the work that is done by an organisation which enables them to sell to an individual customer.

Every activity has its own activity cost driver which is linked to different activities. Each cost driver has a cost driver linked to it which is determined by dividing the activity cost by the driver quantity.

2.4 Chapter Conclusion

The purpose of this literature review was to gain a clear understanding of the operations of 3PLs and the environment in which they work. It is evident from the research reviewed that there is a lack of relevant studies conducted in an African context, as evidenced by the abundance of research in developed countries compared to the literature found in Africa.

An in-depth study was completed on the SCOR model owing to its obvious relevance in the SCM field--numerous mentions of and references to the model are found in the literature. Covering SCOR serves as a foundation for understanding how a 3PL operates, thus supplying a good background understanding of the operations in a supply chain. However, the model itself is not deemed to be applicable for use in reaching the desired outcomes of this thesis, but rather in providing a logic and structure.

The functional operations of a 3PL is a thoroughly researched field, with a wealth of literature focusing on best practices. Substantial information is available on the activities of a 3PL as well as metrics to measure their efficiency and recommendations on building sustainable relationships between 3PLs and suppliers. Once again there is no clear research available on how to overcome possible obstacles to be faced when operating in Africa specifically. RTM literature, however, does cover some of the challenges to be confronted in a broader context.

The literature regarding incentive and compensation provides the reader with valuable insights. When considering the environment 3PL operating in within Africa Depending on the size of the 3PL the compensation scheme must be adjusted towards one of the two methods. A smaller 3PL would be better incentivised by promotions whereas a large 3PL would focus on increasing efficiency and performance. Thus, a consistent pay-for-performance approach would be better suited.

Chapter 3: Data Collection

Before the development of the models called for in the objective of this thesis could commence, it was required to identify and collect the necessary data firstly. The surveying process took place in Nigeria and consisted of an initial in-country visits followed by an extensive surveying process. One of the main reasons for the selection of Nigeria was the opportunity to work with a company working on a similar project in the area who required similar data, thus the partnership provided funding and resources to conduct the survey with. This is also why the thesis focussed on the beer industry specifically as it was in line with the data required by the company. For the purpose of data collection two towns in Nigeria were focussed on, these towns are referred to as Town A and Town B throughout the thesis. A detailed understanding of the RTM in these two areas is essential to understand the operations of a 3PL in such an environment. Gathering data in Nigeria was a complicated task as up to date data directories regarding retail outlets were not readily available, if available at all. Thus, required data was obtained using industry research, historical data, and an in-depth survey which was planned during an in-country visits and executed by a local surveying company.

3.1 Identification of Required Data

The introduction called for the identification of an ideal 3PL and its characteristics. Data collection occurred in Nigeria as this was an ideal example of an African-based market. Resources and funding were available for a visit to Nigeria to determine which information had to be collected and to contract a third-party surveyor to collect the required data using surveying.

Before the collection of data could commence, it was necessary to identify all the information which had to be gathered, in particular through which method the data was to be obtained. An initial research study was conducted to identify information which was followed by the initial in country visit where the required information was refined to reflect the operations on a 3PL in Nigeria. Several significant inputs and standards were identified within the industry. They can be seen in Table 10 and Table 11. The relevant descriptions and the appropriate units are shown. Table 10 indicates some industry standards which can be applied to different 3PLs while Table 11 indicates specific inputs required for each 3PL as they will differ.

Table 10: Industry standards with description and unit information.

Standard	Units	Description
Inflation	%	The general rate prices for goods and services rise in a country per annum.
Estimated case growth rate	%	The expected growth rate of cases sold per annum based on the past and present sales.
Cost of debt	%	The interest a company pays on its debts.
Corporate income tax	%	The tax levied by governments on companies based on their annual profits.
Risk-free rate	%	A theoretical rate of return with no risk on investment.
Bad debt	%	Any debt that is not collectable and thus worthless.
Losses & breakages	%	The number of products lost or broke throughout the supply chain process.
Supplier credit	Days	Average days supplier credit allowed.
Customer Credit	Days	Average days credit to customers allowed.
Useful life of furniture & equipment	Years	The expected useful life of furniture and equipment.
Write-off period of furniture & equipment	Years	The normal period of which furniture and equipment will be written off.
Useful life of IT infrastructure	Years	The expected useful life of IT infrastructure
Write-off period IT infrastructures	Years	The planned period after which the IT infrastructure will need to be replaced in.
Residual value at original cost	%	The remaining value of investments after a set period.
Trailer utilisation	%	The space in a trailer which is utilised.
Cases per pallet	Cases	The number of cases per pallet.
Truck depot time	Min/Load	Truck admin and dead time at the depot.
Truck delivery time	Min/Drop	Truck admin time per delivery per drop.
Truck maintenance	%	Truck maintenance factor/year of age, after age 5.
Fuel cost	$/litre	Costs of fuel per litre, diesel.
Truck lifespan	Years	The useful life of trucks.
Write-off period of trucks	Years	The expected period after a truck will be written off.
Time under maintenance	%	The percentage of time a truck will be under maintenance when it could otherwise be utilised.

Table 11: Specific inputs per 3PL with description and unit information.

Specific Inputs	Units	Description
Weekly volume	Cases/week	The volume of cases sold per week.
Volume delivered	Cases	The volume delivered directly to customers.
Average route distance	Km	Average distance a truck travels per delivery.
Average Inventory Full's	Cases	The average inventory level of full cases on hand.
Average Inventory Empties	Cases	Average inventory level of empty cases on hand,
Customer service interval	Days/Week	The number of times a customer is serviced per week.
Operating days per week	Days/Week	The amount of working days per week.
Operating hours per day	Hours/Day	The number of hours working per week.
Debtors	%	Credit sales as % of the total.
Creditors	%	Credit purchases as % of the total.
Returnable containers	%	Number of returnable containers as a percentage of sales.
Average unit cost of product	$/Case	Average price cases are bought for from suppliers.
Average unit sales price of product	$/Case	Average price cases are sold for to customers.
Average unit price of empties	$/Case	The average price received for a case of empties.
Office space rental	$/Month	The monthly cost of office space rental.
Warehouse space rental	$/Month	The monthly cost of warehouse space rental.
General expenses per month	$/Month	General expenses per month (Accounting, telephone, stationery, etc.)
Overheads per month	$/Month	Overheads per month (Elec, Water, etc.)
Replacement cost of office furniture & equipment	$	Costs of replacing office furniture & equipment
Replacement cost of IT infrastructure	$	Costs of replacing IT infrastructures

With all the relevant inputs and standards identified in Table 10 and Table 11, it was necessary to determine how this data was to be collected. Three main methods had been designated for collecting the relevant data:

1. Research focussed on the industry would yield many of the required standards which were used in practice.
2. Historical data would be analysed to determine additional standards and help to forecast future predictions.
3. The remaining standards and all the specific inputs would be determined using surveys and interviews based in Nigeria.

Excluding the standards and specific inputs already discussed it was also important to gather information regarding the truck specifications and salaries for employees. Some standards for trucks had already been identified in Table 10, however additional information was required for different truck sizes. Seven were identified which also had to be collected for each truck size namely:

1. Fuel consumption per 100km.
2. Annual maintenance cost.
3. Annual lubrication cost.
4. Annual tyre replacement and maintenance cost.
5. License fees.
6. Capital investment cost.
7. Load capacity.

Lastly, nine employee types were identified where annual salary rates were collected for each:

1. Management
2. Administrative staff
3. Sales man
4. Security
5. Cleaners
6. Warehouse supervisor
7. Warehouse labour
8. Crew members on trucks
9. Vehicle driver

3.2 Industry Research and Historical Data

This section covers the collection of data which could not be collected through means of surveying. Thus it is information that could readily be obtained through research and other data collection methods.

3.2.1 Industry Research

Three information types were identified to be collected through means of industry research; vehicle information, salary information, and industry standards. This information was gathered through research of available documentation and interviews with relevant parties who are knowledgeable regarding the required information.

3.2.1.1 Vehicle Information

To gather the vehicle information a hauling company was contacted. This gave an understanding of which vehicle types are most commonly used by 3PLs. Vehicle size is strongly connected with the distance and volume 3PLs must move. Thus a variety of five vehicles were identified and will be referred to hence forth as vehicle A – E. The hauling company suggested using information from a Fleetwatch report [82] which contains all the required specifications for the five vehicles. It was then possible to collect all the necessary specifications for the five vehicle types which can be seen summarised in Table 12 below.

Table 12: Vehicle information summarised from research and [82].

Vehicle Information	Vehicle A	Vehicle B	Vehicle C	Vehicle D	Vehicle E
Fuel consumption per 100km (l)	11.99	10.70	18.18	22.22	28.57
Annual maintenance cost ($)	$939	1014	351	1183	900
Annual lubrication cost ($)	190	205	86	204	201
Annual tyre costs ($)	94	135	182	259	288
License fees ($)	18	18	44	79	71
Capital investment cost ($)	10000	7714	4009	5520	5871
Load capacity (pallets)	8	14	20	26	30

3.2.1.2 Salary Information

The salary rates were collected from an online source [83]. Various listing of the required salary types based in Nigeria where available. Salaries differ from location and experience; a monthly mean was extracted for each job type and can be seen in Table 13 below:

Table 13: Summary of annual salaries extracted from [83]

Job Description	Base Rate
Management	$486.80
Administrative staff	$212.81
Sales Man	$179.11
Security	$63.49
Cleaners	$52.32
Warehouse Supervisor	$327.19
Warehouse Labour	$51.43
Crew members per Vehicle	$51.43
Vehicle Driver	$112.61

3.2.1.3 Industry Standards

To determine the required industry standards a senior management consultant specialising [84] in beverages RTM was interviewed [84]. Other relevant sources were consulted as well [30] [85]. This allowed the value column in Table 14 to be populated:

Table 14: Industry standards obtained from [30] [84] [70].

Standard	Value	Units
Corporate income tax	30	%
Risk-free rate	1.28	%
Bad debt	1	%
Losses & breakages	0.2	%
Useful life of furniture & equipment	10	Years
Write-off period of furniture & equipment	5	Years
Useful life of IT infrastructure	3	Years
Write-off period IT infrastructures	3	Years
Residual value at term of original cost	20	%
Trailer utilisation	85	%
Cases per pallet	51.22	Cases

Standard	Value	Units
Vehicle maintenance	25	%
Vehicle lifespan	10	Years
Write-off period of vehicles	5	Years
Time under maintenance	5	%

3.2.2 Historical Data

Three standard inputs were identified which proved to be problematic namely the inflation rate, cost of debts, and estimated growth rate. It was decided to use historical data. Using the values which were available for a specific year would prove inaccurate as these inputs are highly volatile to change as can be seen in Table 15. Due to the volatile nature of these inputs, a mean and standard deviation had to be calculated. This allowed for a more accurate estimation as it lessens the effects of outlier years and considers the uncertainties surrounding the inputs. The analysed historical data with the calculated means and standard deviations can be seen in Table 15.

Table 15: Collected historical data.

Inflation Rate		Cost of Debt		Estimated Growth Rate	
Year	Percentage	Year	Percentage	Year	Percentage
2003a	9.1	1987	14.0	1991	-0.6
2003b	18.7	1988	16.6	1992	2.2
2004a	20.2	1989	20.4	1993	1.6
2004b	10.6	1990	25.3	1994	0.3
2005a	15.1	1991	20.0	1995	1.9
2005b	20.7	1992	24.8	1996	4.1
2006a	10.9	1993	31.7	1997	2.9
2006b	5.9	1994	20.5	1998	2.5
2007a	5.9	1995	20.2	1999	0.5
2007b	4.9	1996	19.8	2000	5.5
2008a	9.1	1997	17.8	2001	6.7
2008b	14.0	1998	18.2	2002	14.6
2009a	13.5	1999	20.3	2003	9.5
2009b	11.7	2000	21.3	2004	10.4
2010a	14.5	2001	23.4	2005	7.0
2010b	13.1	2002	24.8	2006	6.7
2011a	11.7	2003	20.7	2007	7.3
2011b	10.1	2004	19.2	2008	7.2

Inflation Rate		Cost of Debt		Estimated Growth Rate	
Year	Percentage	Year	Percentage	Year	Percentage
2012a	12.5	2005	17.9	2009	8.4
2012b	12.0	2006	16.9	2010	11.3
2013a	8.9	2007	16.9	2011	4.9
2013b	8.1	2008	15.5	2012	4.3
2014a	7.9	2009	18.4	2013	5.4
2014b	8.2	2010	17.6	2014	6.3
2015a	8.7	2011	16.0	2015	2.7
2015b	9.4	2012	16.8	2016	-1.7
2016a	13.3	2013	16.7		
2016b	18.0	2014	16.5		
		2015	16.8		
Mean	14.5%	Mean	19.5%	Mean	5.1%
Standard deviation	5.7%	Standard deviation	3.7%	Standard deviation	3.9%

3.3 Survey Planning

Before the survey could take place, a survey plan had to be compiled. There are numerous reasons why it is important to plan and develop a survey plan. One of the most vital factors to consider whenever conducting a survey is to determine the target audience [86]. This ensures that the data is representative of the correct demographic group and not just focused on the geographic area. For the purpose of data collection two towns in Nigeria were focussed on, these towns are referred to as Town A and Town B throughout the thesis. The purpose of the survey was to collect all the data which could not be collected through industry research or found in historical data. The first step undertaken in planning the survey was to determine the scope of the survey. Thus, identifying how many locations had to be surveyed and what approach had to be taken to ensure that the survey yielded accurate and representative results.

It was crucial to determine who the target audience of the survey was. The target was identified as the different retail outlets, categorised into several market segments. Each of these segments had to be surveyed in detail regarding their daily operations. Next, it was important to set up a frame for the survey. Ideally, a whole population must be measured, but this was not feasible with the available time and resources. Therefore, it became necessary to identify a manageable sample of the population which could be surveyed. To ensure that the sample was a good representation of the overall population, it was crucial that all market segments were present in the sample [86].

3.3.1 Survey Limitations

Survey methods are either qualitative or quantitative [87]. A qualitative survey uses information from sales staff and other sources. A quantitative approach uses past data to predict the future. In practice, it is important to combine these two methods to obtain the most realistic results. Even though this is the most accurate method available, it still has some limitations which are important to take note of. Qualitative surveys suffer from human limitations. This is evident in the survey which was conducted. Surveys rely on several factors which influence the reliability of the final survey data:

- Respondents may not feel encouraged to provide accurate, honest answers or answers which may unfavourably present themselves;
- Surveys with close-ended questions will limit the answers of the interviewees and may steer the answers of respondents in a certain direction unknowingly;
- Data errors may exist due to the size and spread of respondents interviewed;
- Survey question answer options could lead to unclear data because certain answer options may be interpreted differently by those interviewed. For example, what is a little for someone may be a lot for another;
- Lack of time to carry out a survey - ideally, it should stretch over a year period to include differences due to seasonality.

Quantitative surveys suffer from limitations of economic predictions. Quantitative surveys mainly use past numbers as its basis which includes complex economic data. Although surveys that use this type of data is highly mathematical, it makes a crucial assumption that history predicts the future. If market conditions change unexpectedly, these methods become less accurate.

3.3.2 Market Segments

When planning took place to decide which market segments had to be surveyed, it was decided to not just focus on 3PLs, but also their clients so that an extensive amount of data could be collected regarding the full RTM and not just the 3PL side. It is important to understand who the customers of the 3PLs are and what their needs are to determine how best to service them from the 3PLs side. Thus, a comprehensive list was created in Table 16 which indicates all the market segments in the beer industry who purchase from a 3PL with a segment description which describes the differences between these segments. Key and Sub-distributors are added to Table 16 as it was noted that distributors buy and sell products to other distributors based on their size and location from suppliers and breweries.

For the duration of the survey, it is important to note that 3PLs play the role of distributors in these market segments.

Table 16: Market Segments with descriptions.

Segment	Segment Description
Small grocer	• General items sold – mostly non-perishable items, but may sell milk, bread and eggs. • Might be attached to a residence – dedicated portion of residence used to sell and store stock. • Predominantly in residential neighbourhoods or where high footfall occurs.
Large grocer	• Registered with the government. • Referred to as a supermarket. • The point of sale system in place. • A Large variety of groceries - perishable and non-perishable.
Key-distributor	• Has a formal and exclusive relationship with a supplier. • Performs deliveries to sub-distributors and wholesalers. • Has a van sales operation with fixed routes, aligned and managed by the supplier's sales representative.
Sub-distributor	• Receives deliveries from key-distributor, is not exclusive. • Sells spirits, beer and other beverages to retail outlets. • May have an on-premise outlet attached. • Has walk-in customers and does deliveries upon request. May offer customers credit, in the form of empties.
Wholesaler	• Supplies on-premise outlets. • Minimal external branding. • May sell beer in cans and other beverages e.g. soft drinks, juices, malt; • Stock purchased from market stores.
Market store	• Outlets who buy and sell in bulk, located in an enclosed trading area. • Sells to the public and other retail outlets. • Obtains stock from importers and suppliers. • Specific trade days (based on area, varies from one day per week/month to daily).

Segment	Segment Description
Basic bar	• A local bar, which may be an informal structure. • Minimal space for consumers during the day, consumers sit at tables and chairs on the side walk after work. • Cooler boxes used to chill products.
Mainstream bar / regular bar	• A formal structure; • May offer entertainment (music, televised sports matches); • One or more branded fridges; • A variety of beer is sold; • Local food or meals made and sold; • Supplier investment by way of posters, pricing, light boxes, branded tables and chairs, and regular promotions visible.
Upmarket bar	• High-end premium brands sold here; • Found in affluent residential areas or inside international hotels; • A point of sale system in place;
Night club	• Trading hours are from 20:00 to the following morning; • A point of sale system in place; • Music and dedicated dancing area provided; • Many promotions and activations.

With the various market segments identified it was then important to understand how they interact with each other in the RTM. As can be seen in Figure 20 the RTM in Nigeria is quite simple, some RTM insights obtained is also mentioned below:

- The breweries haul directly to strategically placed key-distributors.
- The key-distributors are then tasked with distributing the products down the channel.
- Key-distributors will deliver to large sub-distributors, but also employ van sales which deliver to retail outlets.
- Retail outlets can collect from key-distributors as some have very loose rules on minimum sales quantitates.
- Sub-distributors will deliver to their retail clients, either with a small van or even on a wheelbarrow.
- Walk in clients collecting stock is not uncommon;
- The ultimate consumer will purchase from retail outlets, but also buy from sub-distributors.

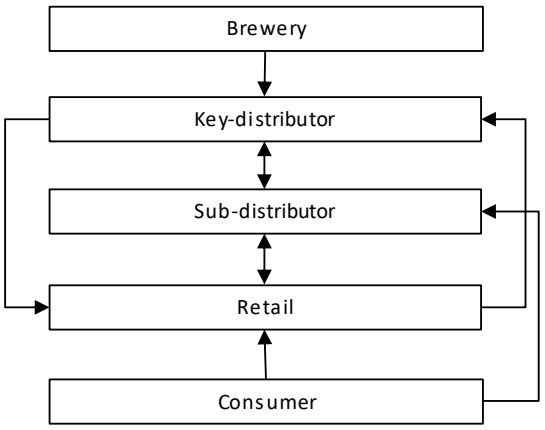


Figure 20: RTM relationship between various segments.

3.3.3 Area and Segment Allocation

Without any concrete information on outlet densities, the 2006 population census [88] and insights from locals were used to guide the determination of the number of surveys per area. Most of the information regarding income categories and settlement types were obtained from an interview with Dr Wapwera from the faculty of environmental sciences at the University of Jos [89]. A summary of the planned number of surveys for Town A is provided in Table 17. In Town A 600 retail outlet surveys were to be completed across eleven areas.

Table 17: Areas that were to be surveyed in Town A.

#	Area	Allocated outlets	Income category	Settlement type
1	Area A1	20	Low	Rural
2	Area A2	75	High	Urban
3	Area A3	60	High	Peri-urban
4	Area A4	70	Medium	Urban
5	Area A5	65	Low	Urban
6	Area A6	45	High	Urban
7	Area A7	65	Low	Peri-urban
8	Area A8	70	Medium	Urban
9	Area A9	65	Low	Peri-urban
10	Area A10	45	Medium	Urban

In the Town B 1,500 outlets were to be surveyed across 8 areas. A summary of the areas is provided in Table 18.

Table 18: Areas to be surveyed in Town B.

#	Area	Allocated outlets	Income category	Settlement type
1	Area B1	175	Medium	Peri-urban
2	Area B2	150	High	Urban
3	Area B3	175	High	Urban
4	Area B4	100	Medium	Peri-urban
5	Area B5	150	Low	Rural
6	Area B6	225	Low	Rural
7	Area B7	275	Medium	Peri-urban
8	Area B8	250	Low	Rural

3.3.4 Survey questionnaire

In this section, the structure of the questionnaire is provided. The standards and inputs discussed in Table 10 and Table 11 provided a base for the questionnaire to be built upon. With further insights obtained through research and discussion, a frame for the final survey could be completed. A sample totalling 2 100 retail outlets must be collected between the two geographies. The survey is divided into three subsections:

1. *Administrative information*: This section firstly records the required administrative information of customers, and secondly it helps to keep track of the progress of the surveyors.
2. *Product information*: Here information is collected on the liquid streams. The data includes sales volume, stock on the floor, prices, and missed sales opportunities.
3. *Supply chain information*: The current RTM strategy is surveyed. By identifying how products flow along the supply chain, it becomes possible to identify several key supply chain links.

3.3.4.1 Administrative information

For each section, a numbered list of items to be completed by the surveyor are provided. In addition, applicable notes are bulleted. Flow diagrams and example layouts are included where necessary to ensure there is no ambiguity.

1. *Surveyor name*: The first item to be completed is the surveyor name which must be a non-editable field and linked to the device.
2. *Timestamp*: When a survey starts, the time and date must be recorded.
3. *Location*: The recorded location must include the latitude and longitude represented as decimal degrees. Additionally, the accuracy of the recorded GPS location must be saved.
4. *Town*: The final survey data must include the town. This can be reverse geocoded; it does not need to be indicated by the surveyor.
5. *Area*: The final survey data must include the area. This can be reverse geocoded but must reflect the names allocated as per the section on survey areas.
6. *Retail outlet name*: The surveyor must record the retail outlet name.
7. *Market segment*: The market segment must be selected from a drop-down menu. The details are provided in Table 16.

3.3.4.2 Product Information

To gather a better understanding of the overall operations of the market segments specific attention was given to the liquid streams, beer products, they sell. This includes metadata such as unit sizes, pack sizes and packaging material. The list provides a good indication of what products are typically found in trade, but cannot be considered 100% complete. Therefore, the survey must be flexible to account for popular products found in trade, not on the original list. A methodology is suggested in Figure 22 to streamline the surveyor selection and addition of products. In the example, the surveyor initially selected Brand 1, which means he is only able to choose from the known pack sizes of Brand 1. However, if he encounters a new pack size for a specific product or a new product altogether, he can capture it by entering new data. The prices, sales and stock data by product for each liquid stream must be recorded per case. The products of each liquid stream must be selected from a drop-down menu. It is assumed 20% of products account for 80% of the volume. Thus it is critical that the surveyor captures all the best-selling brands. A maximum of seven products can be recorded for beer, ranging from the most popular to the seventh most popular product. Figure 21 indicates how the survey questions must be structured. The information must be recorded per case.

Select the categories applicable to you	Units	Total sales per week	Total stock on floor	Are you ever out of stock?	If you always had stock, how many more units could you sell per week?
☐ *Beer*	*Cases*			☐ *Yes* ☐ *No*	

Figure 21: A mock up for beer product data collection.

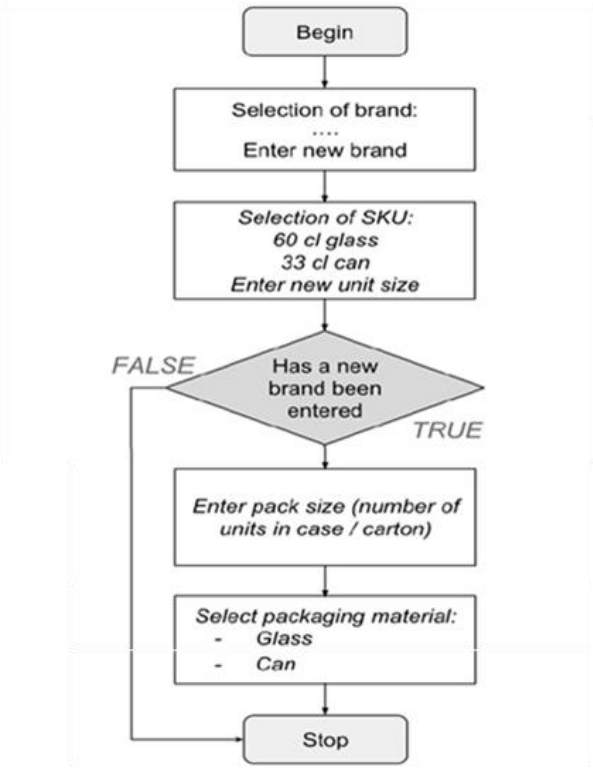


Figure 22: An example of how products can be selected, or new products added.

3.3.5 Supply Chain Information

Figure 23 illustrates the structure surveyors must follow when gathering information regarding the supply chain. The flow chart must be used as a guideline when collecting data. Information is provided where necessary to ensure the survey collects both correct and relevant data.

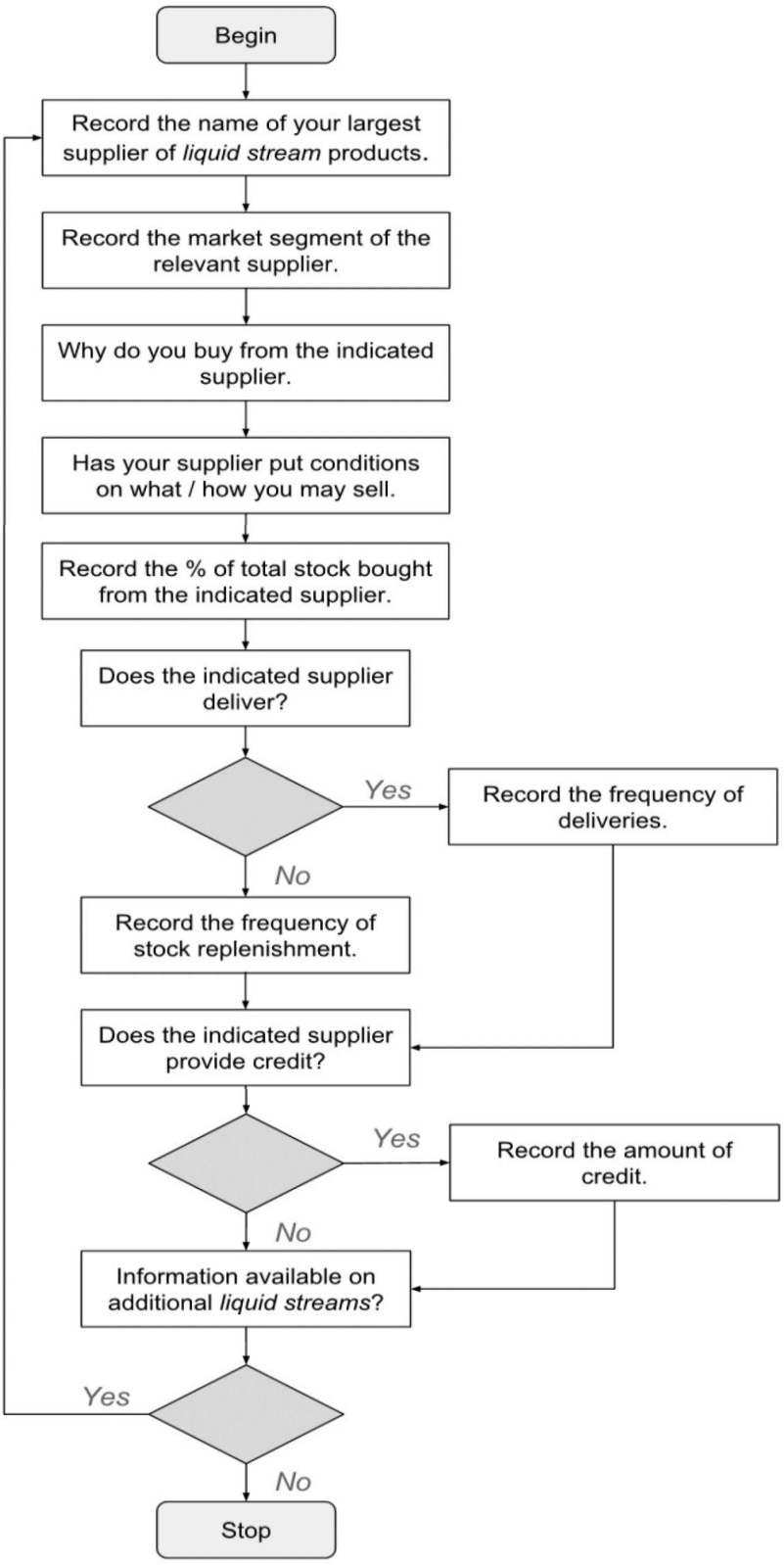


Figure 23: A flow diagram detailing the logic behind the supply chain section.

Figure 24 indicates how survey questions relating to the supplier information must be structured. For data consistency purposes, the option to select each market segment from a drop-down menu is necessary; Table 19 explains the characteristics of each supplier segment.

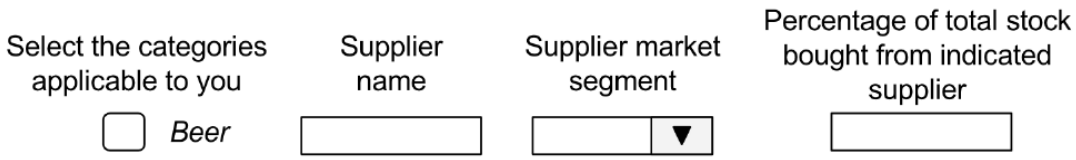


Figure 24: Capturing supplier information.

Table 19: Dropdown of supplier market segments for beer:

Supplier Segment	Characteristic of supplier relationship
Brewery	1. Retailer buys directly from the supplier, no middle man. 2. The retailer receives deliveries in bulk in large trucks, not vans.
Key-distributor	1. The retailer receives deliveries one, two or three times a week. 2. Deliveries might be van sales, where the driver will simply stop by and ask whether the retailer wants to purchase something. 3. The retailer receives sales rep visits and has some promotions. 4. The retailer can only purchase products from one brewery here, exclusive.
Sub-distributor	1. The retailer can go and collect or receive deliveries. 2. The retailer is often close to the sub-distributor, receiving deliveries in wheel barrows or other small vehicles.
Wholesaler	1. A retailer might only be able to buy spirits and not beer here. 2. The retailer will not be able to buy beer in cases, only cans.
Retailer	1. Any other retail outlet not described above. 2. The retailer will not be able to buy in bulk from them. 3. Typically, small grocers and other bars.

The following questions must also be surveyed to gather all the required supply chain information:

1. Why does the outlet buy from a specific supplier?
    a. For the above question, the surveyor must be able to select multiple items from the following dropdown:
        i. Best price.
        ii. Best service.
        iii. Receive credit.

iv. The supplier has promotions.
v. The supplier is close to the outlet.
vi. The outlet has no other option.

2. Does the supplier have conditions on what / how products are to be sold?
    a. If the answer is yes, the surveyor must be able to select multiple of the following answers:
        i. Only allowed to sell supplier products.
        ii. Not allowed to sell specific competitor products.
        iii. Not allowed to buy from a different supplier.
        iv. Must sell products at a specific price.
        v. The supplier has imposed credit conditions.

3. What is the delivery status of the supplier?
    a. It is important to record if a supplier delivers to retail outlets or not.

4. How regularly does the supplier deliver?
    a. If the delivery is not daily, weekly or monthly, the surveyor must be able to specify how many times a week he receives deliveries.

3.3.6 Survey Database

The following section has been included to convey how the final database was structured. To accomplish what is outlined below, the data collected by the survey had to be provided in a spreadsheet, one record or row per customer with x fields detailing the collected data. PowerPivot was utilised to analyse, summarise and finally present the surveyed data. By using PowerPivot, which is an add-in for Microsoft Excel, it was possible to import data from multiple sources into excel and build up a database. This simplifies the task of organising and managing data by allowing various links and relationships to be created between data sets as well creating calculated columns within the database. Figure 25 serves as a visual aid, illustrating how the database is structured together as a whole.

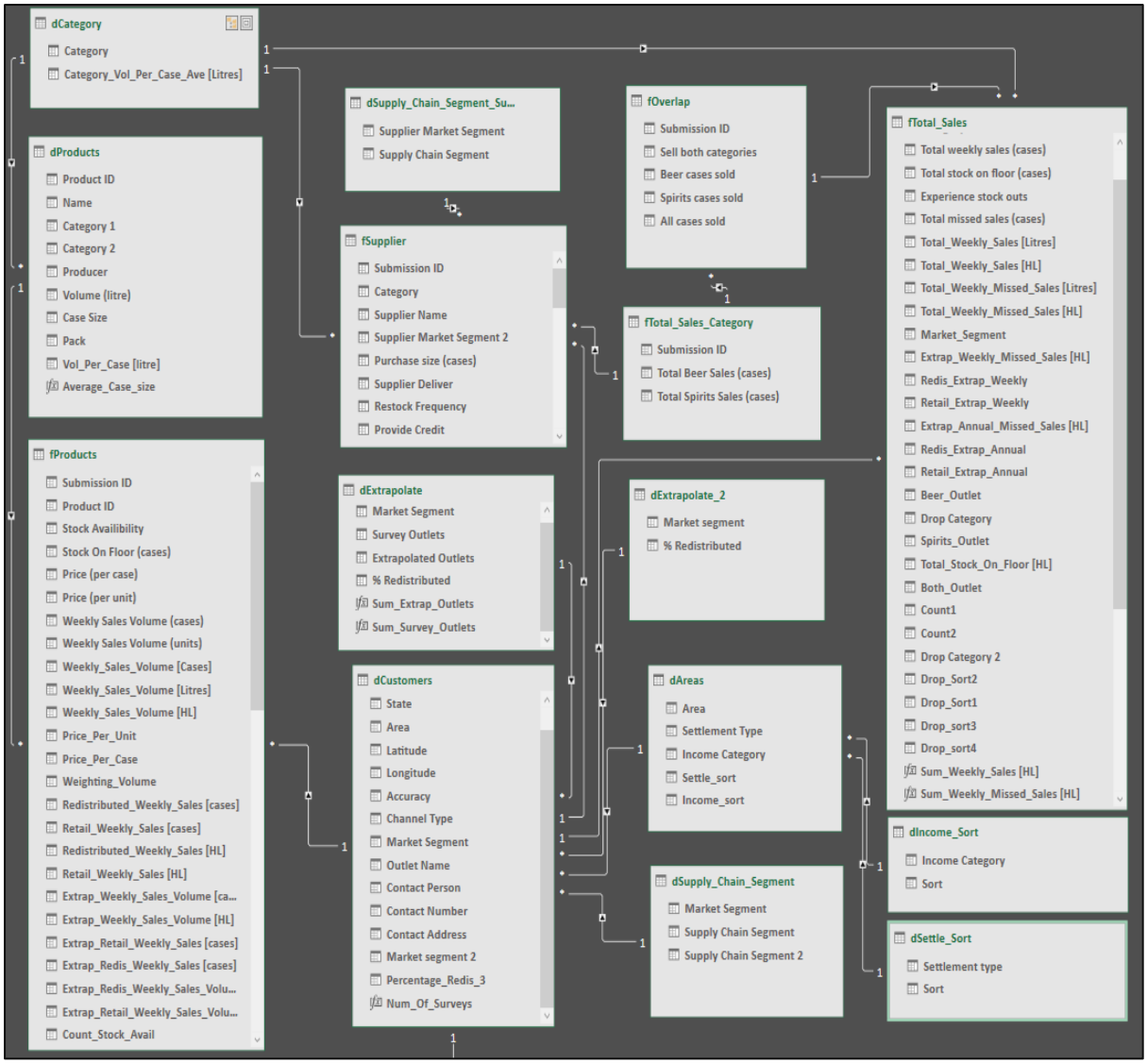


Figure 25: Illustration showing the diagram view of the database structure in PowerPivot.

3.4 Chapter Conclusion

The purpose of this chapter was to identify and collect the information required to develop a 10-year break-even model. The first step was to determine which information had to be collected and how. Four main groups of data were identified to be collected: industry standards, specific inputs, vehicle information, and salary information. Three approaches to collecting the required data was identified next, namely industry research, historical data, and an in-depth survey which was planned during in-country visits and executed by a local surveying company.

Several challenges were overcome in the surveying process. The biggest challenge was the reliability of the survey data as it can be influenced by numerous factors. The first step in the surveying process was

to determine the scope of the survey. The towns in Nigeria was selected to conduct the surveys in, with ten customer segments identified in each. Then these towns divided into areas based on the settlement type and income category of the population. The information which could not be gathered in the industry research and historical data section was then used to compile a survey questionnaire. Lastly, a survey database was created to store and manage the collected data.

Chapter 4: Analysis of Survey Data

With the survey completed the next step is to analyse the data to determine which insight can be extracted. All the surveyed data was entered into the survey database discussed in section 3.3.6. With the data entered and analysed several insights were obtained. To better understand the survey data, it is analysed in three sections:

1. The first section will discuss only the data collected in Town A.
2. Then the data gathered in Town B will be analysed similarly.
3. Lastly, the similarities between the two data sets will be analysed and discussed.

4.1 Town A Survey Analysis

The first step in analysing the survey data is to determine whether the prescribed targets have been achieved. The final survey numbers are compared to the planned number of surveys in Table 20.

Table 20: Comparison of the planned number of surveys vs actual number of surveys for Town A.

#	Area	Allocated outlets	Surveyed outlets
1	Area A1	40	47
2	Area A2	75	45
3	Area A3	60	57
4	Area A4	70	75
5	Area A5	65	46
6	Area A6	45	64
7	Area A7	65	77
8	Area A8	70	42
9	Area A9	65	152
10	Area A10	45	56
Grand total		**600**	**661**

As illustrated in Table 20 the actual survey completed 661 retail outlet surveys in Town A, compared to the planned 600. Also, the survey achieved a good split between all the survey areas. For a few areas, the actual number of surveys fell short of the planned number of surveys. This simply means the outlet density was lower than expected. The last validation step is to assess the survey split between the different market segments in Town A. The survey split by market segment is provided in Table 21. The summarised raw data can be seen in Table A1.

Table 21: Count of outlet surveys by market segment.

Market Segment	outlet count	% of total
Basic Bar	356	53.86%
Formal Retailer	0	0.00%
Large Grocer	19	2.87%
Mainstream / Regular Bar	52	7.87%
Night Club / Upmarket Bar	13	1.97%
Small Grocer	125	18.91%
Sub-Distributor	43	6.51%
Wholesaler	17	2.57%
Wine / Spirit Store	36	5.45%
Grand total	**661**	**100.00%**

The survey did not find any formal retailers or large chain supermarkets in Town A. In Town A, the basic bar and mainstream/regular bar market segments constitute 61.7% of all outlets surveyed. This agrees well with observations made during the in-country visit. Regarding outlets selling alcohol, these two market segments are extremely prevalent. Most outlets exclusively selling spirits label themselves as wine/spirits stores but they still occasionally sell beer. Small grocers are another major market segment where consumers can purchase a basket of goods.

4.1.1 Weekly beer sales volume

This section explores the weekly sales volume captured by the survey. The weekly beer sales volume represented in Figure 26 has been produced by summing the individual sales volume by brand. The survey captured the weekly sales volume of 53 product SKUs per retail outlet. The bottom-up approach attempts to minimise the estimation errors that would otherwise be introduced by an overall estimation of sales volumes. The summarised raw data can be seen in Table A3. Overall the retail survey captured a weekly sales volume of 5,628 hectolitre [hl] of beer. The figure does not differentiate between redistributed and retail volumes. However, it provides a good indication of the importance of the market segments basic bars and sub-distributors. Collectively the two segments account for 4,890.02 hl of the total beer sales volume captured in Town A. The summarised raw data can be seen in Table A3.

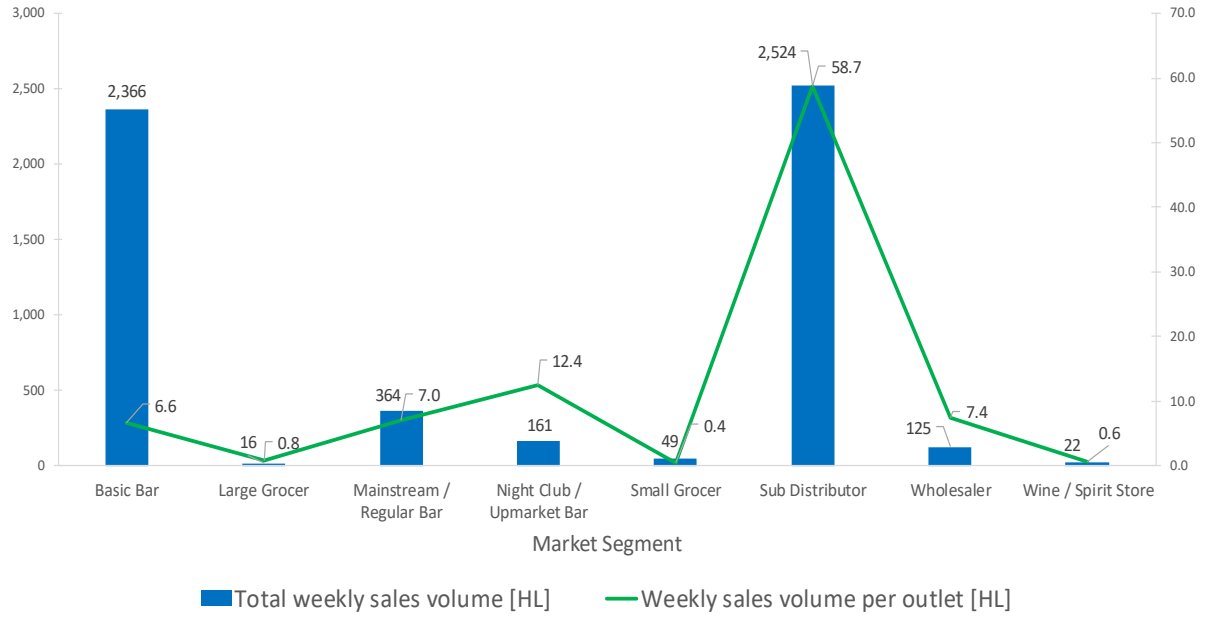


Figure 26: Total weekly sales volume versus weekly sales volume per outlet.

Figure 26 compares the total weekly sales volume with the weekly sales volume per outlet by market segment. It provides a clearer indication of the popularity of outlets within each market segment by eliminating any survey bias. As expected the weekly sales volume by outlet is the highest in the wholesale market segment named sub-distributors. On average outlets belonging to the market segments, basic bars and mainstream/regular bars sell the same volume per week. Therefore, from a RTM point of view, there is no difference between the two market segments. Sheer outlet numbers drive the total sales volume contained in the market segment basic bars. In comparison, night clubs/upmarket bars exhibit a much higher sales volume per outlet than any other retail market segment.

The weekly sales volume by income category per outlet is evaluated in Figure 27. The pie chart on the left indicates the average weekly sales volume per area and the pie chart on the right indicates the average weekly sales volume per income category. The summarised raw data can be seen in Table A5. All market segments described as liquid distributors have been excluded from the analysis. Only sub-distributors and wholesalers are described as liquid distributors. The remainder of the market segments is classified as outlets.

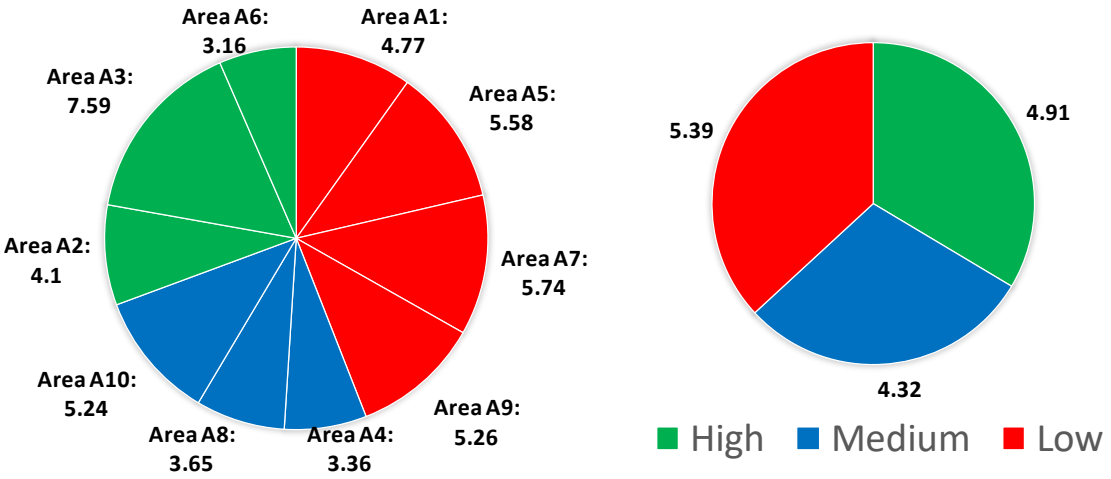


Figure 27: Weekly sales volume [hl] per outlet by income category.

Similarly, the weekly sales volume by settlement type is evaluated in Figure 28. The pie chart on the left indicates the average weekly sales volume per area and the pie chart on the right indicates the average weekly sales volume per urbanisation level. The summarised raw data can be seen in Table A5. The classification of areas by income category was provided by the department of urban and regional planning at Jos University [89]. The classification by settlement type was done by reviewing satellite imagery and largely based on in-country insights. For Town A, rural settlements consist of both low and medium income areas.

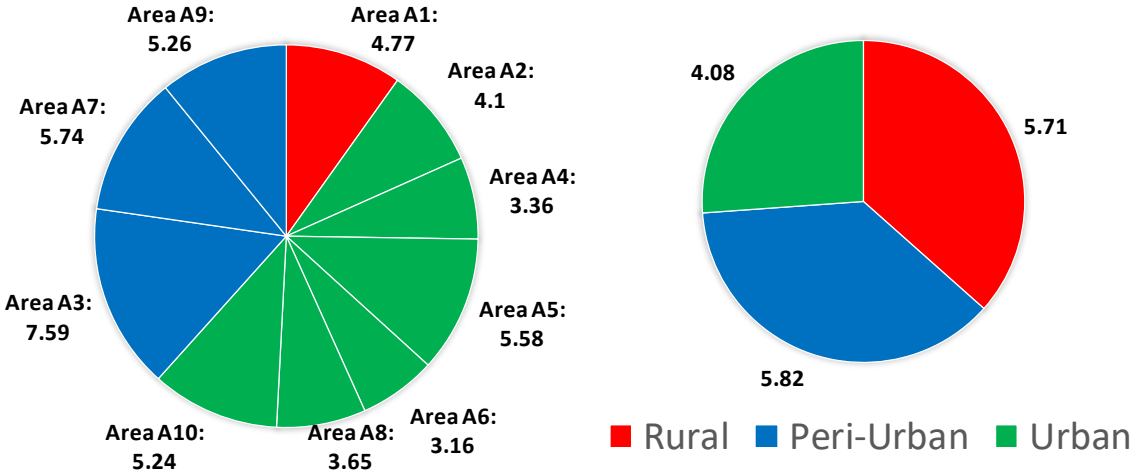


Figure 28: Weekly sales volume [hl] per outlet by settlement type.

The relative popularity of material and returnability of products is explored in Figure 29. The pie chart on the left indicates split between can and glass containers and the pie chart on the right indicates the split between returnable and non-returnable containers. The returnable glass bottle accounts for 96.74% of all glass bottles sold or 93.64% of the total volume of beer sold in Town A.

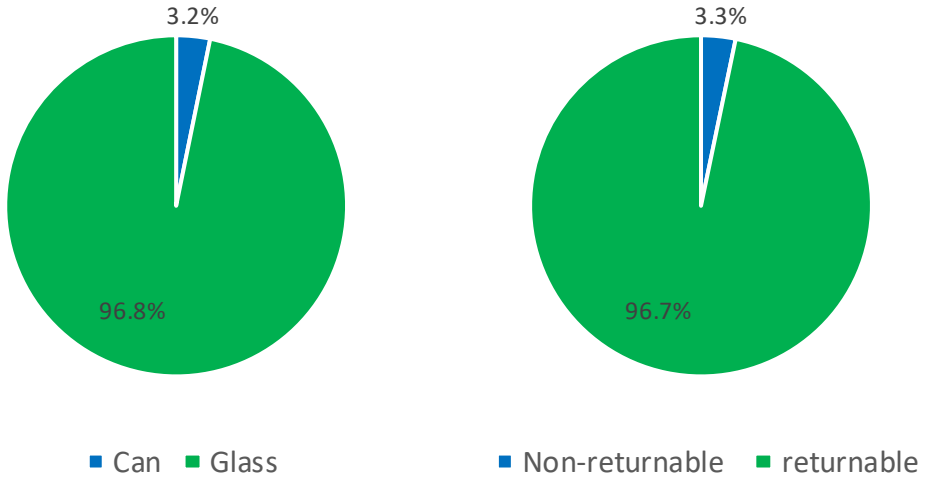


Figure 29: Market share by pack size and pack material.

4.1.2 Pricing of beer

All unit prices represented in this section have been calculated by weighing the captured prices with the associated sales volume. Therefore, the weighted unit price or weighted price per bottle accounts for a price point at which most of the volume is sold. The weighted unit price of beer is compared across the different market segments as illustrated in Figure 30 with the summarised raw data in Table A3.

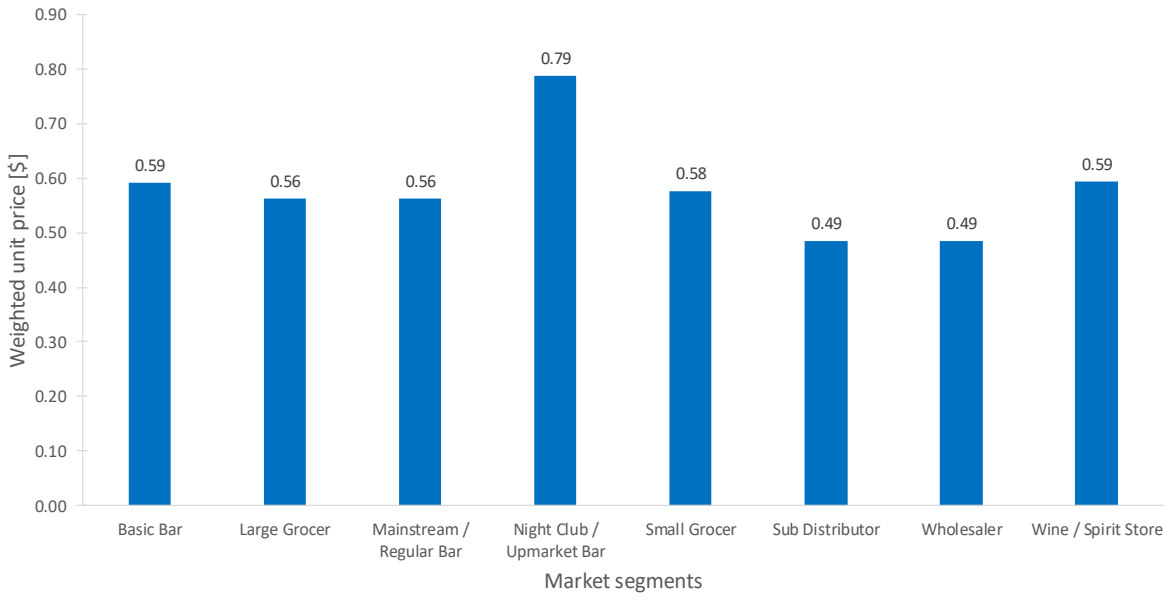


Figure 30: A comparison of the weighted unit price of beer by market segment.

Figure 31 investigates the sensitivity of the market to pricing by comparing the top 10 best-selling brands across weekly sales volumes and weighted unit prices. The summarised raw data can be seen in

Table A7. By looking at all products, there is a definitive correlation between weekly sales volume and the weighted unit price. The less expensive the product is, the higher the associated weekly sales volume.

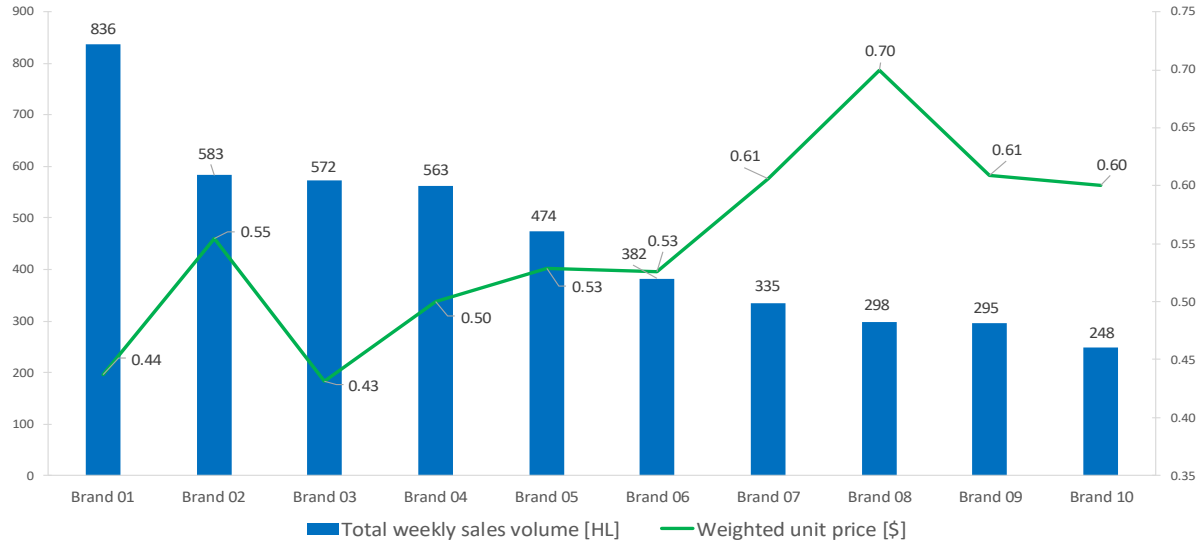


Figure 31: A comparison of the weighted price of the top ten best-selling brands.

4.1.3 Stock availability of beer

The following section explores the stock availability in Town A. Figure 32 illustrates the total stock on the floor by market segment. The summarised raw data can be seen in Table A3. The total stock on floor estimate provided by the outlets is compared to the total stock on floor summation of each SKU to determine how accurate the information is.

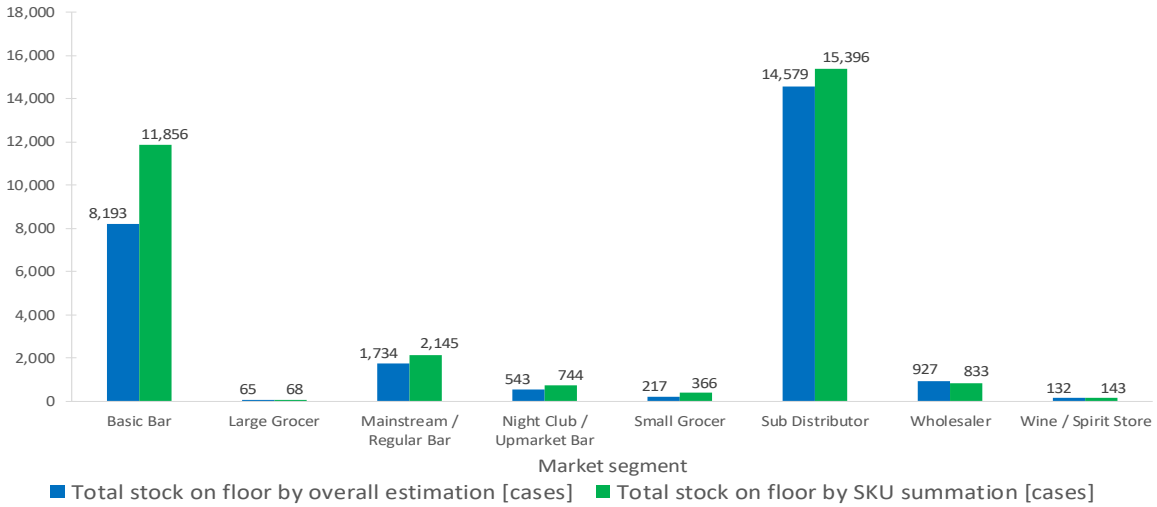


Figure 32: Validation of total stock on floor estimation.

The two metrics compare favourably. The days of cover by market segment is determined by the bottom-up method to portray a more realistic picture. The days of cover are illustrated in Figure 33 with the summarised raw data in Table A3.

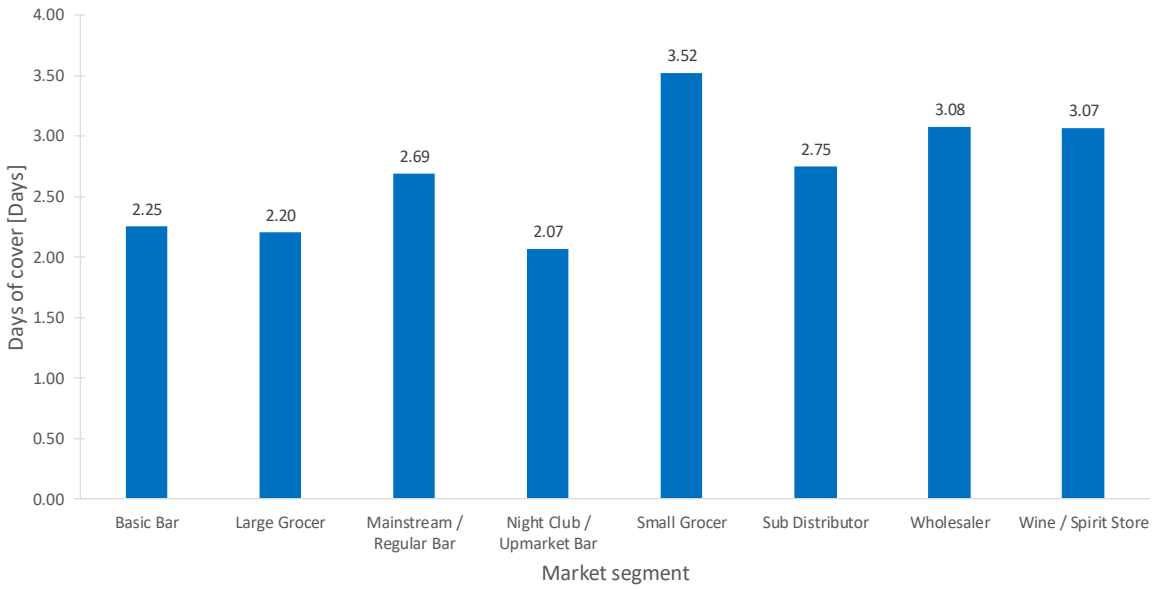


Figure 33: Days of cover by market segment.

4.1.4 Weekly missed beer sales volume

For each outlet surveyed, an estimation of its weekly missed sales volume was recorded in the surveying process. These figures are explored in the subsequent section. The weekly missed sales volume represented in this section cannot be interpreted as a gap in the market to be filled by a new entrant. However, the missed sales volume alludes to the potential market size of Town A if the channels are properly managed and bolstered with favourable credit terms. The estimated missed sales volume has not been manipulated in any manner and therefore does not account for overzealous estimations provided by outlets. Figure 34 indicates that only basic bars and sub-distributors recorded weekly missed sales volume worth noticing with the summarised raw data in Table A3. The addition of the missed sales volume increases the total recorded beer sales volume in Town A from 5,628.42 hl to 6,089 hl or an increase of 8.18%.

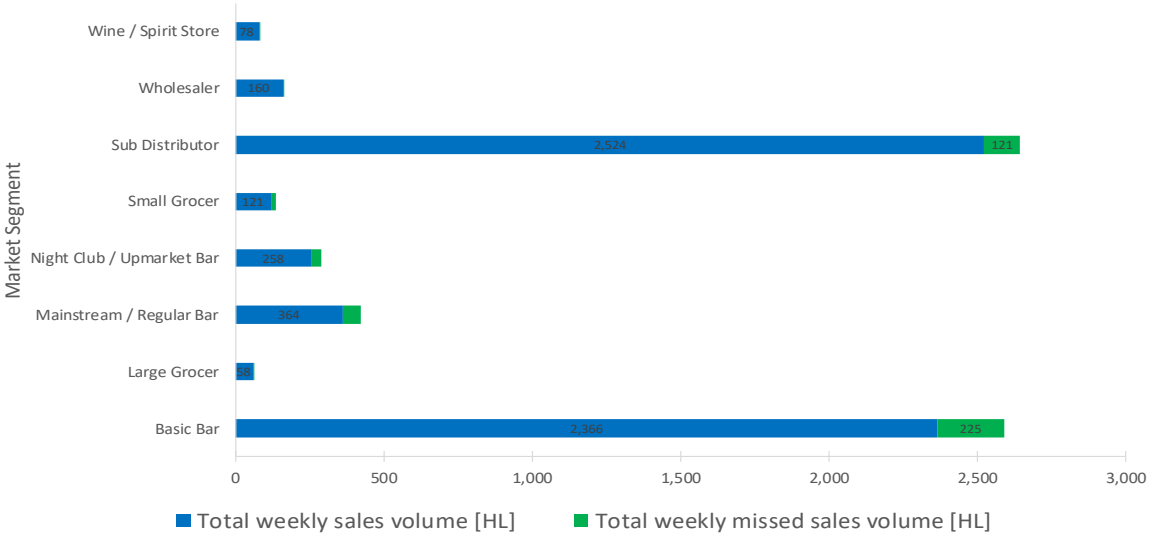


Figure 34: Comparison total weekly sales volume and total weekly missed sales volume.

Table 22 summarises the insights gathered around the weekly missed sales volume by market segment.

Table 22: Summary of weekly missed sales volumes by market segment.

Market Segment	survey outlets	Weekly sales volume [hl]	Weekly missed sales volume [hl]	% sales volume missed	Outlets experiencing stock outs	% outlets with stock outs
Basic Bar	356	2,365	225	9.5%	56	15.8%
Large Grocer	19	15	2	16.6%	4	33.3%
Mainstream / Regular Bar	52	364	57	15.8%	14	27.5%
Night Club / Upmarket Bar	13	161	32	20.3%	3	23.1%
Small Grocer	125	49	14	29.0%	22	46.8%
Sub-Distributor	43	2,524	121	4.8%	4	11.1%
Wholesaler	17	125	2	2.1%	3	21.4%
Wine / Spirit Store	36	22	4	18.8%	5	23.8%
Grand Total	661	5,628	460	8.2%	111	20.2%

4.1.5 Extrapolated beer volumes

This subsection determines the total market size of Town A by extrapolating the captured weekly sales volumes and weekly missed sales volume to the entire universe of outlets in Town A. The volumes captured by the survey does not allow the analysis to quantify the potential of the entire outlet universe in Town A. Thus, to extrapolate the captured volumes, the surveyor has provided an estimation of the total universe size of Town A regarding outlets selling alcohol. The extrapolated numbers are given in Table 23.

Table 23: Surveyed outlets versus total outlet universe by market segment.

Market Segment	Survey count	Total outlet universe
Basic Bar	356	1,320
Formal Retailer	0	0
Large Grocer	19	70
Mainstream / Regular Bar	52	193
Night Club / Upmarket Bar	13	48
Small Grocer	125	463
Sub-Distributor	43	159
Wholesaler	17	63
Wine / Spirit Store	36	133
Grand total	**661**	**2,449**

The total number of outlets in Town A as estimated by the surveyor has been subdivided among the nine market segments using the current distribution of outlets between market segments. This assumes that the survey sample is, in fact, a good representation of the larger outlet universe in Town A. Additionally, the double counting of sales volumes is avoided by calculating what percentage of the sales volume is redistributed back into retail. The redistribution figures are based on observations made during the in-country visit and can be seen in Table 24.

Table 24: Assumed redistribution of volume by market segment.

Market Segment	Redistributed %
Basic Bar	0%
Formal Retailer	5%
Large Grocer	5%
Mainstream / Regular Bar	0%
Night Club / Upmarket Bar	0%
Small Grocer	5%
Sub-Distributor	90%
Wholesaler	90%
Wine / Spirit Store	5%
Grand total	22%

The breakdown of the channel volume as captured by the survey is provided in Table 25. The weekly sales volume is split into redistributed and retail volumes. The retail volume represents the total weekly sales volume which has been bought by the ultimate consumer. According to Table 25, the redistributed

and retail volume does not balance. It is expected that the two figures would roughly balance, as most of the volume is redistributed by wholesalers to retailers. The imbalance would indicate that the survey could have surveyed a disproportional number of retail outlets compared to wholesale outlets. Also, since the survey is only a sample, it cannot be said with any certainty whether volumes captured at a wholesaler and retail level can be attributed to the same stock. Lastly, it is possible that retailers have overstated their weekly sales volume.

Table 25: Weekly sales volume of beer subdivided into redistributed and retail volume for Town A.

Market Segment	Weekly sales volume [hl]	Weekly sales volume per outlet [hl]	Weekly redistributed sales volume [hl]	Weekly retail sales volume [hl]
Basic Bar	2,366	7	0	2,366
Large Grocer	16	1	1	15
Mainstream / Regular Bar	364	7	0	364
Night Club / Upmarket Bar	161	12	0	161
Small Grocer	49	0	2	47
Sub-Distributor	2,524	59	2,272	252
Wholesaler	125	7	113	13
Wine / Spirit Store	22	1	1	21
Grand Total	**5,628**	**9**	**2,389**	**3,239**

4.1.6 Supply chain

The last subsection evaluates the supply chain norms observed by the survey and analyses the current RTM employed by the incumbent players.

4.1.6.1 Supply chain norms

The following section evaluates the supply chain norms. The analysis is broken down into two sections, the first view the supply chain from the perspective of the retail outlet. Therefore, Table 26 is organised according to the market segments found among all outlets surveyed. In comparison, Table 27 is organised according to the market segment from which the outlet purchased goods. The metrics captured by outlet such as average restocks per week is then represented according to the source of supply. Table 27 provides insight into how the different supplier market segments operate.

Table 26: Summary of supply chain norms by market segment.

Market Segment	Outlet count	Exclusive outlets	Outlets with credit count	Outlet deliveries	Restocks per week	Purchase size [cases]
Basic Bar	356	3	4	285	4.71	15
Large Grocer	19	0	0	3	2.00	18
Mainstream / Regular Bar	52	0	1	42	3.83	21
Night Club / Upmarket Bar	13	0	0	11	5.19	27
Small Grocer	125	1	0	17	1.83	12
Sub-Distributor	43	1	1	30	3.27	214
Wholesaler	17	0	0	9	2.05	95
Wine / Spirit Store	36	0	0	2	2.67	8
Grand total	**661**	**5**	**6**	**399**	**4.30**	**31**

Notably, among outlets selling beer in Town A, there is close to no exclusivity. Likewise, only a small number of wholesale and retail outlets receive credit. In contrast, 60.36% of outlets receive deliveries. The remainder of the section views the supply chain from the perspective of the supplier. The supply chain norms by supplier market segment are summarised in Table 27.

Table 27: Summary of supply chain norms by supplier market segment.

Market Segment	Outlet count	Exclusive outlets	Outlets with credit	Outlet deliveries	Restocks per week	Purchase size [cases]	Market Segment
Brewery	9	0	9	1	2.11	1,668	235
Key-Distributor	80	1	76	0	4.57	17,936	74
Neighbourhood dist.	77	2	59	1	4.69	3,980	11
Retailer	2	0	1	0	0.50	11	33
Sub-Distributor	274	3	225	1	4.29	16,915	21
Wholesaler	42	0	29	2	3.75	1,736	9
Grand total	**484**	**6**	**399**	**5**	**4.30**	**42,246**	**31**

As expected very few outlets are large enough in Town A to order directly from the brewery. This could, however, be due to confusion in the mind of the outlets surveyed regarding the difference between the actual brewery and an exclusive key-distributor. The key-distributors can perform the high number of restocks per week by employing van sales. Similarly, neighbourhood distributors and sub-distributors can complete the many weekly deliveries by employing basic delivery mechanisms such as

wheelbarrows. The market segment described as wholesalers are predominantly focused on spirits and do not sell large beer volumes.

4.1.6.2 Route to market

The last section evaluates the current route to market employed by incumbent market players by assessing the flow of volume along the channel. The flow of volume is depicted in Figure 35.

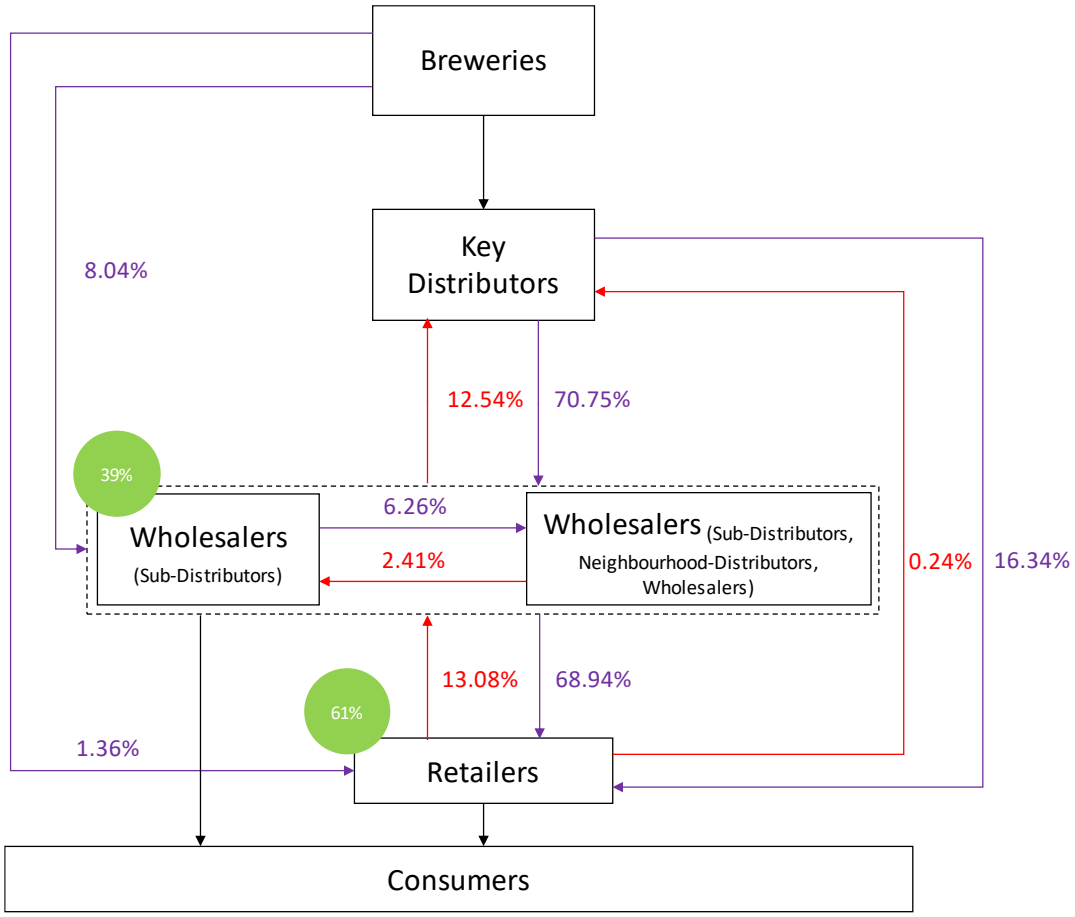


Figure 35: Current distribution channel for beer Town A.

The red and purple arrows indicate the collection and delivery of volume respectively. The green circles indicate that 61% of the total surveyed volume for beer was captured at a retail level and 39% at a wholesaler level. This indicates the importance of the different supply chain members. The percentages in Figure 35 represent the share of volume brought into the channel member. Thus it does not represent the total stock distributed by the specific channel member. The share of volume has been split into calling and delivered volume as well.

4.2 Town B Survey Analysis

The first step in analysing the survey data for Town B is to determine whether the prescribed targets have been achieved. The final survey numbers are described and compared to the planned number of surveys in Table 28.

Table 28: Comparison of the planned number of surveys vs actual number of surveys for Town B.

#	Name	Allocated outlets	Surveyed outlets
1	Area B1	150	137
2	Area B2	175	171
3	Area B3	275	353
4	Area B4	175	178
5	Area B5	100	104
6	Area B6	250	200
7	Area B7	225	278
8	Area B8	150	167
Grand total		**1,500**	**1,588**

As illustrated in Table 28 the actual survey completed 1,588 retail outlet surveys in Town B, compared to the planned 1,500. Also, the survey achieved a good split between all the survey areas. For a few areas, the actual number of surveys fell short of the planned number of surveys. The last validation step is to assess the survey split between the different market segments in Town B. The survey split by market segment is provided in Table 29. The summarised raw data can be seen in Table A2.

Table 29: Count of outlet surveys by market segment.

Market Segment	outlet count	% of total
Basic Bar	503	31.68%
Formal Retailer	60	3.78%
Large Grocer	66	4.16%
Mainstream / Regular Bar	391	24.62%
Night Club / Upmarket Bar	75	4.72%
Small Grocer	237	14.92%
Sub-Distributor	60	3.78%
Wholesaler	55	3.46%
Wine / Spirit Store	141	8.88%

Market Segment	outlet count	% of total
Grand total	1,588	100.00%

4.2.1 Weekly beer sales volume

This section explores the weekly sales volume captured by the survey. The weekly beer sales volume represented in Figure 36 has been produced by summing the individual sales volume by brand. The survey captured the weekly sales volume of 53 product SKUs per retail outlet. The bottom up approach attempts to minimise the estimation errors that would otherwise be introduced by an overall estimation of sales volumes. The summarised raw data can be seen in Table A4. Overall the retail survey captured a weekly sales volume of 9,979 hectolitre [hl] of beer. The figure does not differentiate between redistributed and retail volumes. However, it provides a good indication of the importance of the three primary market segments namely basic bar, mainstream/regular bars and sub-distributors. Collectively the three segments account for 7,837 hl of the total beer sales volume in Town B. The summarised raw data can be seen in Table A4.

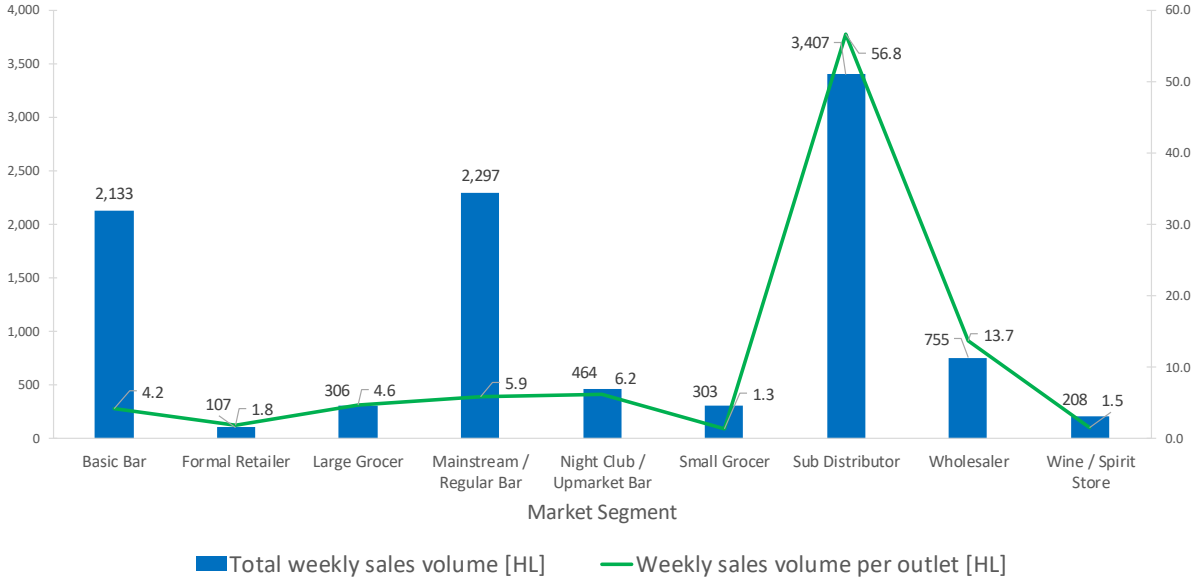


Figure 36: Total weekly sales volume versus weekly sales volume per outlet.

Figure 36 compares the total weekly sales volume with the weekly sales volume per outlet by market segment. It provides a clearer indication of the popularity of outlets within each market segment by eliminating any survey bias. The market segments basic bars and mainstream/regular bars are similar in total sales volume and sales volume per outlet. The weekly sales volume per outlet is higher for on-premise retail outlets than for off-premise retail outlets. Thus, from a RTM point of view, an emphasis must be placed on effectively distributing goods to on-premise retail outlets. As expected the weekly

sales volume per outlet is very high for sub-distributors. This market segment is an important supply chain link between key-distributors and retail outlets, as wholesalers primarily focus on spirits.

The weekly sales volume by income category per outlet is evaluated in Figure 37. The pie chart on the left indicates the average weekly sales volume per area and the pie chart on the right indicates the average weekly sales volume per income category. The summarised raw data can be seen in Table A6. All market segments described as liquid distributors have been excluded from the analysis. Only sub-distributors and wholesalers are described as liquid distributors. The remainder of the market segments is classified as outlets.

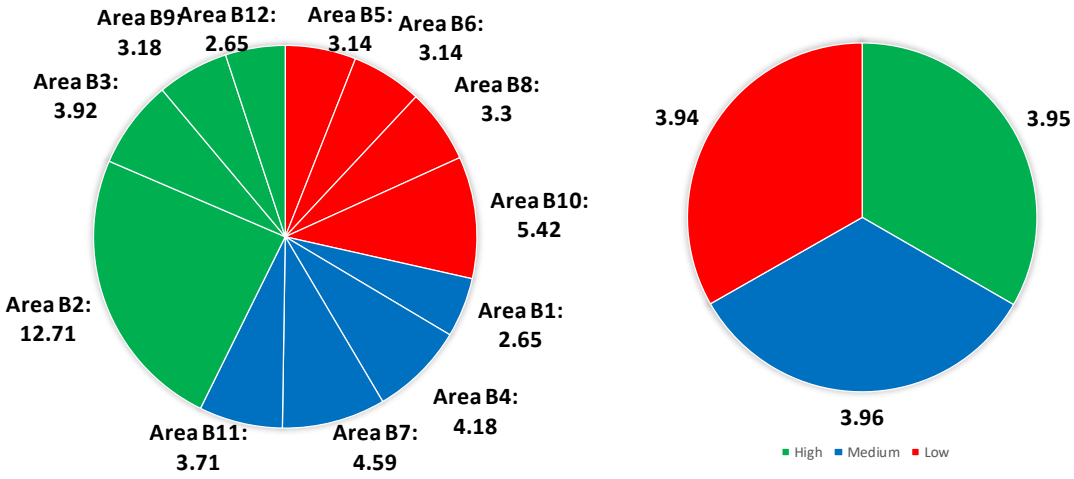


Figure 37: Weekly sales volume [hl] by outlet per income category.

Similarly, the weekly sales volume by settlement type is evaluated in Figure 38. The pie chart on the left indicates the average weekly sales volume per area and the pie chart on the right indicates the average weekly sales volume per urbanisation level. The summarised raw data can be seen in Table A6. For all three income categories, the weekly sales volume per outlet is nearly identical. In Town B, there is a homogeneous relationship between the income category and settlement type. Thus, the breakdown by settlement type is identical to the breakdown of income category.

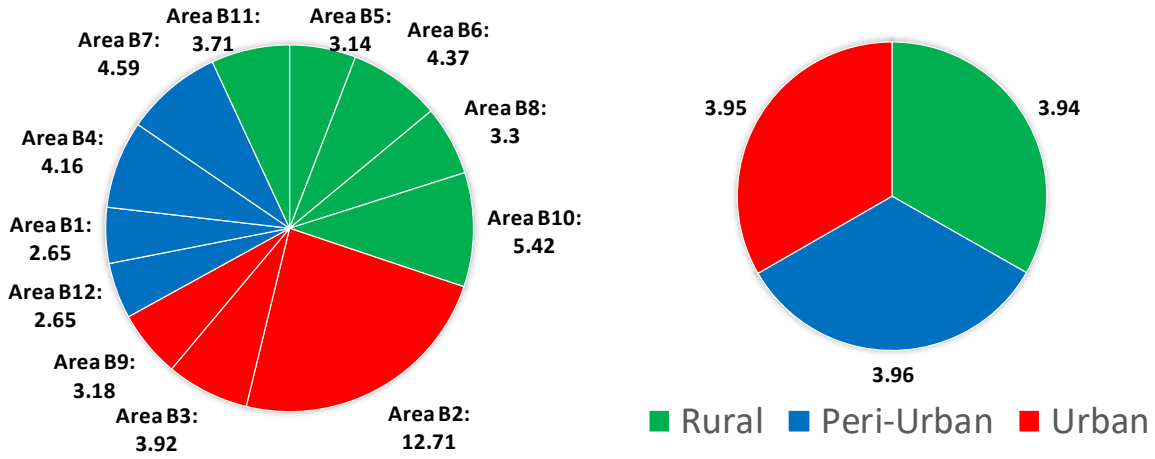


Figure 38: Weekly sales volume [hl] by outlet per settlement type.

The relative popularity of material and returnability of products is explored in Figure 39. The pie chart on the left indicates split between can and glass containers and the pie chart on the right indicates the split between returnable and non-returnable containers. The returnable glass bottle accounts for 89.93% of all glass bottles sold or 81.57% of all beer volume sold in Town B.

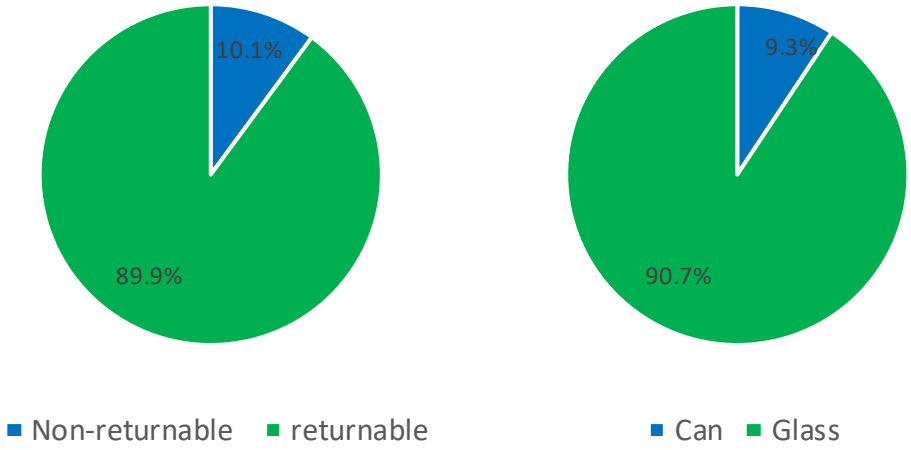


Figure 39: Market share by pack size and pack material.

4.2.2 Pricing of beer

All unit prices represented in this section have been calculated by weighing the captured prices with the associated sales volume. The weighted unit price of beer is compared across the different market segments as illustrated in Figure 40 with the summarised raw data in Table A4.

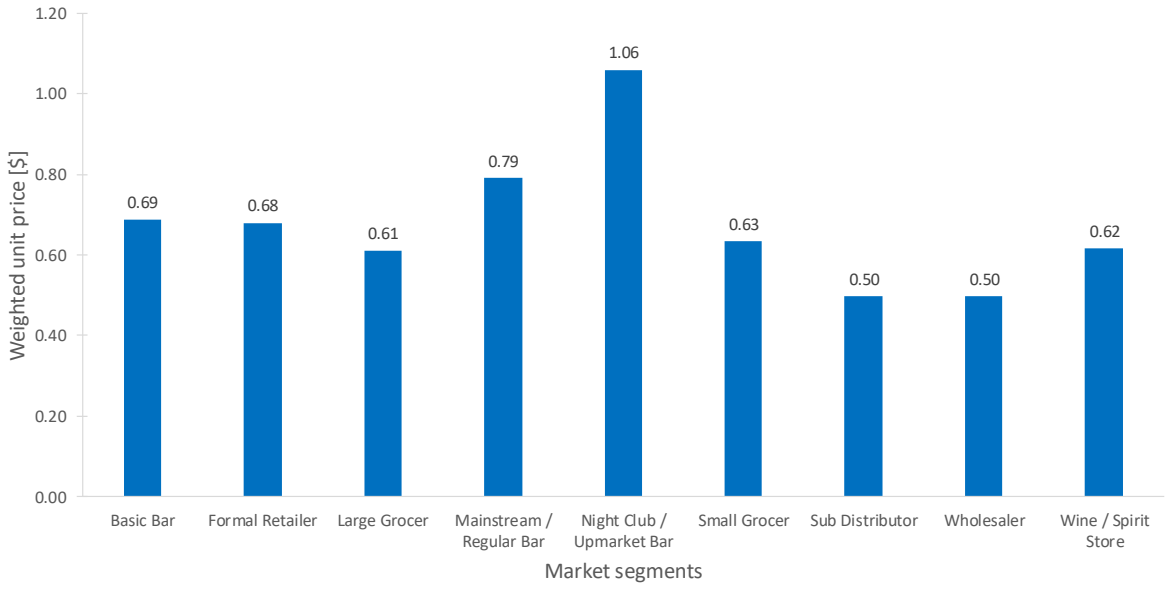


Figure 40: A comparison of the weighted unit price of beer by market segment.

Figure 41 investigates the sensitivity of the market to pricing by comparing the top 10 best-selling brands across weekly sales volumes and weighted unit prices. The summarised raw data can be seen in Table A7. Among the top 5 best-selling brands, there is a clear correlation between pricing and total weekly sales volume. However, Heineken is a premium brand positioned at number five. Therefore, it can be concluded that a market does exist for premium products and a portion of the market is not overly sensitive to pricing.

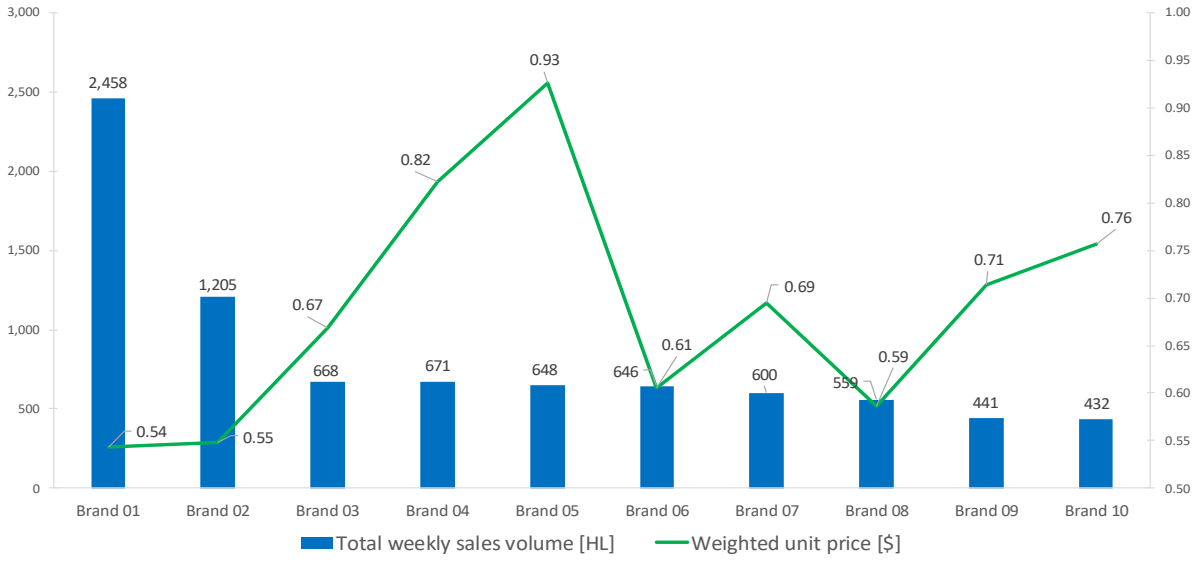


Figure 41: A comparison of the weighted price of the top ten best-selling brands.

4.2.3 Stock availability of beer

The following section explores the stock availability in Town B. Figure 42 illustrates the total stock on the floor by market segment. The summarised raw data can be seen in Table A4. The total stock on floor estimate provided by the outlets is compared to the total stock on floor summation of each SKU to determine how accurate the information is.

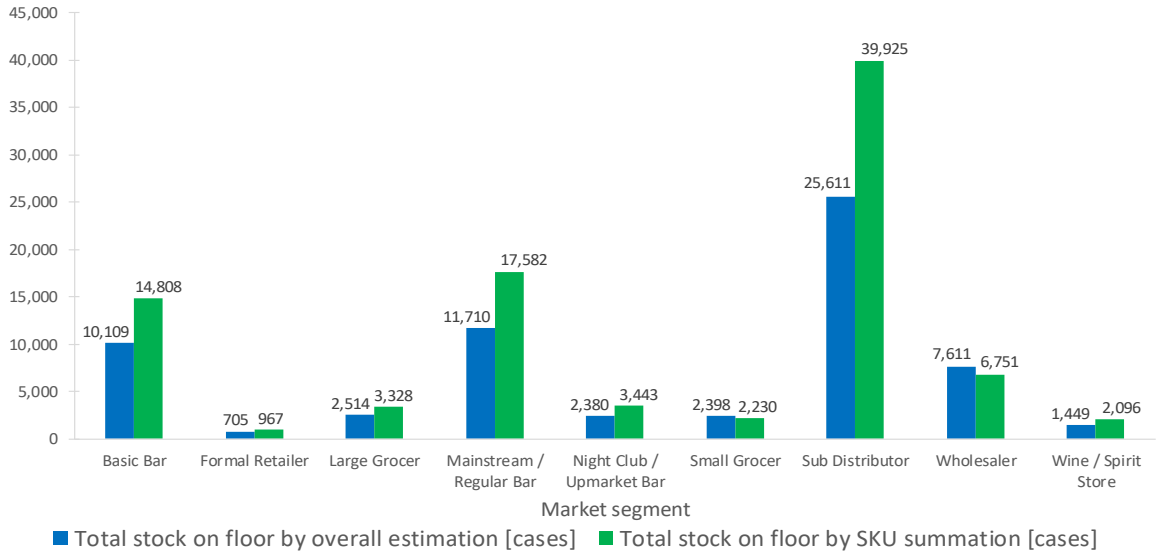


Figure 42: Validation of total stock on floor estimation.

The two metrics compare favourably. It would, however, appear as if the outlets underestimated their stock on floor figures when asked for an overall estimation by category. Thus, to portray a more realistic picture, the days of cover by market segment is determined by the bottom-up method. The days of cover are illustrated in Figure 43 with the summarised raw data in Table A3.

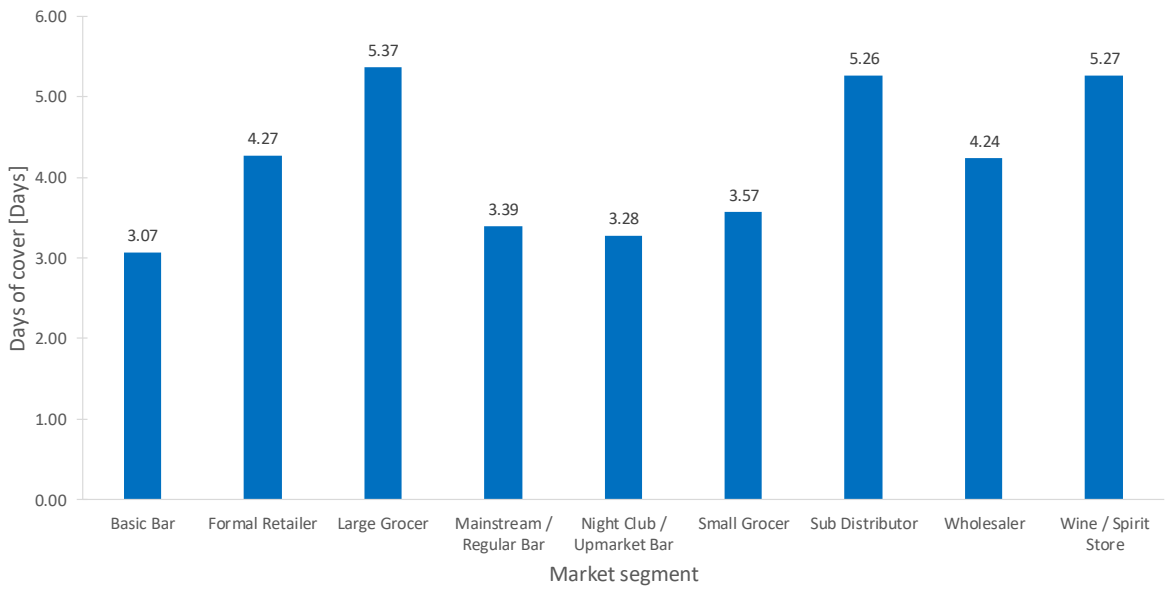


Figure 43: Days of cover by market segment.

4.2.4 Weekly missed beer sales volume

For each outlet surveyed, an estimation of its weekly missed sales volume was recorded in the surveying process. These figures are explored in the subsequent section. The in-country visit supported the notion that stock-outs are not driven by a shortage of products but rather driven by cash flow and the mismanagement of outlets. Therefore, the weekly missed sales volume represented in this section cannot be interpreted as a gap in the market to be filled by a new entrant. However, the missed sales volume alludes to the potential market size of Town B if the channels are properly managed and bolstered with favourable credit terms. The estimated missed sales volume has not been manipulated in any manner and therefore does not account for overzealous estimations provided by outlets.

Figure 44 indicates that basic bars, mainstream/regular bars and sub-distributors recorded weekly missed sales volume worth noticing with the summarised raw data in Table A4. The addition of the missed sales volume increases the total recorded beer sales volume in Town B from 9,979 hl to 16,030 hl or an increase of 60.62%.

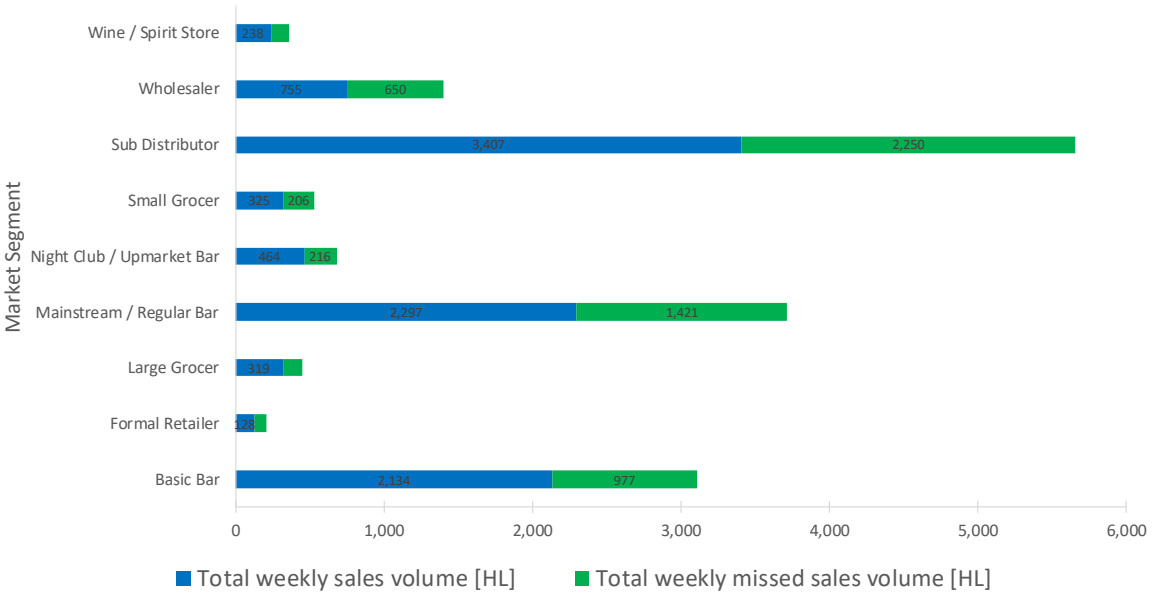


Figure 44: Comparison total weekly sales volume and total weekly missed sales volume.

Table 30 summarises the insights gathered around the weekly missed sales volume by market segment.

Table 30: Summary of weekly missed sales volumes by market segment.

Market Segment	survey outlets	Weekly sales volume [hl]	Weekly missed sales volume [hl]	% sales volume missed	Outlets experiencing stock outs	% outlets with stock outs
Basic Bar	503	2,134	977	45.8%	340	68.4%
Formal Retailer	60	108	78	72.4%	48	96.0%
Large Grocer	66	306	128	41.8%	35	59.3%
Mainstream / Regular Bar	391	2,297	1,421	61.9%	309	79.6%
Night Club / Upmarket Bar	75	464	216	46.6%	54	72.0%
Small Grocer	237	303	206	68.2%	144	82.8%
Sub-Distributor	60	3,407	2,250	66.1%	42	73.7%
Wholesaler	55	755	650	86.1%	40	76.9%
Wine / Spirit Store	141	208	124	59.6%	69	83.1%
Grand Total	1,588	9,980	6,050	60.6%	1081	75.3%

4.2.5 Extrapolated beer volumes

This subsection determines the total market size of Town B by extrapolating the captured weekly sales volumes and weekly missed sales volume to the entire universe of outlets in Town B. The volumes captured by the survey do not allow the analysis to quantify the potential of the entire outlet universe

in Town B. Thus, to extrapolate the captured volumes, the surveyor has provided an estimation of the total universe size of Town B regarding outlets selling alcohol. The extrapolated numbers are given in Table 31.

Table 31: Surveyed outlets versus total outlet universe by market segment.

Market Segment	Survey count	Total outlet universe
Basic Bar	503	1,619
Formal Retailer	60	193
Large Grocer	66	212
Mainstream / Regular Bar	391	1,258
Night Club / Upmarket Bar	75	241
Small Grocer	237	763
Sub-Distributor	60	193
Wholesaler	55	177
Wine / Spirit Store	141	454
Grand total	**1,588**	**5,110**

The total number of outlets in Town B as estimated by the surveyor has been subdivided among the market segments using the current distribution of outlets between market segments. This assumes that the survey sample is, in fact, a good representation of larger outlet universe in Town B. Additionally, the double counting of sales volumes is avoided by calculating what percentage of the sales volume is redistributed back into retail. The redistribution figures are based on observations made during the in-country visit and can be seen in Table 32.

Table 32: Assumed redistribution of volume by market segment.

Market Segment	Redistributed %
Basic Bar	0%
Formal Retailer	5%
Large Grocer	5%
Mainstream / Regular Bar	0%
Night Club / Upmarket Bar	0%
Small Grocer	5%
Sub-Distributor	90%
Wholesaler	90%

Market Segment	Redistributed %
Wine / Spirit Store	5%
Grand total	22%

The breakdown of the channel volume as captured by the survey is provided in Table 33. The weekly sales volume is split into redistributed and retail volumes. The retail volume represents the total weekly sales volume which has been bought by the ultimate consumer. According to Table 33, the redistributed and retail volume does not balance. It is expected that the two figures would roughly balance, as most of the volume is redistributed by wholesalers to retailers. The imbalance would indicate that the survey could have surveyed a disproportional number of retail outlets compared to wholesale outlets. Also, since the survey is only a sample, it cannot be said with any certainty whether volumes captured at a wholesaler and retail level can be attributed to the same stock. Lastly, it is possible that retailers have overstated their weekly sales volume.

Table 33: Weekly sales volume of beer subdivided into redistributed and retail volume for Town B.

Market Segment	Weekly sales volume [hl]	Weekly sales volume per outlet [hl]	Weekly redistributed sales volume [hl]	Weekly retail sales volume [hl]
Basic Bar	2,134	4	0	2,134
Formal Retailer	108	2	5	102
Large Grocer	306	5	15	290
Mainstream / Regular Bar	2,297	6	0	2,297
Night Club / Upmarket Bar	464	6	0	464
Small Grocer	303	1	15	288
Sub-Distributor	3,407	57	3,066	341
Wholesaler	755	14	679	75
Wine / Spirit Store	208	1	10	197
Grand Total	**9,980**	**6**	**3,792**	**6,188**

4.2.6 Supply chain

The last subsection evaluates the supply chain norms observed by the survey and analyses the current route to market employed by the incumbent players.

4.2.6.1 Supply chain norms

The following section evaluates the supply chain norms. The analysis is broken down into two sections, the first view the supply chain from the perspective of the retail outlet. Therefore, Table 34 is organised

according to the eight market segments found among all outlets surveyed. In comparison, Table 35 is organised according to the market segment from which the outlet purchased goods. The metrics captured by outlet such as average restocks per week is then represented according to the source of supply. Table 35 can provide insight into how the different supplier market segments operate.

Table 34: Summary of supply chain norms by market segment.

Market Segment	Outlet count	Exclusive outlets	Outlets with credit count	Outlet deliveries	Restocks per week	Purchase size [cases]
Basic Bar	503	6	6	395	4.16	13
Formal Retailer	60	0	0	16	2.22	11
Large Grocer	66	1	2	26	1.85	32
Mainstream / Regular Bar	391	12	5	332	4.05	19
Night Club / Upmarket Bar	75	4	2	60	3.36	25
Small Grocer	237	1	0	73	2.54	10
Sub-Distributor	60	5	0	56	2.77	386
Wholesaler	55	4	0	32	2.14	120
Wine / Spirit Store	141	1	1	18	2.82	16
Grand total	**1,588**	**34**	**16**	**1,008**	**3.61**	**35**

Notably, among outlets selling beer in Town B, there is close to no exclusivity. Likewise, neither wholesale nor retail outlets receive credit. In contrast, 63.48% of outlets receive deliveries. The remainder of the section views the supply chain from the perspective of the supplier. The supply chain norms by supplier market segment are summarised in Table 35.

Table 35: Summary of supply chain norms by supplier market segment.

Market Segment	Outlet count	Exclusive outlets	Outlets with credit count	Outlet deliveries	Restocks per week	Purchase size [cases]	Market Segment
Brewery	41	3	38	4	2.60	11,786	291
Key-Distributor	138	5	115	4	3.07	18,745	109
Neighbourhood dist.	297	0	242	1	3.68	10,009	17
Retailer	2	1	2	2	3.50	20	0
Sub-Distributor	600	7	481	10	4.15	29,030	19
Wholesaler	238	0	130	13	2.68	4,685	14
Grand total	**1,316**	**16**	**1,008**	**34**	**3.61**	**74,275**	**35**

A handful of outlets is large enough to order directly from the brewery in Town B. This could be attributed to a confusion between key-distributors and the brewery. However, the increased average

purchase size would indicate otherwise. The key-distributors can perform the high number of restocks per week by employing van sales. Similarly, neighbourhood distributors and sub-distributors can perform a large number of their weekly deliveries by employing basic delivery mechanisms such as wheelbarrows.

4.2.6.2 Route to market

The last section evaluates the current route to market used by incumbent market players by assessing the flow of volume along the channel. The flow of volume is depicted in Figure 45. The red and purple arrows indicate the collection and delivery of volume respectively. The green circles indicate that 57% of the total surveyed volume for beer was captured at a retail level and 43% at a wholesaler level. This indicates the importance of the different supply chain members. The percentages in Figure 45 represent the share of volume brought into the channel member. Thus it does not represent the total stock distributed by the specific channel member. The share of volume has been split into calling and delivered volume as well.

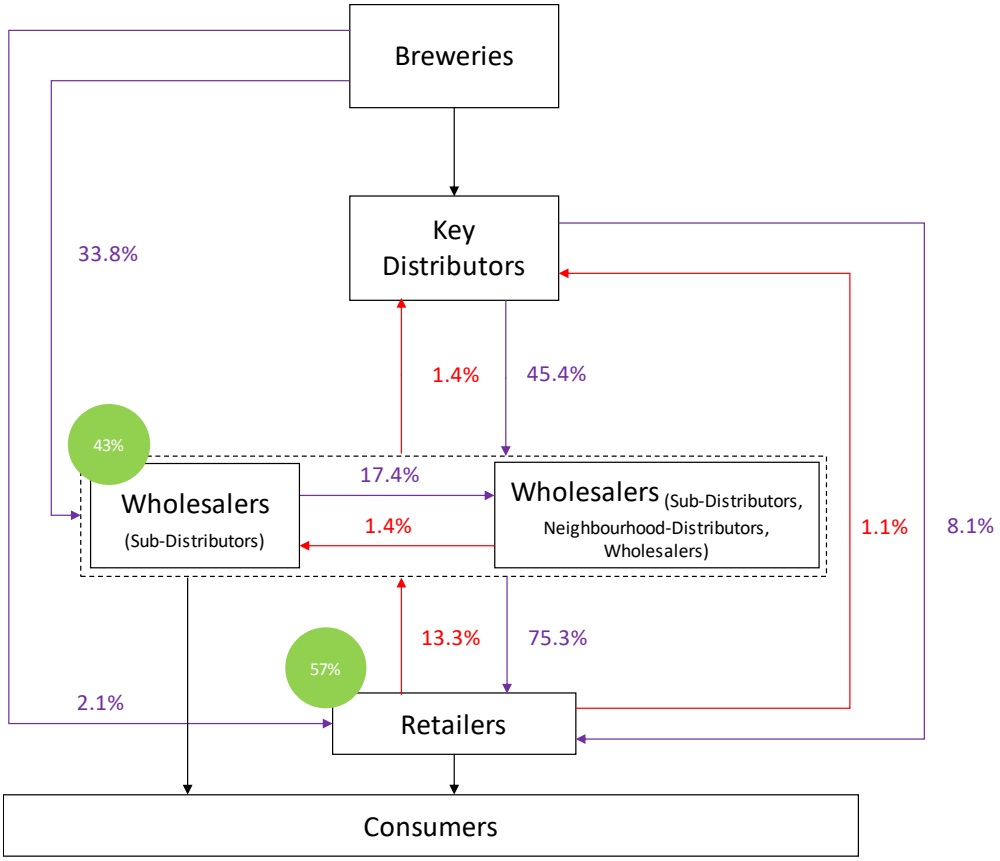


Figure 45: Current distribution channel for beer in Town B.

4.3 Survey Comparison Between Town A vs Town B

The purpose of this section is to compare Town A and Town B according to a few key metrics related to sales volume, pricing and supply chain norms. The total weekly sales volume of Town A is compared to that of Town B can be seen on the right of Figure 46. To further understand the data presented in Figure 46, the weekly sales volume per outlet is plotted on the right of Figure 46. While Town B is a much larger market than Town A overall, by outlet Town A exhibits a much higher weekly sales volume.

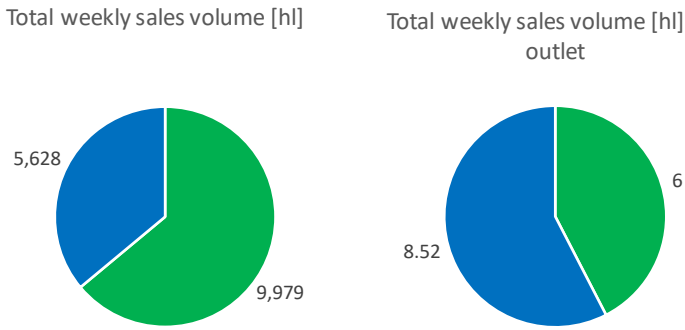


Figure 46: Sales volume comparison for Town A (green) vs Town B (blue).

The weighted pricing per unit for Town A and Town B is explored in Figure 47 with the summarized data displayed in Table A8. The weighted price per unit is much higher in Town B than in Town A. There is a stark difference in pricing for the market segment night club/upmarket bars. This would suggest that upmarket establishments in Town B are more exclusive and therefore more expensive than what can be found in Town A.

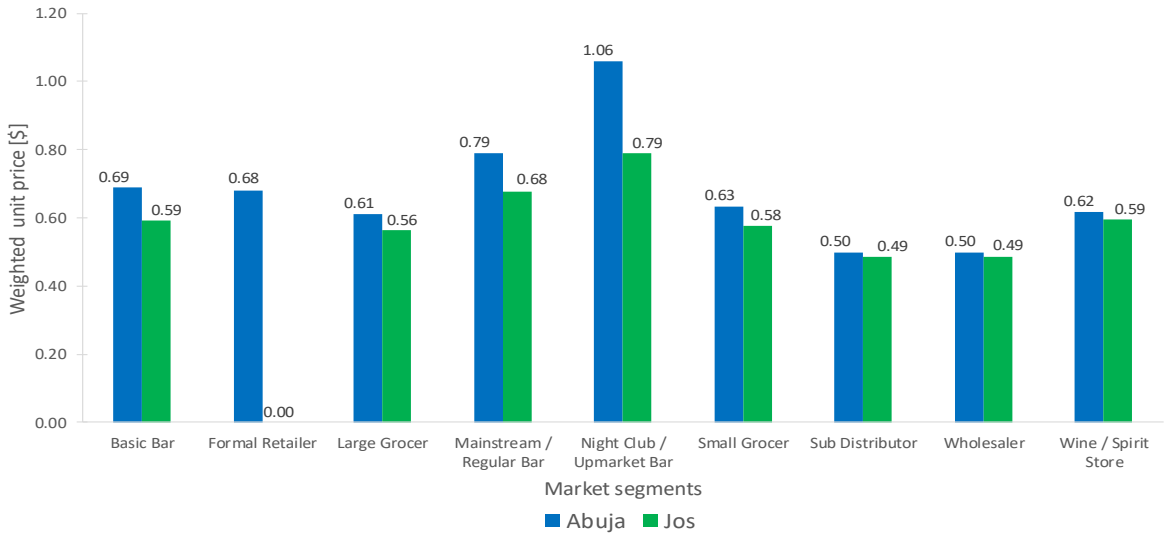


Figure 47: Weighted unit price by market segment for Town A vs Town B.

The days of cover by market segment between Town A and Town B is presented in Figure 48 with the summarized data displayed in Table A3 and Table A4 for Town A and Town B respectively. Town B has a much higher rate of days cover than Town A; this is due to two main reasons. Firstly, Town B is a lot closer to the breweries than Town A, thus making stock replenishment a lot easier. Secondly, from Figure 46 Town A on average sells a lot more products per outlet per day than Town B resulting in lower inventory levels.

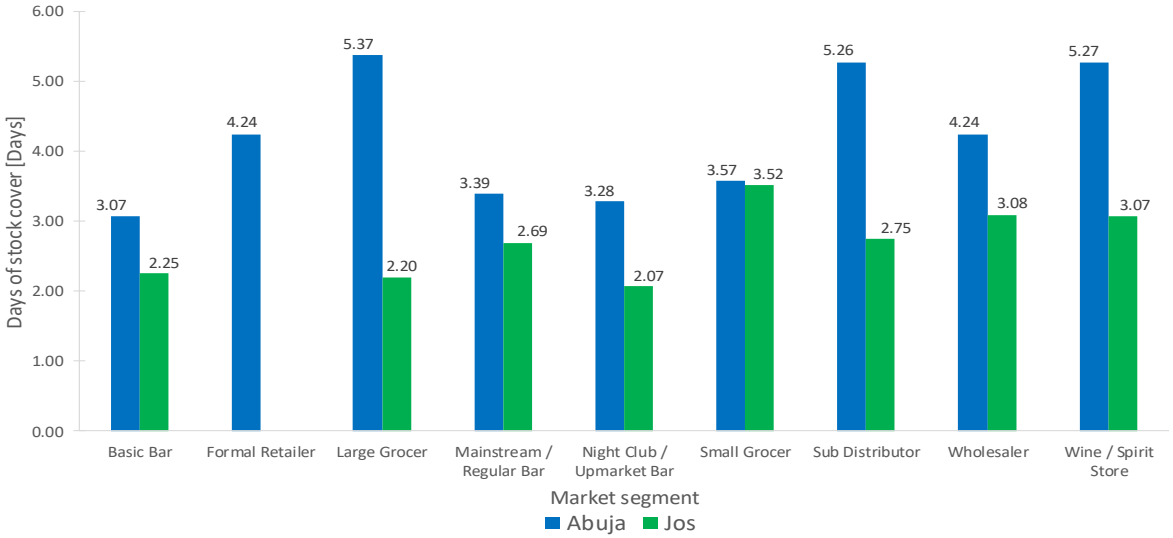


Figure 48: Days of cover by market segment for Town A vs Town B.

Next, a few key supply chain metrics between Town A and Town B are observed. From Figure 49 it is evident that there is no real difference in the prevalence of outlets who receive credit or are exclusive. Likewise, the percentage of outlets who received deliveries are similar for both towns.

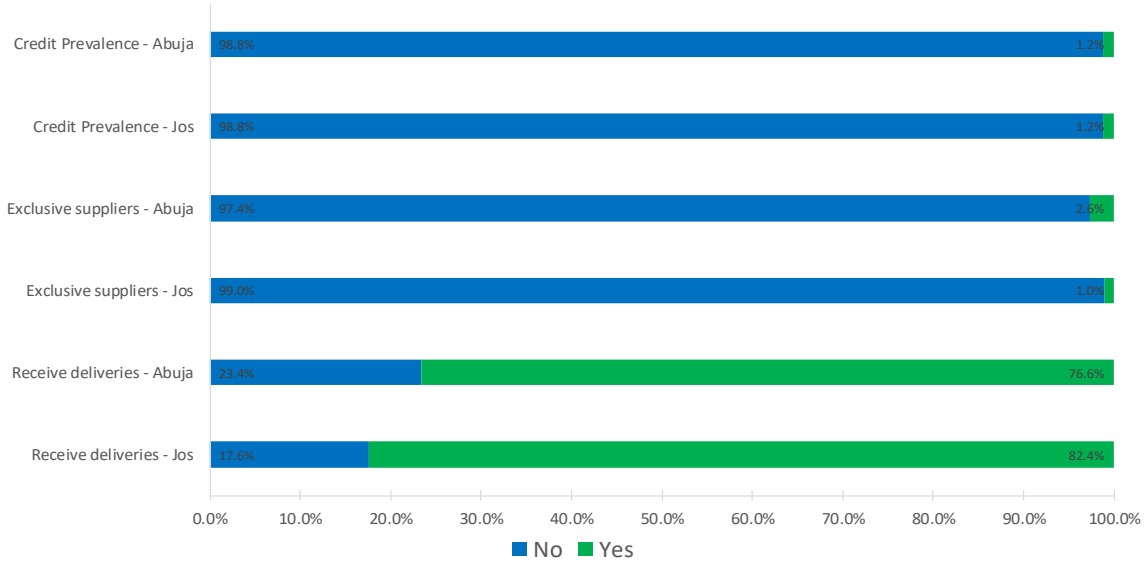


Figure 49: Key supply chain metrics for Town A vs Town B.

The average number of weekly restocks and average purchase size is compared in Figure 50 and Figure 51 respectively with the summarized data displayed in Table A8. On-premise retail outlets restock more frequently in Town A than in Town B. However, the average purchase size by market segment illustrated in Figure 51 is very similar between the towns. This supports the notion that the weekly sales volume by outlet is higher in Town A than in Town B.

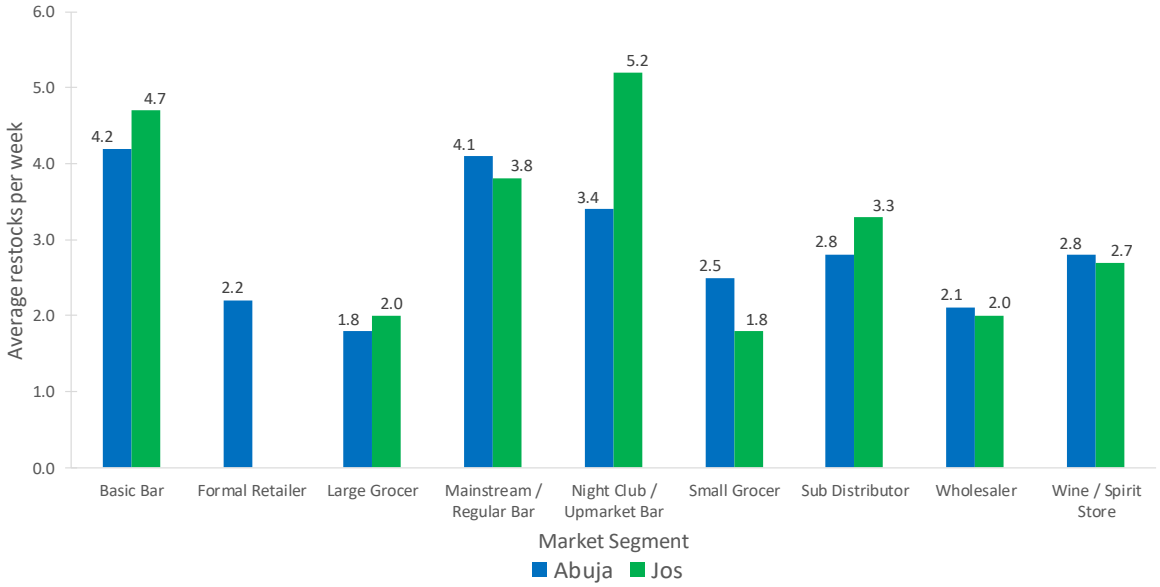


Figure 50: Average number of restocks per week for Town A vs Town B.

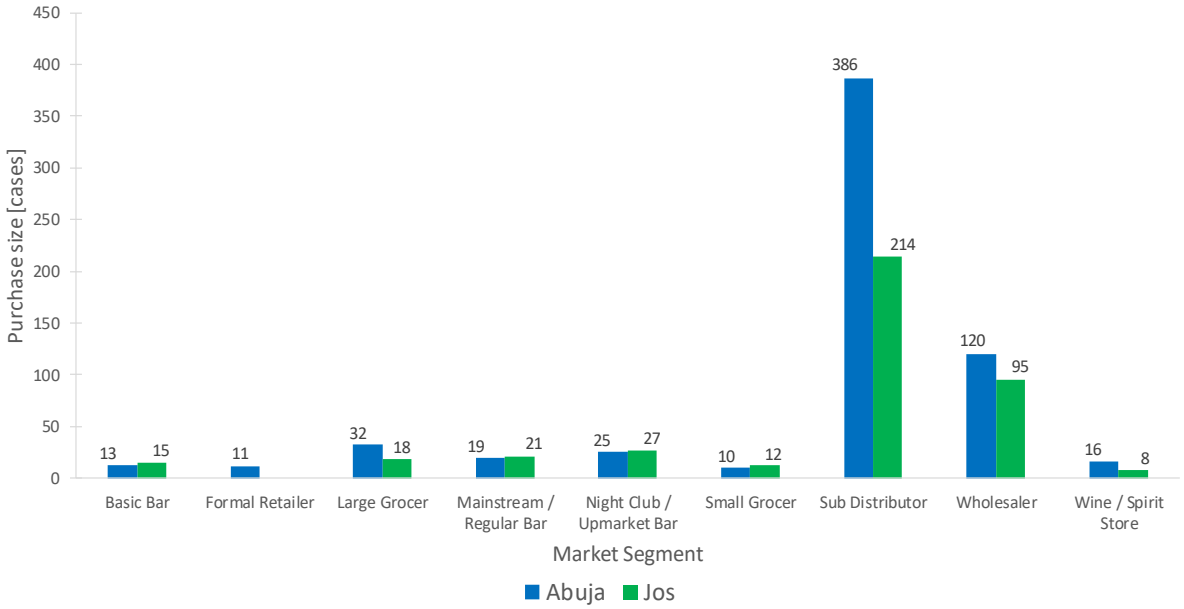


Figure 51: Average purchase size [cases] for Town A vs Town B.

4.4 Chapter Conclusion and Additional 3PL Survey

After analysing all the collected data, it became apparent that all the identified required data from section 1 has not been collected. All the outstanding data falls under the 3PL market segment. Therefore, the surveying company was contracted again to collect the remaining data. Five 3PLs from the previously surveyed 3PLs were identified as a focus group, and interviews were organised with them. The outstanding data is operational of nature, meaning an in-depth survey is not required. The following questions were the base of the interviews conducted by the surveyor:

- Total weekly sales volume in cases, focusing on how it may change through the year;
- The split between volume delivered to customers and volume collected by customers;
- Average distance travelled per vehicle per day, thus the average route distance;
- The number of vehicles owned and their respective capacities;
- The number of employees;
- The size of warehouse space or area used to store full and empty crates while noting how many are inside/outside;
- The size of office space and an estimation of annual offices-related costs such as general expenses, overheads, furniture and equipment, and IT infrastructure costs if available.

If any of the required information is unavailable, steps must be taken to determine a close estimation. A summary of the information gathered from the additional survey can be seen in Table 36:

Table 36: Summary of 3PL interviews.

Specific Inputs	3PL A	3PL B	3PL C	3PL D	3PL E
Total weekly volume (Cases)	11,880 – 13,860	4,000 – 5,000	3,000 – 3,500	2,500 – 3,500	170 - 190
Volume delivered (Cases)	4,500 – 6,000	1,500 – 2,000	800 – 1,200	1,000 – 1,500	50 - 60
Volume collected (Cases)	800 – 1,200	500 - 700	100 - 200	200 - 400	15 - 30
Number of vehicles	10 vehicles	6 vehicles	5 vehicles	4 vehicles	1 vehicle
Vehicle Capacity (Cases)	150 - 700	200 - 400	150 - 500	150 - 300	60 - 70
Distance per Route (km)	30 - 70	30 - 50	20 - 70	20 - 40	20 - 40
Total Number of employees	30	14	9	15	2
Number of Drivers	10 Drivers	6 Drivers	5 Drivers	4 Drivers	1 Drivers
Vehicle crew	10 Crew	6 Crew	2 Crew	4 Crew	0 Crew
Warehouse staff	10 Staff	2 Staff	2 Staff	7 Staff	1 Staff
Size of warehouse (m by m)	200 x 250	200 x 300	120 x 100	30 x 40	10 x 15
Size of office space	3 Rooms(5x5)	4 Rooms(5x4)	2 Rooms(5x6)	4 Rooms(5x4)	1 Room(5x4)

Chapter 5: Third Party Logistics (3PL) Model

5.1 Modelling

The aim of this section was to evaluate how 3PLs are currently operating and performing in relation to each other to allow a base line to be determined. This allowed for the identification of the operational characteristics of a 3PL. For this purpose, a model was designed utilising various inputs and standards identified and analysed in section 3 and 4. This model simulates a 10-year forecast of a 3PL to determine four KPIs of which the break-even rate per case KPI indicates the compensation required for 3PL to operate.

5.1.1 Model Overview

An extensive model has been built to simulate and forecast the operations of a 3PL over a period of ten years. It is important to understand how the model operates and links together. Figure 52 groups 13 elements into two parts and illustrates how the different elements of the model link together. Part A focusses on calculating the *Break-even Model* element, while part B determines various financial indicators. The inputs of 3PL A is used as an example to populate the elements in the discussion below.

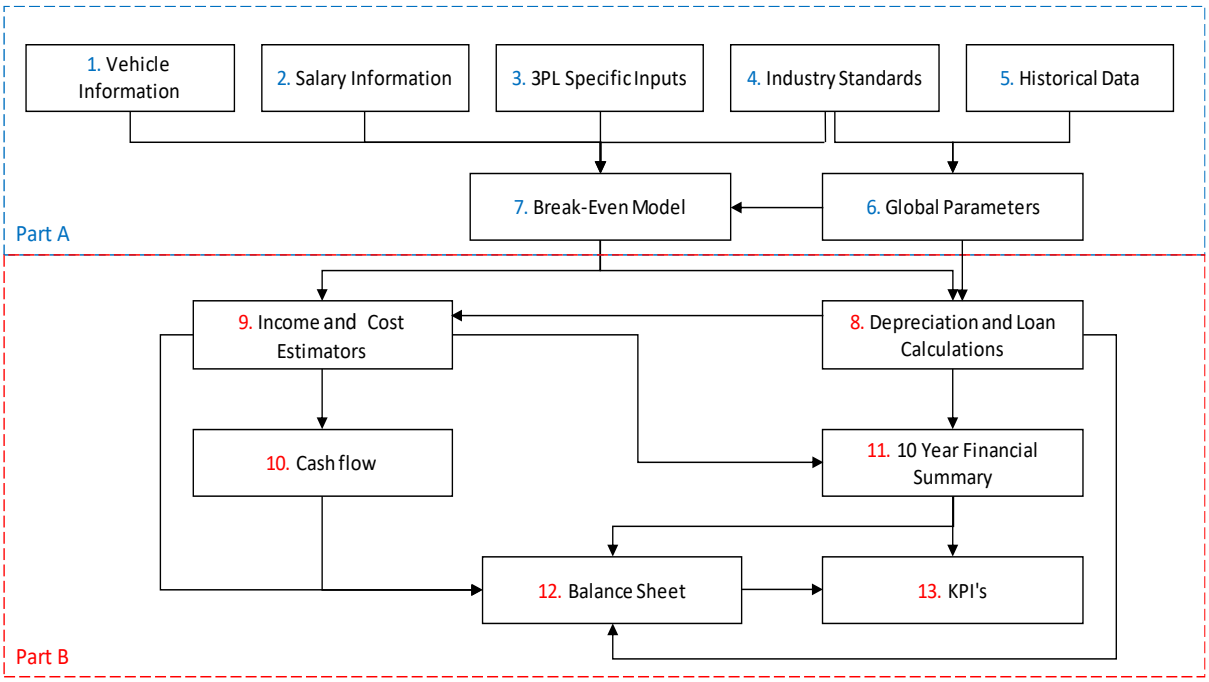


Figure 52: Overview of 3PL Model

Figure 52 combined with the explanation of element 1 to 13 below describes how the model links together, it is necessary to understand what each element in the model represents:

Element 1: *Vehicle Information*: Element 1 is previously discussed in section 3.2.1, an extract of the element can be seen in Table 12. This data is fixed between the 3PL A-E, with only the number of vehicles each 3PL owns determining which data is drawn out of the data table.

Element 2: *Salary Information*: Element 2 is discussed in section 3.2.1, an extract of the element can be seen in Table B1. The data table contains a base rate with a range stretching from -25% to 25% to accommodate for 3PLs operating in different regions and sizes which would pay their employee's different rates. The base rate is fixed for all 3PLs.

Element 3: *3PL Specific Information*: Element 3 is collected in the initial survey combined with information from the additional survey discussed in section 4.4 to yield the extract in Table B2. This table will differ depending on the specific 3PL being analysed.

Element 4: *Industry Standards*: Element 4 is discussed in 3.2.1 and illustrated in Table B3. These standards will remain fixed for different 3PLs.

Element 5: *Historical Data*: Element 5 is discussed and calculated in section 3.2.2 and illustrated in Table 15. This data will also be utilised as a constant between different 3PLs.

Element 6: *Global Parameters*: Element 6 pulls data from element 4 and 5 and is illustrated in Table B4. Element 6 considers the effect element 5 will have on element 4 as time passes. Therefore, element 6 needs to be calculated before it can be used in element 7 which spans over a 10-year period. The extract in Table B4 only shows a 5-year period, whereas the model calculates it for the full period of ten years.

Element 7: Break-Even Model: Table B5 illustrates a 5-year extract of the element 7, whereas the model calculates it for the entire period of ten years. This element pulls information directly from element 1, 2, 3, 4, and 6. Element 7 uses the information from the previous models to determine the total costs for each category in a 3PL, refer to the category column in Table B5. Using the total modelled annual costs, the element 7 determines a Break-even rate per annum.

Element 8: *Depreciation and Loan Calculations*: Element 8 is illustrated in Table B6 to Table B10 and pulls all its information from element 6 and 7. Element 8 consists of several calculations tables concerning different aspects of depreciation and loans:

- Table B6 calculates and illustrates the depreciation charges per annum of newly bought vehicles with a 5-year write-off period.
- Table B7 calculates and illustrates the vehicle loan charges per annum on all loans taken out over a 5-year repayment period.

- Table B8 calculates and illustrates the monthly repayments on a 5-year loan taken out for capital investments. It also indicates the percentage of the loan each payment represents.
- Table B9 uses the data from Table B8 to calculate the amount repayable per annum for loans taken out each year.
- Table B10 indicates a summary of the yearly expenses concerning loans for vehicle purchases compiled from Table B6 to Table B9.

Element 9: *Income and Cost Estimators*: Element 9 can be seen in Table B12 and is calculated from element 7 and 8. Element 9 illustrates the total income, total costs, and loan costs undergone by a 3PL per annum. The extract in Table B11 only shows a 5-year period, whereas the model calculates it for the full 10-year period.

Element 10: *Cash flow*: Element 10 is derived straight from element 9 and is illustrated in Table B12. Element 9 is a 5-year extract of the cash flow for 3PL A, whereas the model calculates it for the full 10-year period. The cash flow serves to indicate the amount of money being transferred into and out of business each year.

Element 11: *10-year Financial Summary*: Element 11 is derived from element 8 and 9 and is illustrated in Table B13. Element 9 is an extract of the 10-year financial summary for 3PL A over a 5-year period, whereas the model calculates it for the full period of ten years. The 10-year financial summary summarises all the incomes and expenses and then calculate the profit before and after tax.

Element 12: *Balance Sheet*: Element 12 is derived from element 8, 9, 10, and 11. Element 12 is illustrated in Table B14. The balance sheet covers the change in assets, liabilities and capital of the 3PL over a 10-year period. The extract in Table B14 only shows a 5-year period, whereas the model calculates it for the full period of ten years.

Element 13: *KPI's*: Element 13 is derived from element 11 and 12, and is illustrated in Table B15. Four KPI's have been identified namely:

- *Return on Investments (ROI)*: ROI is calculated by the net operating profit after tax in Table B13 divided by the total invested capital, the sum of the vehicle and stock assets in Table B14.
- *Return on Assets (ROA)*: ROI is calculated by the net operating profit after tax in Table B13 divided by the total assets in Table B14.
- *Net operating profit after tax percentage (NOPAT%)*: NOPAT% is calculated by dividing the net operating profit after tax with the total income in Table B13.

- *Break-even rate per case*: In Table B5 the break-even rate is calculated dividing the total modelled annual cost with the total volume per year in cases.

5.1.2 Longitudinal Uncertainty

When conducting forecasts, it is important to remember that there are many uncertainties and over the longer period the forecast stretches, the greater the effect of uncertainties become. Thus, when working with a 10-year forecast, most of the factors considered in the first year would have changed drastically over the last year. The standards in Table 10 will not remain constant, as well as many of the inputs in Table 11. A special Excel add-in named @risk (pronounced "at risk") was incorporated into the model to accommodate for these uncertainties.

@RISK performs risk analysis using Monte Carlo simulation to show many possible outcomes in a spreadsheet model. Monte Carlo simulation offers an alternative to analytical mathematics for understanding the statistic's sampling of a distribution by evaluating its behaviour using random samples; this is done empirically from a known population of simulated data [90]. Monte Carlo mathematically and objectively computes and tracks the many different possible future scenarios, indicating the probabilities and risks associated with each different scenario. An example of how @risk was used in the model is for determining the inflation each year. Historical inflation data for each month over the past 14 years were collected and analysed to create a normal distribution for the inflation rate as can be seen in Figure 53 below with a mean of 11.73% and a standard deviation of 4.59%. Similar steps were followed for various inputs and standards. Using @risk distributions were assigned to different inputs and standards in element 3, 4, 5, and 6.

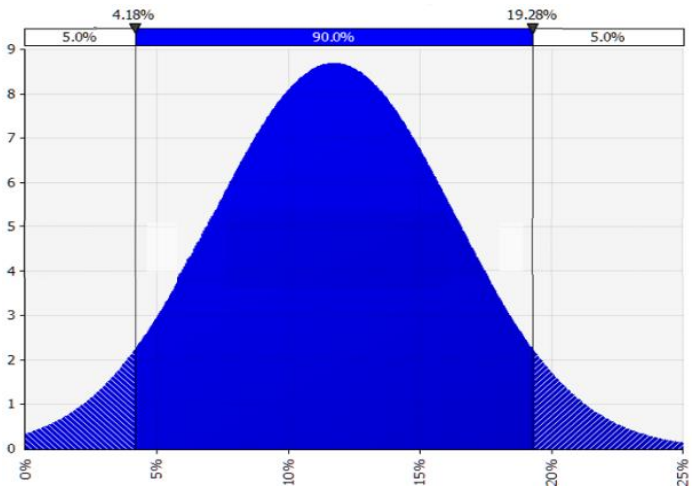


Figure 53: Calculated Distribution for Inflate Rate

5.1.3 Sensitivity Analysis

A sensitivity analysis is a procedure used to determine how different values of an independent variable impact a dependent variable under a given set of assumptions. This technique is used within specific boundaries that depend on one or more input variables. There are three main sensitivity methods [91]:

- *Mathematical*: Mathematical methods assess the sensitivity of a model output to the range of variation of an input.
- *Statistical*: Statistical methods involve running simulations in which inputs are assigned probability distributions and assessing the effect of variance in inputs on the output distribution.
- *Graphical*: Graphical methods give representation of sensitivity in the form of graphs, charts, or surfaces

For this thesis, a statistical sensitivity analysis was used combined with graphical outputs. Through a screening process of the inputs in identified in Table 11, only the operational values which a 3PL can control and change if necessary was considered in this analysis. Therefore, industry standards and values determined from historical data such as inflation were left out of the sensitivity analysis as they are fixed. Eight key inputs were identified for a 3PL from the obtained data to be used in the sensitivity analysis namely:

- Weekly Volume
- Volume delivered
- Average route distance
- Average inventory full's
- Average inventory empties
- Returnable containers
- Average unit cost of product
- Average unit sales price of product

Each of these inputs was then assigned a distribution based on the collected data. The key inputs were then simulated to determine their effect on each of the four KPI's. These simulations were run for 3PL A-E to determine a base line of the effects of each input on each KPI for 3PLs. A single sensitivity analysis which was run consisted of eight Inputs being analysed against four KPI's for five 3PLs, thus 160 simulations with 100 iterations each. An example of the raw output data from the sensitivity analysis can be seen in Table B16. The summarised output data from the sensitivity analysis is displayed in Table B17. Figure 54 indicates the weight the top inputs have on each KPI. Lastly, the average weight per

input is shown on the right-hand of Figure 54. Depending on which KPI is most important to a 3PL it will have to shift its focus accordingly, but it is evident from the sensitivity analysis that emphasis must be given to; average inventory full's, average unit cost of product, weekly volume, and volume delivered.

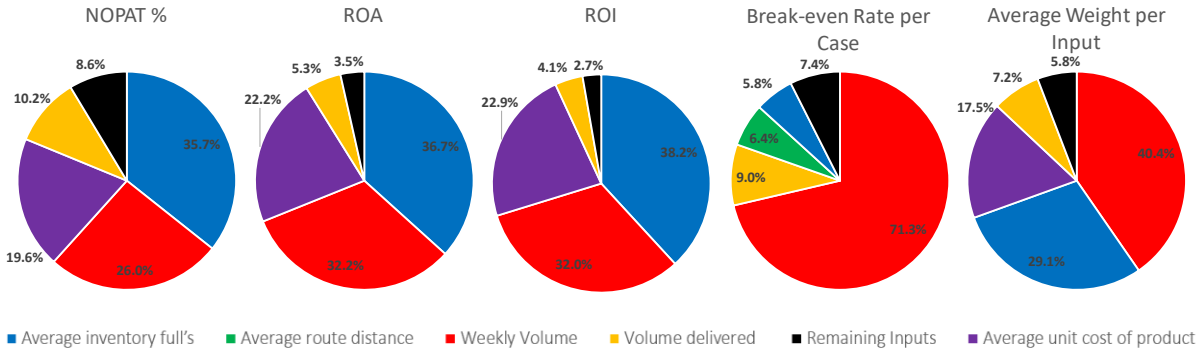


Figure 54: Inputs with the largest sensitivity on the KPIs.

It is important to note that not just the sensitivity of an input must be considered when selecting a variable to change, but also the difficulty of changing the input. For example, when considering volume delivered, average inventory full's, and average route distance it may be a lot easier to increase or decrease inventory compared to increasing or decreasing the route distance, depending on the unique setup of each 3PL. Figure 55 illustrates the graphical output obtained from a simulation using @risk in the model. It is assumed that the more a value changes from its base value, the more difficult it is to modify this value. The graph of the left-hand side of Figure 55 is used to indicate which input can be manipulated the easiest for the greatest outcome. Weekly volume has the largest effect on the break-even rate per case while changing its base value with 10 percent. Average route distance, on the other hand, must be modified drastically and will only have a minor effect on the break-even rate per case.

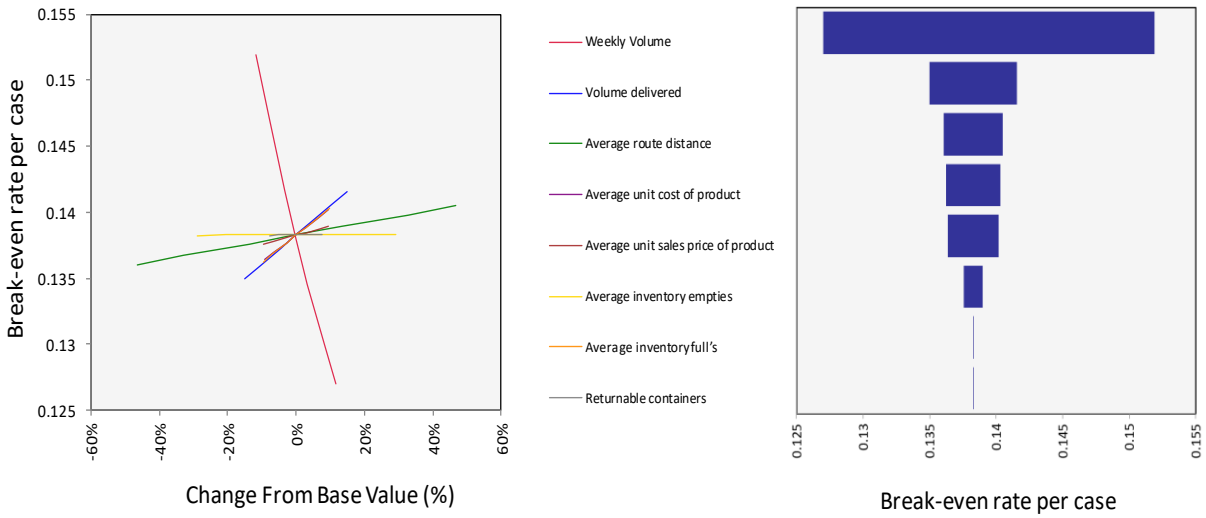


Figure 55: Example of Graphical output obtained from @risk for 3PL A.

5.1.4 3PL Modelled KPIs

With the KPIs identified it is important to determine what the baseline for each KPI is for a 3PL. Using @risk in the model on the KPI's element it is possible to simulate a ten-year forecast for each KPI. The four KPIs were calculated for 3PL A-E as can be seen in Table 37 illustrating the extracted data for a 1-year, 5-year and 10-year period. Each 3PLs column indicates the mean of the KPI shown for the mentioned years in the middle. The 5% and 95% columns indicate a 90-percentile minimum and maximum expected value for each mean. Therefore, when considering the risk from changing factors such as inflation, interest rates, expected growth amongst others may have on the indicated mean, the 5% and 95% columns give a 90 percent assurance that the final answer will rest within these percentiles. It is important to note that the difference between the mean and 5% and 95% percentiles will be much greater for year ten compared to year one due to the added difficulty and increased risk in forecasting far ahead. An example to understand the Table 37 follows; under 3PL B, next to ROI in year five we have three values; -6%, 1% and 7%. This indicates that the expected mean ROI after five years is 1%, the -6% and 7% is the range in which ROI may end up due to various risk factors considered by @risk. Thus, an ideal scenario will yield 7% otherwise a worst-case scenario of -6% is expected.

Table 37: Key indicator results from simulation

		3PL A			3PL B			3PL C			3PL D			3PL E		
	Year	5%	Mean	95%	5%	Mean	95%	5%	Mean	95%	5%	Mean	95%	5%	Mean	95%
NOPAT%	1	-3%	-1%	1%	-4%	-3%	-1%	-6%	-5%	-4%	-3%	-2%	-1%	-30%	-27%	-25%
	5	0%	4%	8%	-1%	2%	5%	-4%	0%	3%	-1%	1%	3%	-22%	-9%	5%
	10	4%	9%	15%	2%	7%	11%	-1%	4%	8%	1%	4%	7%	-10%	2%	14%
Rate/Case	1	0.16	0.17	0.19	0.24	0.26	0.28	0.29	0.32	0.34	0.37	0.40	0.44	0.71	0.78	0.85
	5	0.21	0.26	0.31	0.30	0.36	0.42	0.38	0.45	0.53	0.49	0.60	0.70	0.78	0.99	1.38
	10	0.31	0.43	0.55	0.44	0.59	0.78	0.54	0.71	0.92	0.75	0.97	1.25	0.98	1.39	2.02
ROI	1	-7%	-2%	2%	-12%	-7%	-3%	-19%	-14%	-10%	-14%	-9%	-5%	-35%	-30%	-29%
	5	-2%	5%	13%	-6%	1%	7%	-15%	-7%	0%	-9%	-2%	4%	-30%	-23%	-15%
	10	9%	20%	33%	6%	15%	26%	-3%	7%	16%	3%	12%	23%	-22%	-11%	1%
ROA	1	-6%	-2%	1%	-13%	-8%	-3%	-24%	-17%	-11%	-16%	-11%	-6%	-61%	-52%	-50%
	5	10%	19%	25%	9%	18%	25%	-27%	2%	17%	1%	14%	23%	-56%	32%	129%
	10	26%	39%	48%	31%	45%	54%	-29%	20%	46%	18%	38%	53%	-52%	117%	307%

Analysing Table 37, year five and ten show a drastic improvement in the key indicators all around. This is because the model pays off new vehicles over a five-year period. Therefore, a substantial initial cost occurs in the first few years of simulation since some 3PLs initially require several vehicles to operate including other start-up costs. Note that the model does take into consideration the fact that all the vehicles are not bought new in the first year, some of the vehicles would have been purchased in previous years.

From the survey in Table B2, it was determined that on average a 3PL buys a case for $5.56 and sells it for $5.89 which is a margin of $0.33. When observing small 3PLs such as 3PL E, distributing an average of 180 cases per week with a current break-even rate per case of $0.78, a profit cannot be made. Especially when competing against other 3PLs in the market. Excluding 3PL D and E, the first three modelled 3PLs have a break-even rate per case of between $0.17 and $0.32, which is below the $0.33 margin. The $0.33 margin is an overall average. Thus 3PL A with a break-even rate of $0.14 does not necessarily make a $0.16 profit per case. 3PL A would be higher up in the supply chain. Thus it will buy and sell its products for less than the survey average of $5.56 and $5.89.

Figure 56 illustrates when each 3PL will turn profitable based on the modelled NOPAT% data for a ten-year period:

- 3PL A – 1 year 8 months
- 3PL B – 2 years and 10 months
- 3PL C – 4 years and 7 months
- 3PL D – 3 years and 5 months
- 3PL E – 7 years and 6 months

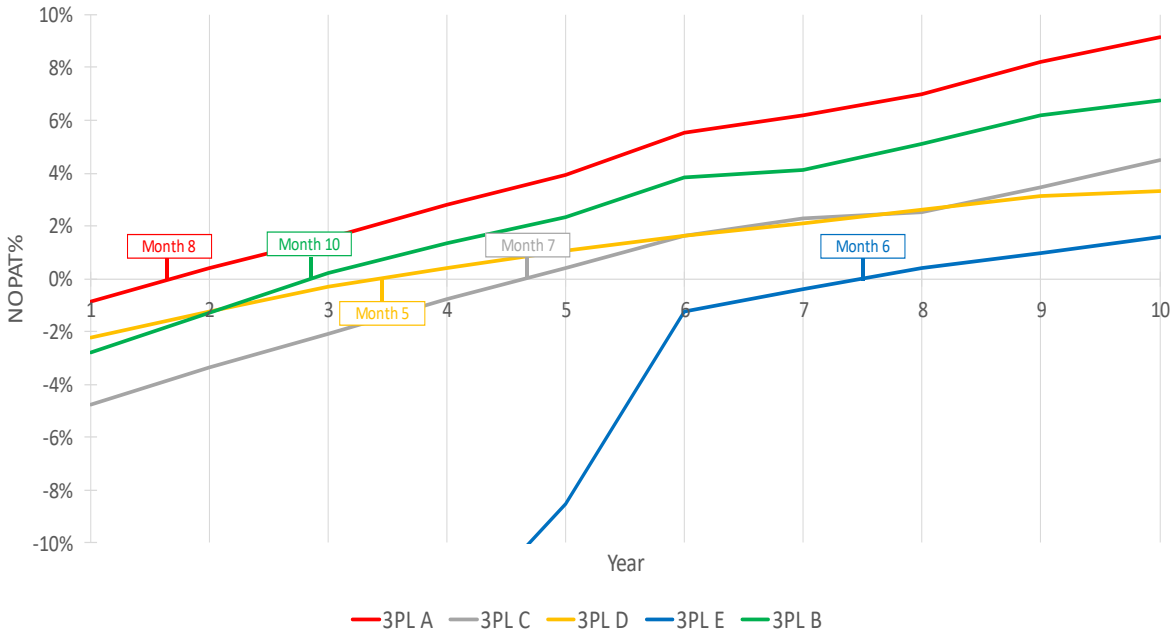


Figure 56: Time until 3PL turns profitable using NOPAT%

5.2 Compensation

The research objectives call for a detailed break-even model to determine the appropriate compensation for a smaller 3PL and a simple 3PL compensation plan streamlining the process for large 3PLs to be created. This section covers how 3PLs were divided into two appropriate groups and then discusses the compensation approach for both.

5.2.1 Compensation Groups

When considering the difference in break-even rates per case modelled in Table 37, it is important to note the correlation between the number of cases sold per week and the break-even rate per case. A linear relationship starts to appear as the number of cases per week reaches 5,000 as can be seen in Figure 57. The cost per case starts to increase drastically as the number of cases goes below 5,000. This makes the need to handle 3PLs operating on different sides of the 5,000 cases per week margin clear.

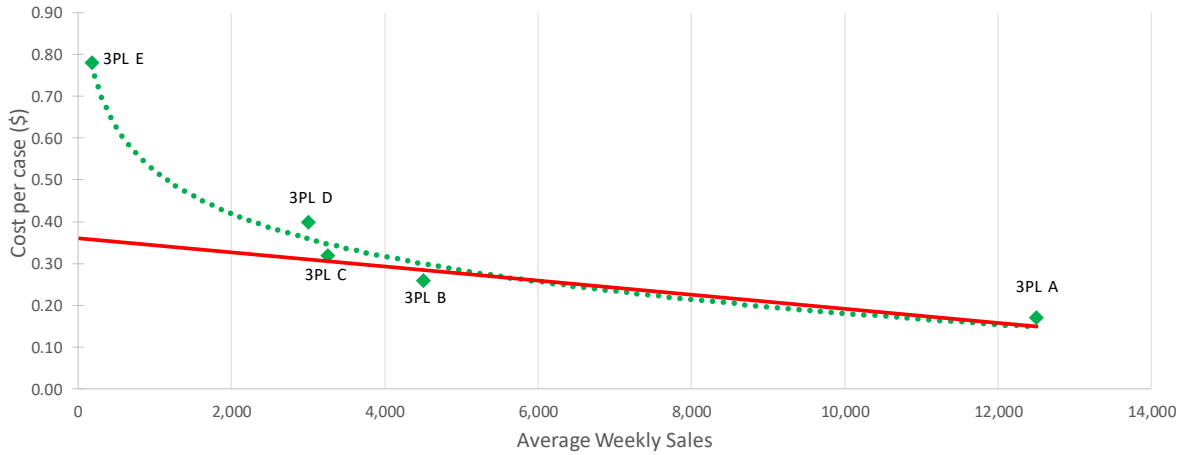


Figure 57: Relationship between cases delivered and cost per case.

From Figure 57, 3PLs can be classified into small or large categories, depending on which side of the 5,000 margin they fall. Determining a compensation plan for the 3PLs under the small category will complete the first research objective, which is to determine the appropriate compensation for a smaller 3PL. By creating a compensation plan for the remaining 3PLs categorised as large, the second research objective will be completed which calls for a simple organisational compensation plan streamlining the compensation process for numerous and large 3PLs.

The trend line used in Figure 57 will have an enormous effect on any calculations done to determine the average cost per case for 3PLs based on their average weekly sales. Therefore, it is important to ensure that the most accurate trend line formula is used. Three trend lines were considered namely, exponential, logarithmic and power trend lines. Firstly, a data set was calculated for each trend line

with respects to the average weekly cases delivered. Then the correlation between the calculated and surveyed data was determined followed by the R-squared values. R-square indicates how closely a calculated data set matches the original set, a value of 1 would indicate a perfect match. Thus the closer to 1 the better the trend line is matched.

Table 38: Correlation data of different trend lines

Average weekly cases delivered	Survey data	Logarithmic	Power	Exponential
12500	0.17	0.15	0.19	0.16
4500	0.26	0.30	0.28	0.36
3250	0.32	0.35	0.31	0.40
3000	0.40	0.36	0.32	0.42
180	0.78	0.77	0.84	0.56
Correlation		0.99	0.98	0.88
R-Squared		0.98	0.96	0.78

From Table 38 a logarithmic trend line is the closest match to the surveyed data with an R-squared value of 0.98 compared to a 0.96 value for a power trend line. This suggests that a logarithmic trend line is best suited to the surveyed data. When considering the forecast of these trend lines, which can be seen in Figure 58, even though a logarithmic trend line better suits the surveyed data, a power trend line is found to be more appropriate. The cost per case can never reach 0 much less go into the negative. It is expected that the cost per case will strive towards a minimum value, which can be seen in Figure 58 where it evens out at $0.1 per case.

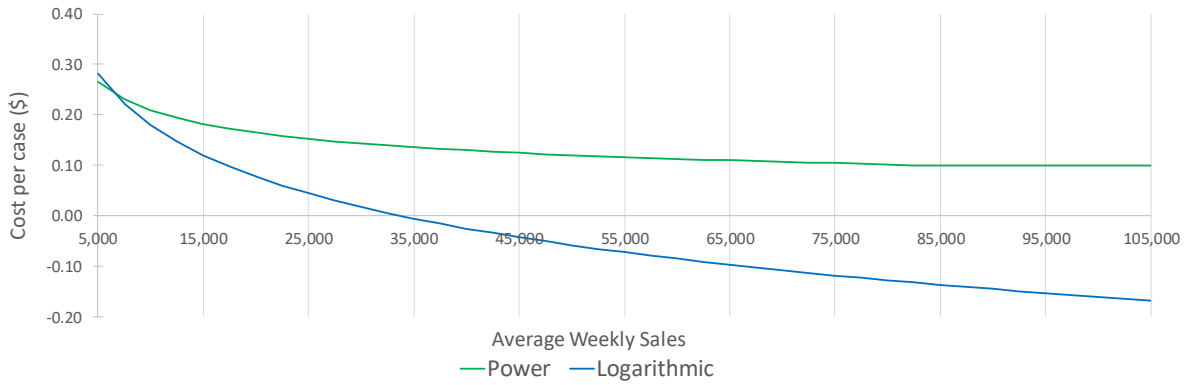


Figure 58: Power vs logarithmic trend line forecast.

5.2.2 Small 3PLs

Large 3PL are more profitable and easier to manage than their smaller counterparts. However, it is still crucial to have smaller 3PLs for several reasons, especially in Africa. Smaller 3PLs are more numerous than larger 3PLs in Africa due to the socioeconomic climate of these countries. In rural and poor communities, which account for most of the communities, large 3PLs do not appear often. Instead, locals will have small shops they run as 3PLs with which they supply the smaller market segments such as local bars and wholesalers. These smaller 3PLs will most commonly purchase their products from larger 3PLs or directly from depots or suppliers if they are located nearby. These smaller 3PLs are not as efficient as the larger 3PLs and will have a high break-even rate.

Small 3PLs still play a vital role in the RTM as they serve a large portion of the market and reach some areas which larger 3PLs are ill-equipped to service. Small 3PLs will be the only suppliers to small, hard to reach communities which are too expensive or difficult for larger 3PLs to service. Servicing these poor small and excluded communities is an arduous task which does not yield the same revenue as other customer segments. However, it is vital for a supplier that someone still services these segments. Without the small 3PLs operating in these areas, no one will be available to service these customers, and the suppliers will have lost out on these market segments, which combined adds up to a significant portion of customers. Therefore, it is important for suppliers to ensure that these small 3PLs stay operational even if it requires extra compensation to keep them operational. This makes it clear that all 3PLs cannot be compensated with the same compensation plan as it is important to take note of the circumstances in which certain 3PLs operate which will result in them delivering fewer products at a higher break-even rate.

For small 3PLs a compensation plan is suggested which looks at each 3PL individually. Even though it would lead to a more time-consuming process, it remains important to ensure that these 3PLs are compensated appropriately. The five most prominent inputs identified in section 5.1.3 in the sensitivity analysis illustrated in Figure 54 are:

- Weekly Volume
- volume delivered
- Average inventory levels
- Average route distance
- Average unit cost of products

It is important that these inputs are measured for each small 3PL. Using the break-even model with these inputs a break-even rate per case can then be determined for a 3PL which will consider the difficulties small 3PLs faces and ensure that they will survive, thus ensuring that they can continue to serve their customers to the benefit of all the role-players. Thus, small 3PLs will be compensated based on a break-even rate which takes account of each 3PLs specific conditions.

5.2.3 Large 3PLs

The key link in the RTM is the large 3PLs as most of the market segments and smaller 3PLs are supplied by them excluding the few customers who are situated close to a supplier or depot who would then purchase products directly from them and cut out the 3PLs as the middle man. These 3PLs are thus the main volume drivers in the RTM with a minimal weekly volume of 4,500 cases. Therefore it is expected of them to operate with some degree of efficiency as they find themselves in a highly competitive market.

The competitiveness of the market gives the suppliers the option to choose between various large 3PLs. Therefore, unlike small 3PLs, it is not necessary for the suppliers to be concerned with paying the large 3PLs a premium based on their specific conditions. There will always be several competitors ready to take over a contract if one 3PL goes bankrupt due to bad management or inefficient practices. This gives the suppliers the opportunity to set a fixed compensation plan which 3PLs must adhere to otherwise they can be replaced by one of their competitors. Thus, a simple 3PL compensation plan streamlining the process for large 3PLs can be created.

The focus of the compensation plan is on the average weekly sales of the 3PLs. With several 3PLs to choose from under normal circumstances, the suppliers do not have to do a detailed study of the operations of each large 3PL as is advised for the smaller 3PLs. This saves the suppliers time and money by excluding extra steps in the selection process as they can now focus on the 3PLs output performance instead of concerning them with the more inherent challenges each 3PL faces. Therefore, compensation for large 3PLs is linked directly to their weekly sales volume. Large 3PLs will be paid a fixed compensation rate per case based on their weekly sales volume. This compensation rate for large 3PLs is divided into 13 bands illustrated in Figure 59 with the tabulated data displayed in Table B18. Thus, large 3PLs will be compensated based their weekly sales volume linked to several break-even rate bands which were determined from the model.

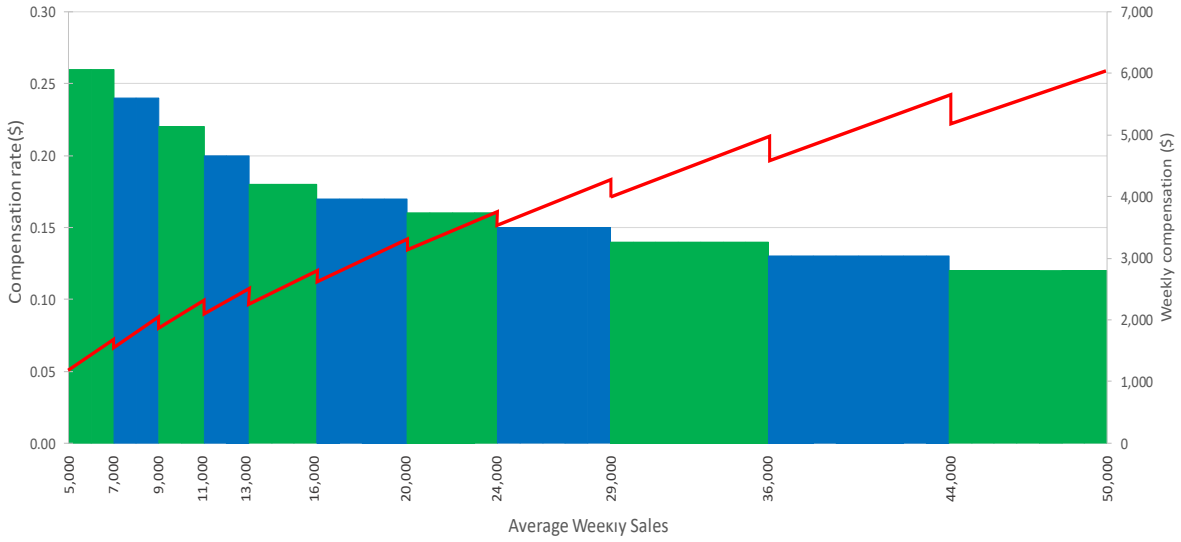


Figure 59: Compensation bands for large 3PLs based on average weekly sales.

5.3 Margin Analysis for Validation Purposes

With both compensation approaches being strongly connected to the break-even rate per case it is important to validate the calculated break-even rates obtained from the break-even model to ensure that the compensation rates suggested are feasible. Validating a compensation plan is a difficult task, for this research validation is based on how the modelled break-even rate compared to the actual profit margin obtained from several producers and 3PLs. Thus, a margin analysis is firstly conducted which is followed by a comparison of the margin against the calculated break-even rates.

5.3.1 Margin Analysis

This analysis looks at the profit margin obtained between each link in the RTM. To create an accurate margin analysis, several products were chosen based on their weekly sales volume and availability of pricing throughout the channel. Obtaining the pricing between different RTM links was extremely difficult due to the sensitive nature of the information. 3PLs have recommended prices for distributing to wholesalers and directly into retail. By distributing directly into retail, 3PLs can make a slightly larger margin on specific products. Therefore, the final margin made by retailers is calculated for both channels of distribution. The margin analysis for Supplier A is illustrated in Figure 60. This analysis includes Products A1 to A5 which collectively account for 40.57% of the total beer volume sold from the survey.

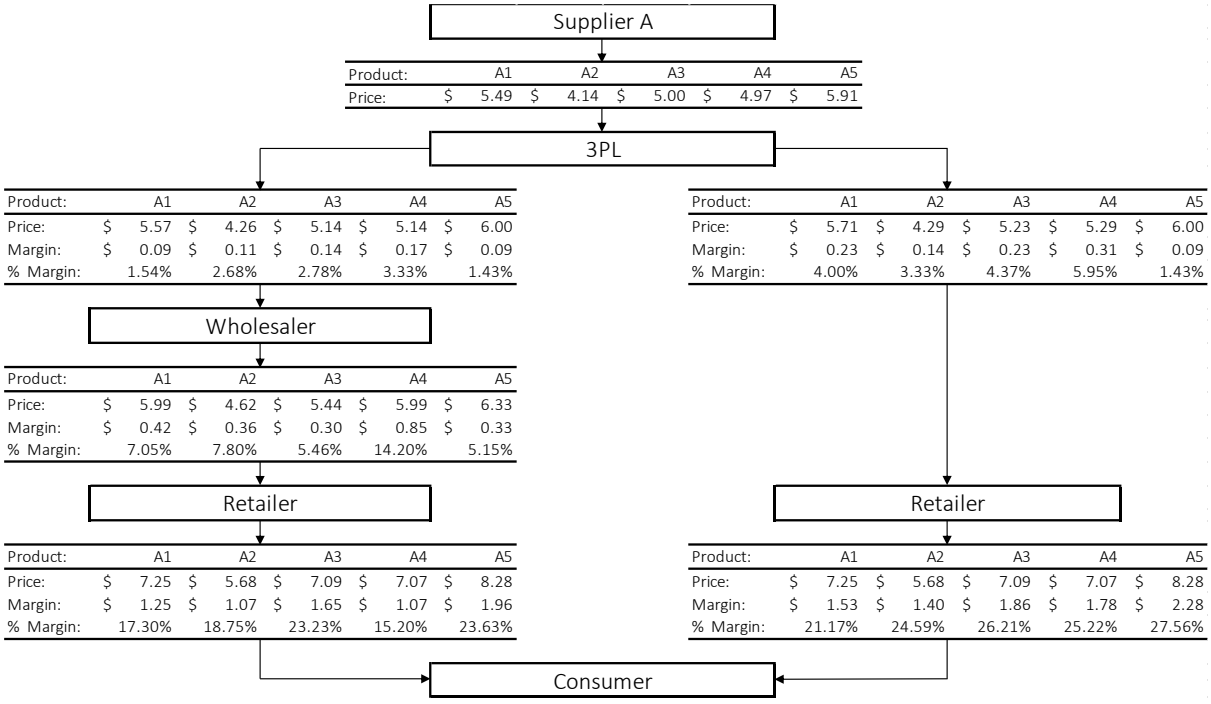


Figure 60: Margin analysis for Supplier A's products.

The second margin analysis was done for Supplier B. The margin analysis for Supplier B is illustrated in Figure 61. The analysis is based on four products, described as Product B1 – B4, which account for 82.82% of the total volume Supplier B's products sold.

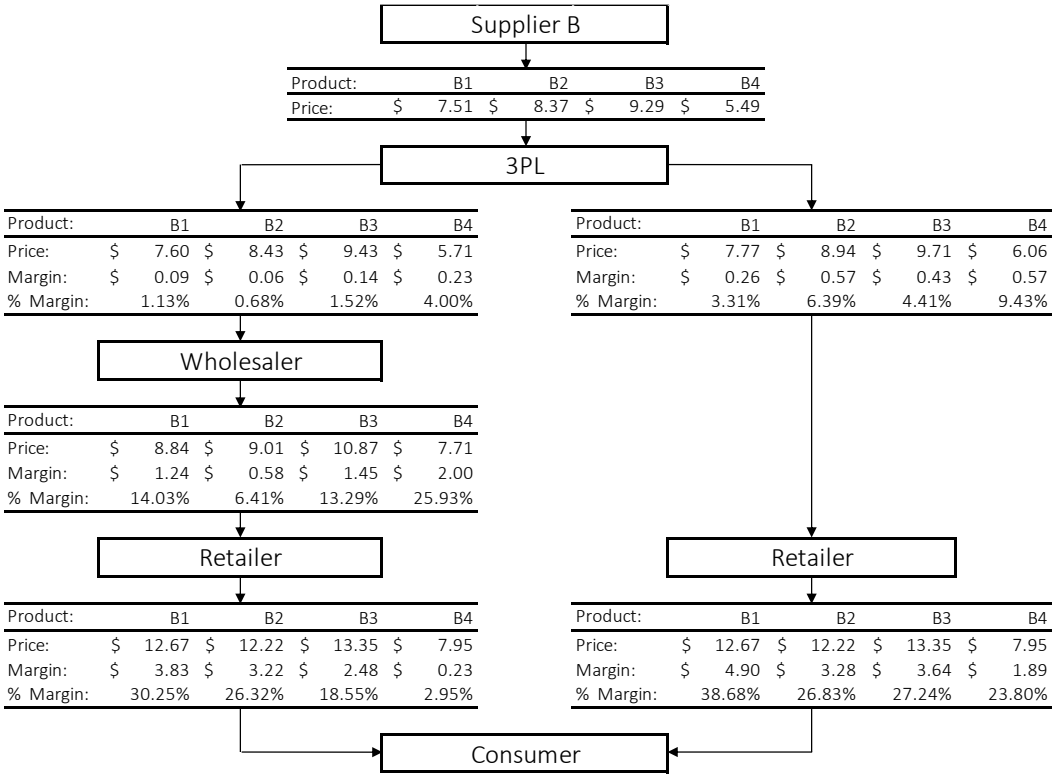


Figure 61: Margin analysis for Supplier B's products.

In contrast to Supplier A, wholesalers are making an above average margin on several Products. While the wholesaler margin for Product B4 looks out of place, it was determined from a sample size of 33 and can be considered statistically relevant. The margin analysis for Supplier C is presented in Figure 62. It is important to note that only Product C1 is included in the margin analysis, as no pricing information could be obtained for the other products of Supplier C.

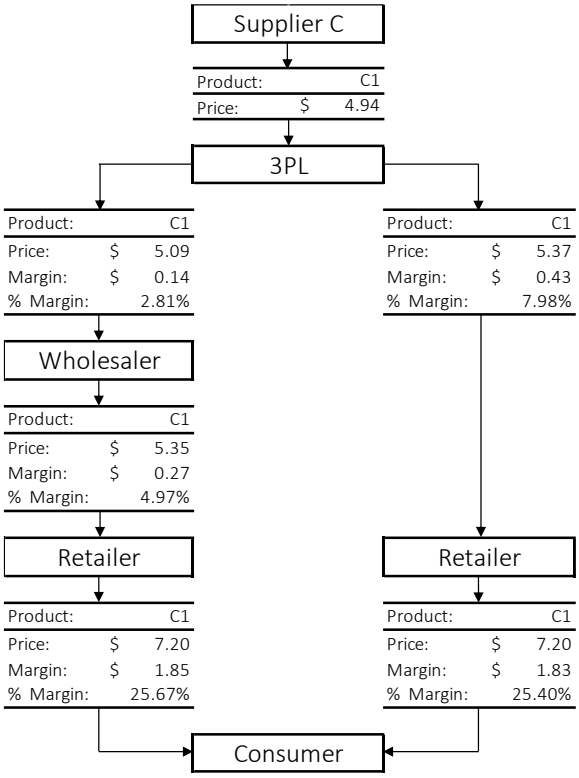


Figure 62: Margin analysis for Supplier C's products.

5.3.2 Validation

It is important to check how the calculated break-even rates from the break-even model correlate to the actual margin 3PLs are receiving. The compensation rates of the suggested compensation approach are based on the calculated break-even rates from the break-even model, thus if the compensation rates do not correlate with the actual margin 3PLs are making it cannot be viewed as a feasible compensation approach. Combining the results from Figure 60, Figure 61 and Figure 62 with the market share of each supplier a weighted average for the price per case of and margin per case could be calculated as can be seen in Table 39.

Table 39: 3PL price and margin per case for wholesale and retail RTM.

	Wholesale price per case	Wholesale margin per case	Retail price per case	Retail margin per case	Market share
Supplier A	5.220	0.120	5.300	0.200	60.6%
Supplier B	7.790	0.130	8.120	0.460	29.3%
Supplier C	5.090	0.140	5.370	0.430	10.1%
Weighted Average	5.960	0.125	6.133	0.299	100.0%

It is important to note that the values for Supplier B in Table 39 is a lot higher than that of the other two suppliers, this is due to the target market of Supplier B who targets the high-end customers, thus supplying most of the expensive beers in the market. This is clear when observing the product prices of Product B1-B3 in Figure 61 which has a high base price from the supplier of between $7.51 to $9.23 which is more than the customer price of the other two suppliers.

The values in Table 39 were calculated from data collected in a top-down approach, thus the data was obtained directly from supplier's side of the RTM. The survey, on the other hand, followed a bottom-up approach, as the wholesalers and 3PLs were interviewed directly. From the survey in Table B2, it was determined that on average a 3PL buys a case for $5.56 and sells it for $5.89 which gives a margin of $0.33. Analysing these values, the modelled values and the margin analysis values are similar to each other. The suggested compensation rates in Figure 59 closely match the wholesale margin per case from Table 39. As expected the retail margin per case is higher than that of the wholesale margin, but it remains feasible when compared to the modelled rates.

5.4 Chapter Conclusion

In this section 3PLs are firstly divided into two categories based on their weekly sales volume, thus small or large depending on which side of the 5,000 cases per week margin they operate in. In the first category of 3PLs, those with a weekly volume below 5,000 cases, the importance for suppliers to analyse these 3PLs individually is highlighted. The five identified inputs from the sensitivity analysis combined with the specific challenges these smaller 3PLs face must be used to determine a compensation rate for each small 3PL. This will allow them to operate profitably resulting in the suppliers obtaining a sustainable RTM for its products in the remote and poor areas where the small 3PLs commonly operate. For 3PLs with a weekly volume above 5,000 cases, a set compensation rate must be put in place to drive the 3PLs to improve the service they deliver, or else they will be replaced by one of their more efficient competitors. Figure 59 illustrates the compensation bands with the compensation rate evening out when the supplier reaches $0.1 per case. The validity of the compensation approach was tested using a margin analysis, an average margin per case of between $0.125 and $0.299 was found which closely relates to the surveyed margin of $0.330, which is expected to be more due to the bottom-up approach used to calculate it from the survey.

Chapter 6: Conclusion

The research was undertaken to determine how a 3PL operating in Africa must be compensated for the services they provided, depending on their size and the environment they are operating in. A literature review was conducted followed by an in-country visit, building up to an in-depth survey regarding 3PL operations in Nigeria. Extensive analysis of the surveyed data was then conducted which allowed the 10-year break-even model to be created leading to the identification of KPI's and a compensation strategy. Ultimately this research included identifying and quantifying several 3PL standards and inputs, modelling 3PLs over a 10-year time period, calculating and analysing KPI's to create a base operational standard for 3PLs, and determining a compensation approach for different 3PLs.

6.1 Research Approach

The research approach started off with a detailed literature review. One of the biggest hurdles faced was the lack of easily obtainable information. In response, an in-country visit was conducted to identify what information can be collected in Nigeria and to determine the best method available for collecting the required information. Data collection was limited to Nigeria solely based on the availability of funding and time constraints. Ideally, more countries could have been included as factors influencing 3PL operations will differ between countries. Therefore when applying this research on other countries, it is important to take into account the environmental, economic and cultural differences. After the initial in-person field visit was conducted a local surveying company was enlisted to carry out the comprehensive survey into the operations of 3PLs based in Nigeria. This process reaffirmed the difficulties faced when working in African countries as data collection becomes a slower and more expensive process compared to developed countries.

Through conducting the survey in Nigeria, the process helped to identify and overcome several difficulties when operating in an African country. It illustrated that even though there is a massive barrier to information collection due to the lack of infrastructures and readily available resources, it can still be accomplished with the right amount of planning, time and finance available. The collected data, as in any survey, has some reliability issues owing to the nature of the environment it was gathered in. The interviewees' lack of understanding of their own business operations on a strategic level, combined with language and culture barriers, further hampered the initial data collection process. Therefore, the enlistment of the local surveying company was deemed crucial to the data collection process, justifying the expense. When analysing the collected data, the value added to the research is clear, even though it has limited application within a broader African context. The logic and rationale presented in this

research can still be applied to a developed country making use of 3PLs; it would just be necessary to change some particulars of the data collection process to suit the specific country as well as updating the standards to that of the developed country.

6.2 Results

Analysis of the collected data yielded the required inputs and standards which were identified. This analysis was combined with the literature and industry specific considerations to develop a 10-year break-even model to simulate to operations of a 3PL in its specific environment. Five 3PLs were selected for extensive simulation, and these simulations yielded several key insights into 3PL operations. The main insight obtained from the simulation was gained through the sensitivity analysis which found the main inputs adding to the cost pf 3PLs to be:

- Average inventory full's
- Average unit cost of product
- Weekly volume
- Volume delivered.

These four inputs can serve as a base for future research to work from, they account for over 80% of 3PL operational costs allowing future researchers to focus on them and ignore the smaller factors according to Pareto's law.

By analysing the results, 3PLs were sub dived into two categories based on their volume, where a weekly volume of 5,000 cases was determined to be the separator between these two categories. For the first category of 3PLs, with a weekly volume below 5,000 cases, the results highlighted the importance for suppliers to analyse these smaller 3PLs individually. By taking into consideration the five highlighted inputs from the sensitivity analysis combined with the specific challenges each small 3PL faces, a compensation rate must be determined for each small 3PL in turn, which will allow them to continue operating profitably. This will result in the suppliers obtaining a sustainable RTM for its products in the remote and poor areas where the small 3PLs commonly operate. Furthermore, the results indicate that due to the competitive market for large 3PLs with a weekly volume of more than 5,000 cases, a set compensation rate must be put in place to drive large 3PLs to improve the service they deliver to a certain standard, or else they will be replaced by one of their competitors who can make a profit at the set compensation rate. The validity of the compensation approaches was tested by means of a margin analysis which found the modelled margins to be between $0.125 and $0.299 to be aligned with the actual margins of $0.330 obtained from the survey, which is expected to be more due to the bottom-up approach used in the survey.

These two compensation approaches fulfil the research objectives by providing a streamlined compensation process for larger 3PLs, thus saving suppliers from spending time and money into analysing each 3PL in detail. This approach also allows the suppliers to nurture their relationship with smaller 3PLs by ensuring that they have the means to continue operating successfully through catering for each small 3PL's specific needs, as called for in the first research objective.

Analysis of the collected data led towards several useful insights into the operations of 3PLs in Africa, as well as yielding the required inputs and standards identified. This led to the development of a 10-year break-even model which simulates to operations of a 3PL in a specific environment. Five 3PLs were selected for extensive simulation, and these simulations yielded the required results to determine the main cost drivers of a 3PL in Africa. Thus it was possible to complete the research objective of the paper which was to conduct a sensitivity analysis on a break-even model to determine the main cost drivers of a 3PL in Africa. This study found the main cost drivers to be:

- Average inventory full's
- Average unit cost of product
- Weekly volume
- Volume delivered.

6.3 Future Work

The generic nature of the model highlights possible focus areas for further research. The identification process of the KPI's, which uses a sensitivity analysis, can be improved by expanding the sensitivity analysis not only to identify which factors have the greatest effect on an attribute but to include the difficulty of modifying these factors. Thus, a weighted sensitivity analysis which focuses on the ease of change as well as the magnitude of change can be used for several applications. Next, a detailed fleet-mix model can be incorporated into the current break-even model which can guide the supplier and 3PLs on the number of vehicles required for the size of an operation. Lastly, more detailed research can be conducted on the difficulties faced in RTM in Africa compared to developed countries. Several challenges have been touched upon in this thesis, but there are numerous factors in play which must be analysed further to understand the African market completely.

Appendices

8.1 Appendix A

Table A1: Summarised survey structure data for Town A.

	Survey count			Average price per unit [$]		
Market Segment	Peri-urban	Rural	Urban	Peri-urban	Rural	Urban
Basic Bar	173	30	153	0.64	0.64	0.65
Large Grocer	4		15	0.64		0.57
Mainstream / Regular Bar	18		34	0.74		0.75
Night Club / Upmarket Bar		1	12		0.85	0.85
Small Grocer	57	5	63	0.60	0.55	0.60
Sub Distributor	17	5	21	0.52	0.51	0.52
Wholesaler	5	1	11	0.52	0.51	0.53
Wine / Spirit Store	12	5	19	0.68	0.54	0.60
Grand Total	**286**	**47**	**328**	**0.64**	**0.63**	**0.66**

Table A2: Summarised survey structure data for Town B.

	Survey count			Average price per unit [$]		
Market Segment	Peri-urban	Rural	Urban	Peri-urban	Rural	Urban
Basic Bar	199	260	44	0.73	0.69	0.79
Formal Retailer	21	28	11	0.63	0.65	0.73
Large Grocer	25	24	17	0.64	0.60	0.64
Mainstream / Regular Bar	172	105	114	0.79	0.74	1.06
Night Club / Upmarket Bar	31	16	28	0.99	0.89	1.69
Small Grocer	100	110	27	0.66	0.65	0.76
Sub Distributor	27	27	6	0.54	0.53	0.59
Wholesaler	11	34	10	0.52	0.51	0.50
Wine / Spirit Store	49	41	51	0.66	0.63	0.65
Grand Total	**635**	**645**	**308**	**0.74**	**0.69**	**0.97**

Table A3: Summarised survey stock and volume data of Town A.

Market Segment	Total stock on floor overall estimation [cases]	Total stock on floor by SKU summation [cases]	Days of cover	Total weekly sales volume [HL]	Weekly sales volume per outlet [HL]	Total weekly missed sales volume [HL]
Basic Bar	8,193	11,856	2.25	2,366	6.6	225
Large Grocer	65	68	2.20	16	0.8	2
Mainstream / Regular Bar	1,734	2,145	2.69	364	7.0	57
Night Club / Upmarket Bar	543	744	2.07	161	12.4	32
Small Grocer	217	366	3.52	49	0.4	14
Sub Distributor	14,579	15,396	2.75	2,524	58.7	121
Wholesaler	927	833	3.08	125	7.4	2
Wine / Spirit Store	132	143	3.07	22	0.6	4

Table A4: Summarised survey stock and volume data of Town B.

Market Segment	Total stock on floor overall estimation [cases]	Total stock on floor by SKU summation [cases]	Days of cover	Total weekly sales volume [HL]	Weekly sales volume per outlet [HL]	Total weekly missed sales volume [HL]
Basic Bar	10,109	14,808	3.07	2,134	4.2	977
Formal Retailer	705	967	4.27	108	1.8	20
Large Grocer	2,514	3,328	5.37	306	4.6	40
Mainstream / Regular Bar	11,710	17,582	3.39	2,297	5.9	1,421
Night Club / Upmarket Bar	2,380	3,443	3.28	464	6.2	121
Small Grocer	2,398	2,230	3.57	303	1.3	132
Sub Distributor	25,611	39,925	5.26	3,407	56.8	2,250
Wholesaler	7,611	6,751	4.24	755	13.7	650
Wine / Spirit Store	1,449	2,096.0	5.27	208	1.5	38.0

Table A5: Area data of Town A

Area	Weekly sales volume per outlet [HL] per Settlement Type	Settlement Type	Weekly sales volume per outlet [HL] per Income Category	Income Category
Area A1	4.77	Rural	4.77	Low
Area A2	4.1	Urban	4.1	High
Area A3	7.59	Peri-Urban	7.59	High
Area A4	3.36	Urban	3.36	Medium
Area A5	5.58	Urban	5.58	Low
Area A6	3.16	Urban	3.16	High
Area A7	5.74	Peri-Urban	5.74	Low
Area A8	3.65	Urban	3.65	Medium
Area A9	5.26	Peri-Urban	5.26	Low
Area A10	5.24	Urban	5.24	Medium

Table A6: Area data of Town B.

Area	Weekly sales volume per outlet [HL] per Settlement Type	Settlement Type	Weekly sales volume per outlet [HL] per Income Category	Income Category
Area B1	2.65	Peri-Urban	2.65	Medium
Area B2	12.71	Urban	12.71	High
Area B3	3.92	Urban	3.92	High
Area B4	4.16	Peri-Urban	4.18	Medium
Area B5	3.14	Rural	3.14	Low
Area B6	4.37	Rural	3.14	Low
Area B7	4.59	Peri-Urban	4.59	Medium
Area B8	3.3	Rural	3.3	Low
Area B9	3.18	Urban	3.18	High
Area B10	5.42	Rural	5.42	Low
Area B11	3.71	Peri-Urban	3.71	Medium
Area B12	2.65	Urban	2.65	High

Table A7: Summarised brand data from the survey for Town B and Town A.

	Town B		Town A	
Brand	Total weekly sales volume [HL]	Weighted price per unit [$]	Total weekly sales volume [HL]	Weighted price per unit [$]
Brand 01	647	0.61	583	0.55
Brand 02	560	0.59	383	0.53
Brand 03	601	0.69	220	0.65
Brand 04	649	0.93	176	0.82
Brand 05	441	0.71	194	0.68
Brand 06	1,205	0.55	475	0.53
Brand 07	367	0.49	572	0.43
Brand 09	689	0.67	335	0.60
Brand 10	149	0.73	295	0.61
Brand 11	166	0.76	26	0.68
Brand 12	317	0.70	249	0.60
Brand 13	672	0.82	299	0.70
Brand 14	0	0.71	0	0.57
Brand 15	65	0.45	836	0.44
Brand 16	32	1.05	1	0.72
Brand 17	3	3.35	1	4.86
Brand 18	41	0.71	2	0.74
Brand 19	24	0.55	2	0.56
Brand 20	2,458	0.54	563	0.50
Brand 21	132	0.56	1	0.57
Brand 22	270	0.63	100	0.49
Brand 23	54	0.78	77	0.68
Brand 24	433	0.76	237	0.61
Brand 26	0	0.64	1	0.65
Brand 27	0	0.00		
Brand 28	2	0.59		
Brand 29	0	0.57		
Brand 30	2	0.00		

Table A8: Summarised raw data from survey comparison between Town A and Town B.

Market Segment	Town B	Town A	Town B	Town A	Town B	Town A
	Weighted unit price [$]		Average restocks per week		Purchase size [cases]	
Basic Bar	0.69	0.59	4.20	4.70	13.00	15.00
Formal Retailer	0.68	0.00	2.20	0.00	11.00	0.00
Large Grocer	0.61	0.56	1.80	2.00	32.00	18.00
Mainstream / Regular Bar	0.79	0.68	4.10	3.80	19.00	21.00
Night Club / Upmarket Bar	1.06	0.79	3.40	5.20	25.00	27.00
Small Grocer	0.63	0.58	2.50	1.80	10.00	12.00
Sub Distributor	0.50	0.49	2.80	3.30	386.00	214.00
Wholesaler	0.50	0.49	2.10	2.00	120.00	95.00
Wine / Spirit Store	0.62	0.59	2.80	2.70	16.00	8.00

8.2 Appendix B

Table B1: Example of Salary information table.

Job Description					
Salary margin	-25%	-10%	0%	10%	25%
Total Salary cost: Management	$365.10	$438.12	$486.80	$535.48	$608.50
Total Salary cost: Administrative staff	$159.61	$191.53	$212.81	$234.09	$266.01
Total Salary cost: Sales Man	$134.33	$161.20	$179.11	$197.02	$223.89
Total Salary cost: Security	$47.62	$57.14	$63.49	$69.84	$79.36
Total Salary cost: Cleaners	$39.24	$47.08	$52.32	$57.55	$65.39
Total Salary cost: Warehouse Supervisor	$245.39	$294.47	$327.19	$359.91	$408.99
Total salary cost: Warehouse Labour	$38.57	$46.29	$51.43	$56.57	$64.29
Total salary cost: Crew member	$38.57	$46.29	$51.43	$56.57	$64.29
Total salary cost: driver member	$84.46	$101.35	$112.61	$123.87	$140.76

Table B2: Example of 3PL specific inputs for 3PL A.

3PL specific inputs	3PL A
Weekly volume	13,973.78
Volume delivered	0.75
Average route distance	47.30
Average Inventory Full's	3.13
Average Inventory Empties	1.66
Operating days per week	6
Operating hours per day	9
Debtors	10.00%
Creditors	50.00%
Returnable containers	0.95
Average unit cost of product	5.56
Average unit sales price of product	5.89
Average unit price of empties	2.91
Office space rental	321.43
Warehouse space rental	178.57
General expenses per month	98.57
Overheads per month	242.86
Replacement cost of office furniture and equipment	371.43
Replacement cost of IT infrastructure	700.00
Management	1
Administrative staff	0
Sales Man	0
Security	1
Cleaners	0

3PL specific inputs	3PL A
Warehouse Supervisor	1
Warehouse Labour	5
Crew members per vehicle	1
Vehicles	10

Table B3: Example of industry standards for 3PL A.

Industry standards	
Inflation	14.53%
Estimated case growth rate	5.00%
Cost of debt	16.85%
Corporate income tax	30.00%
Risk-free rate	1.28%
Bad debt	1.00%
Losses and breakages	0.20%
Supplier credit	3
Customer Credit	3
Useful life of furniture and equipment	10
Write-off period of furniture and equipment	5
Useful life of IT infrastructure	3
Write-off period IT infrastructures	3
Residual value at term of original cost	20%
Trailer utilisation	85.00%
Cases per pallet	51.22
Vehicle depot time	10.00
Vehicle delivery time	5.00
Vehicle maintenance	25.00%
Fuel cost per litre	0.54
Vehicle lifespan	10
Write-off period of vehicles	5
Time under maintenance	5%

Table B4: 5-year extract of global parameters for 3PL A.

Global Parameters	Year 1	Year 2	Year 3	Year 4	Year 5

Estimated inflation rate	17.5%	13.8%	13.3%	5.9%	8.5%
Estimated Case Growth Rate	-1.6%	0.0%	6.0%	3.6%	5.8%
Cost of Debt	16.8%	18.1%	17.7%	22.4%	15.8%
Working Days in Year	312	312	312	312	312
Cases Delivered / Week	13,974	13,978	14,817	15,353	16,238
Compound Inflation Rate	117.5%	133.7%	151.5%	160.5%	174.1%
Working Capital to be Financed	25.0%	25.0%	25.0%	25.0%	25.0%
Working Capital Requirement	26,218	26,841	29,092	30,423	32,694

Table B5: 5-year extract of the break-even model for 3PL A.

Category	Calculation	Year 1	Year 2	Year 3	Year 4	Year 5
Demand	Total 3PL Volume (cases/week)	12,880	13,533	14,220	14,941	15,699
	Total Volume (cases/year)	669,760	703,737	739,439	776,951	816,366
	Volume delivered (cases/year)	522,413	548,915	576,762	606,022	636,766
	Volume Collected by Customer (cases/year)	147,347	154,822	162,676	170,929	179,601
	Route distance - average (km)	50	50	50	50	50
	Returnable container %	92%	92%	92%	92%	92%
	Operating Days per year - standard	312	312	312	312	312
	Operating hours per day - standard	9	9	9	9	9
	Operating hours per year - standard	2,808	2,808	2,808	2,808	2,808
	Weighted Average Cost of Capital after tax	24%	24%	24%	24%	24%
vehicles	Required Km / Annum	5,494	5,773	5,514	5,794	5,581
	Net "deemed" investment in Vehicles	14,109	14,111	15,522	15,522	16,934
	Investment amortised over useful life by a growth annuity	2,127	2,141	2,355	2,355	2,569
	Total economic rental per year - pre-tax	3,038	3,059	3,364	3,364	3,670
	# of vehicles (#) - Size 1	10	10	11	11	12
	Capital cost	14,929	14,929	16,421	16,421	17,914
	Annual maintenance cost ($ per year)	2,016	2,016	2,217	2,217	2,419
	Present value of maintenance cost during the useful life of vehicles	9,063	9,007	9,907	9,907	10,808
IT	Replacement value of IT infrastructure	823	942	1,079	1,235	1,415
	Annual tax benefit from depreciation allowance	82	94	108	124	141
	Present value of tax benefits	163	186	213	244	280
	Net "deemed" investment in IT	659	756	866	991	1,135
	Investment amortised over useful life by a growth annuity	294	338	387	444	508
FURNITURE	Total economic rental per year - pre-tax	421	483	553	634	726
	Replacement value of Furniture and Office Equipment	436	500	572	656	751
	Annual tax benefit from depreciation allowance	26	30	34	39	45

Category	Calculation	Year 1	Year 2	Year 3	Year 4	Year 5
	Present value of tax benefits	72	82	94	108	123
	Net "deemed" investment in Furniture and Office Equipment	365	418	478	548	627
	Investment amortised over useful life by a growth annuity	63	73	83	95	109
	Total economic rental per year - pre-tax	90	104	119	136	156
INVENTORY	Inventory on hand - average	6,440	6,767	7,110	7,471	7,850
	Inventory on hand - average value	36,120	37,953	39,878	41,901	44,027
	Investment amortised	8,661	9,163	9,628	10,117	10,630
	Total economic rental per year - pre-tax	12,373	13,091	13,755	14,453	15,186
DEBTORS	Debtors on hand - average value	3,433	4,132	4,972	5,983	7,199
	Investment amortised	823	998	1,200	1,444	1,738
	Total economic rental per year - pre-tax	1,176	1,425	1,715	2,064	2,483
CREDIT	Creditors on hand - average value	18,060	18,976	19,938	20,950	22,013
	Investment amortised	4,330	4,582	4,814	5,058	5,315
	Total economic rental per year - pre-tax	6,186	6,545	6,877	7,226	7,593
ECONOMIC RENTALS	Vehicles	3,570	4,116	5,185	5,938	7,419
	IT Infrastructure	494	650	853	1,119	1,467
	Office Equipment and Furniture	106	140	183	240	315
	Inventory	14,538	17,616	21,198	25,508	30,696
	Debtors	1,382	1,918	2,643	3,642	5,019
	Creditors	-7,269	-8,807	-10,598	-12,754	-15,347
VEHICLERUNNING COSTS	Vehicle maintenance	3,317	3,213	3,534	3,534	3,855
	Vehicle tyres	1,107	1,268	1,561	1,787	2,155
	Fuel and Lubricants	4,833	5,535	6,338	7,259	8,313
	Vehicle licence	126	144	177	203	245
LOSSES	Inventory losses and breakages	6,885	8,286	9,971	11,998	14,438
	Bad Debt	3,571	4,297	5,171	6,222	7,487
	Debt collection fees	36	43	52	62	75
OFFICE	General expenses per annum (Accounting, telephone, stationary, etc)	1,390	1,592	1,823	2,088	2,391
	Office Equipment & Furniture Maintenance	436	500	572	656	751
	Office & Warehouse space rental	588	673	771	882	1,011
	Office Warehouse Overheads	3,424	3,922	4,491	5,144	5,891
SALARIES	Management	12,612	16,972	19,437	22,260	25,493
	Administrative staff	-	-	-	-	-
	Sales Man	-	-	-	-	-
	Security	3,288	4,425	5,067	5,803	6,646

Category	Calculation	Year 1	Year 2	Year 3	Year 4	Year 5
	Cleaners	-	-	-	-	-
	Warehouse Supervisor	8,478	11,409	13,066	14,963	17,137
	Warehouse Labour	8,100	10,900	12,483	14,296	16,373
	Crew members	15,863	18,167	22,886	26,210	32,746
	Drivers	29,160	29,160	32,076	32,076	34,992
TOTAL	**Total Modelled Annual Cost**	116,034	136,134	158,938	179,137	209,567
	Break-even Rate ($/case)	0.17	0.19	0.21	0.23	0.26

Table B6: Depreciation charges for 3PL A.

		Depreciation charge per year									
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Vehicle bought in year:	Year 1	2,807	2,807	2,807	2,807	2,807	0	0	0	0	0
	Year 2		0	0	0	0	0	0	0	0	0
	Year 3			368	368	368	368	368	0	0	0
	Year 4				0	0	0	0	0	0	0
	Year 5					483	483	483	483	483	0
	Year 6						0	0	0	0	0
	Year 7							633	633	633	633
	Year 8								725	725	725
	Year 9									0	0
	Year 10										951
	Total	**2,807**	**2,807**	**3,175**	**3,175**	**3,657**	**851**	**1,484**	**1,841**	**1,841**	**2,310**

Table B7:Vehicle loan charges for 3PL A.

		Loan charge per year									
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Year loan taken out in:	Year 1	-5,214	-5,214	-5,214	-5,214	-5,214	0	0	0	0	0
	Year 2		0	0	0	0	0	0	0	0	0
	Year 3			-724	-724	-724	-724	-724	0	0	0
	Year 4				0	0	0	0	0	0	0
	Year 5					-949	-949	-949	-949	-949	0
	Year 6						0	0	0	0	0
	Year 7							-1,245	-1,245	-1,245	-1,245
	Year 8								-1,426	-1,426	-1,426
	Year 9									0	0
	Year 10										-1,870

	Total	-5,214	-5,214	-5,938	-5,938	-6,887	-1,673	-2,917	-3,619	-3,619	-4,540

Table B8: Loan table for capital repayment for 3PL A.

		Capital charge in year:									
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5
Capital charge for month:	January	$160	$181	$241	$292	$387	0.97%	1.09%	1.46%	1.77%	2.34%
	February	$162	$184	$245	$297	$393	0.98%	1.11%	1.48%	1.80%	2.38%
	March	$165	$186	$249	$302	$400	1.00%	1.13%	1.51%	1.83%	2.42%
	April	$167	$190	$253	$307	$406	1.01%	1.15%	1.53%	1.86%	2.46%
	May	$169	$193	$257	$312	$413	1.02%	1.16%	1.55%	1.89%	2.50%
	June	$172	$196	$261	$317	$419	1.04%	1.18%	1.58%	1.92%	2.54%
	July	$174	$199	$265	$322	$426	1.05%	1.20%	1.61%	1.95%	2.58%
	August	$177	$202	$270	$327	$433	1.07%	1.22%	1.63%	1.98%	2.62%
	September	$179	$205	$274	$333	$440	1.08%	1.24%	1.66%	2.01%	2.66%
	October	$182	$209	$279	$338	$447	1.10%	1.26%	1.68%	2.04%	2.71%
	November	$184	$212	$283	$343	$455	1.11%	1.28%	1.71%	2.08%	2.75%
	December	$187	$216	$288	$349	$462	1.13%	1.30%	1.74%	2.11%	2.79%
	Total	$2,078	$2,371	$3,165	$3,840	$5,082	11.44%	13.04%	17.40%	21.11%	27.94%

Table B9: Loan payments for 3PL A.

		Loan payment per year									
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Year loan taken out in:	Year 1	2,204	2,516	3,357	4,073	5,391	0	0	0	0	0
	Year 2		0	0	0	0	0	0	0	0	0
	Year 3			289	330	440	534	707	0	0	0
	Year 4				0	0	0	0	0	0	0
	Year 5					379	433	578	701	927	0
	Year 6						0	0	0	0	0
	Year 7							497	568	757	919
	Year 8								570	650	868
	Year 9									0	0
	Year 10										747
	Total	2,204	2,516	3,646	4,403	6,210	967	1,782	1,838	2,335	2,534

Table B10: Summary of various loan metrics for 3PL A.

		Yearly loan expenses									
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Loa	Capital	2,204	2,516	3,646	4,403	6,210	967	1,782	1,838	2,335	2,534

Interest	0	2,699	2,291	1,535	676	706	1,135	1,782	1,284	2,007
New Loans	17,541	0	2,301	0	3,018	0	3,958	4,533	0	5,945
Loan Capital	15,337	12,821	11,476	7,073	3,880	2,913	5,089	7,783	5,448	8,860
vehicles	10	10	11	11	12	12	13	14	14	15

Table B11: 5-year extract of the income & cost estimation for 3PL A.

	Year 1	Year 2	Year 3	Year 4	Year 5
Economic Rentals	9,484	8,384	14,944	14,699	12,085
Losses	10,937	11,734	13,589	15,463	17,376
Labour Costs	155,001	172,769	191,290	206,448	222,909
Office Running Costs	5,251	5,562	6,462	7,198	7,495
Vehicle Running Costs	9,804	11,047	11,093	12,396	14,248
TOTAL INCOME	**190,476**	**209,496**	**237,378**	**256,205**	**274,113**
Fixed Costs					
Vehicle Running Costs	126	133	155	172	191
Office Running Costs	4,012	4,249	4,937	5,500	5,726
TOTAL FIXED COST	**4,137**	**4,383**	**5,092**	**5,672**	**5,917**
Variable Based Costs					
Vehicle Running Costs	9,678	10,914	10,939	12,223	14,057
Losses	10,937	11,734	13,589	15,463	17,376
Office Running Costs	5,251	5,562	6,462	7,198	7,495
TOTAL VARIABLE COST	**25,865**	**28,209**	**30,989**	**34,885**	**38,928**
Loan Repayment					
Loan Capital Repayment	2,340	2,687	3,293	3,945	5,610
Interest on Vehicle Loan	2,874	2,527	1,921	1,269	398
Working Capital interest	688	787	655	925	994
TOTAL LOAN COST	**5,902**	**6,001**	**5,869**	**6,139**	**7,002**
Labour Based Costs					
TOTAL LABOUR COST	**155,001**	**172,769**	**191,290**	**206,448**	**222,909**

Table B12: 5-year extract of the cash flow for 3PL A.

	Year 1	Year 2	Year 3	Year 4	Year 5
Variable expenses	(180,866)	(200,979)	(222,280)	(241,333)	(261,837)
Fixed expenses	(4,137)	(4,383)	(5,092)	(5,672)	(5,917)
Financing activities	(3,563)	(3,314)	(2,576)	(2,194)	(1,392)
Movement in Loan	(2,340)	(2,687)	(3,293)	(3,945)	(5,610)
Income	190,476	209,496	237,378	256,205	274,113

NET CASH FLOW	(430)	(1,867)	4,137	3,060	(643)
RUNNING CASH REQUIREMENT	**(430)**	**(2,297)**	**1,840**	**4,900**	**4,257**

Table B13: 5-year extract of the 10-year financial summary for 3PL A.

	Year 1	Year 2	Year 3	Year 4	Year 5
Core Business Income	190,476	209,496	237,378	256,205	274,113
TOTAL INCOME ()	**190,476**	**209,496**	**237,378**	**256,205**	**274,113**
Fixed Costs	4,137	4,383	5,092	5,672	5,917
Variable Costs	25,865	28,209	30,989	34,885	38,928
Labour Costs	155,001	172,769	191,290	206,448	222,909
TOTAL COST ()	**185,004**	**205,361**	**227,372**	**247,006**	**267,754**
Cash Operating Profit ()	5,472	4,135	10,007	9,199	6,359
Depreciation	2,807	2,807	2,807	2,807	3,207
Interest Paid	3,563	3,314	2,576	2,194	1,392
Profit Before Tax ()	**-897**	**-1,986**	**4,624**	**4,198**	**1,759**
Taxation	-	-	1,387	1,260	528
NOPAT ()	**-897**	**-1,986**	**3,237**	**2,939**	**1,231**
NOPAT (Accumulated)	**-897**	**-2,883**	**354**	**3,293**	**4,524**

Table B14: 5-year extract of the balance sheet for 3PL A.

	Year 1	Year 2	Year 3	Year 4	Year 5
Assets					
Fixed Assets	14,735	11,928	9,121	6,315	6,287
Vehicles	17,541	17,541	17,541	17,541	20,849
Accumulated depreciation	-2,807	-5,613	-8,420	-11,226	-14,562
Current Assets	40,284	45,062	64,907	79,875	96,033
Stock	34,814	35,137	35,415	37,954	41,290
Trade Debtors	3,342	3,879	5,031	6,176	7,475
Cash	2,127	6,047	24,462	35,745	47,268
TOTAL ASSETS	**55,019**	**56,990**	**74,028**	**86,190**	**102,320**
Liabilities					
Current Liabilities	38,660	40,677	47,765	55,216	63,973
Trade Creditors	17,731	17,895	18,036	19,329	21,028
Overdraft (Working Capital)	20,426	21,120	22,409	24,801	27,737

	Year 1	Year 2	Year 3	Year 4	Year 5
Tax Payable	503	1,662	7,319	11,086	15,207
Long Term Liabilities	15,185	12,436	9,186	5,106	2,864
Bank Loans	15,185	12,436	9,186	5,106	2,864
Start-up Capital	0	0	0	0	0
Shareholders' Equity	1,174	3,877	17,078	25,867	35,484
Share Capital	0	0	0	0	0
Retained Profit	1,174	3,877	17,078	25,867	35,484
TOTAL CLAIMS	**55,019**	**56,990**	**74,028**	**86,190**	**102,320**

Table B15: 5-year extract of the KPI's for 3PL A

	Year 1	Year 2	Year 3	Year 4	Year 5
NOPAT %	0.608%	1.2%	4.6%	2.8%	2.7%
Return on Assets	2.1%	6.8%	23.1%	30.0%	34.7%
Return on Investment	2.2%	3.7%	10.8%	12.1%	12.9%
Break-even rate per case	0.30	0.35	0.44	0.45	0.47

Table B16: Sensitivity analysis raw data output for 3PL A

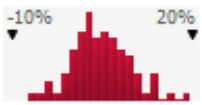
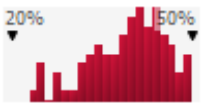
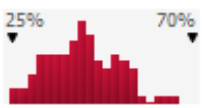
Input Name	Cell	Graph	Min	5%	Mean	95%	Max
NOPAT % / Year 1	AW73		-4.46	-2.8%	-0.9%	0.8%	1.58%
ROA / Year 1	AW74		-11.4%	-6.4%	-2.1%	1.5%	2.6%
ROI / Year 1	AW75		-11.1%	-6.5%	-2.1%	1.6%	2.8%
Rate per Case / Year 1	AW76		0.16	0.16	0.17	0.19	0.19
NOPAT % / Year 5	BA73		-2.8%	-0.5%	4.0%	8.4%	10.6%
ROA / Year 5	BA74		-34.1%	-11.7%	13.3%	28.7%	35.2%
ROI / Year 5	BA75		-6.1%	-2.5%	5.1%	12.8%	18.9%
Rate per Case / Year 5	BA76		0.20	0.21	0.26	0.31	0.33
NOPAT % / Year 5	BF73		1.8%	4.1%	9.0%	15.3%	16.9%
ROA / Year 10	BF74		24.0%	26.0%	39.3%	47.9%	49.1%
ROI / Year 10	BF75		7.5%	8.8%	19.9%	33.3%	39.3%
Rate per Case / Year 10	BF76		0.27	0.31	0.43	0.55	0.66

Table B17: Sensitivity analysis output data summary

			3PL A					3PL B					3PL C					3PL D					3PL E						
KPI	Legend of Input ID		Input ID	Min	Max	Diff	Weight	Input ID	Min	Max	Diff	Weight	Input ID	Min	Max	Diff	Weight	Input ID	Min	Max	Diff	Weight	Input ID	Min	Max	Diff	Weight	Input ID	Base Weight
NOPAT%	Returnable containers	1	1	0.007	0.007	0.000	0.00%	1	-0.098	-0.098	0.000	0.00%	1	-0.124	-0.124	0.000	0.00%	1	-0.081	-0.081	0.000	0.00%	1	-0.266	-0.266	0.000	0.05%	1	0.01%
	Average inventory empties	2	2	0.007	0.007	0.000	0.01%	2	-0.098	-0.098	0.000	0.01%	2	-0.124	-0.124	0.000	0.01%	2	-0.081	-0.081	0.000	0.01%	2	-0.266	-0.266	0.000	0.19%	2	0.05%
	Volume delivered	3	5	0.007	0.007	0.000	1.04%	5	-0.099	-0.097	0.002	3.67%	4	-0.125	-0.123	0.002	4.59%	5	-0.081	-0.080	0.001	3.41%	4	-0.266	-0.265	0.001	4.17%	3	10.17%
	Average unit sales price of product	4	4	0.006	0.007	0.001	5.72%	4	-0.099	-0.097	0.002	3.99%	5	-0.126	-0.123	0.003	4.97%	4	-0.081	-0.080	0.002	4.27%	5	-0.266	-0.265	0.001	6.95%	4	4.55%
	Average route distance	5	3	0.006	0.008	0.001	7.10%	3	-0.101	-0.095	0.006	10.10%	3	-0.127	-0.121	0.006	10.78%	3	-0.082	-0.079	0.004	9.21%	3	-0.267	-0.264	0.003	13.66%	5	4.01%
	Average unit cost of product	6	7	0.006	0.008	0.002	15.57%	6	-0.103	-0.093	0.010	18.34%	6	-0.129	-0.120	0.009	17.72%	6	-0.084	-0.077	0.008	18.47%	6	-0.267	-0.264	0.003	17.22%	6	19.56%
	Weekly Volume	7	6	0.005	0.009	0.004	26.04%	7	-0.106	-0.090	0.016	28.62%	7	-0.132	-0.117	0.015	29.08%	7	-0.087	-0.075	0.012	28.90%	7	-0.268	-0.263	0.006	27.71%	7	25.97%
	Average inventory full's	8	8	0.003	0.010	0.007	44.52%	8	-0.108	-0.088	0.019	35.27%	8	-0.133	-0.116	0.017	32.85%	8	-0.088	-0.073	0.015	35.73%	8	-0.269	-0.263	0.006	30.07%	8	35.69%
Return on Assets	Returnable containers	1	5	-0.039	-0.039	0.000	0.00%	5	-0.120	-0.120	0.000	0.00%	5	-0.166	-0.166	0.000	0.00%	5	-0.131	-0.131	0.000	0.00%	5	-0.524	-0.524	0.000	0.00%	1	0.01%
	Average inventory empties	2	1	-0.039	-0.039	0.000	0.00%	1	-0.120	-0.120	0.000	0.00%	1	-0.166	-0.166	0.000	0.00%	1	-0.131	-0.131	0.000	0.00%	1	-0.524	-0.524	0.000	0.05%	2	0.05%
	Volume delivered	3	2	-0.039	-0.039	0.000	0.00%	2	-0.120	-0.120	0.000	0.01%	2	-0.166	-0.166	0.000	0.01%	2	-0.131	-0.131	0.000	0.01%	2	-0.524	-0.524	0.000	0.21%	3	5.35%
	Average unit sales price of product	4	4	-0.041	-0.038	0.003	3.70%	4	-0.122	-0.119	0.003	3.32%	4	-0.168	-0.165	0.003	3.78%	4	-0.133	-0.130	0.003	3.59%	4	-0.525	-0.523	0.002	2.89%	4	3.46%
	Average route distance	5	3	-0.042	-0.037	0.005	5.75%	3	-0.123	-0.118	0.005	5.44%	3	-0.169	-0.164	0.005	5.26%	3	-0.134	-0.129	0.005	5.37%	3	-0.526	-0.522	0.004	4.92%	5	0.00%
	Average unit cost of product	6	6	-0.048	-0.031	0.017	20.63%	6	-0.130	-0.111	0.019	22.06%	6	-0.177	-0.156	0.020	22.25%	6	-0.142	-0.122	0.020	22.03%	6	-0.534	-0.514	0.020	24.19%	6	22.23%
	Weekly Volume	7	7	-0.052	-0.027	0.025	30.49%	7	-0.134	-0.108	0.027	31.80%	7	-0.182	-0.152	0.030	32.60%	7	-0.146	-0.118	0.028	32.10%	8	-0.538	-0.510	0.028	33.82%	7	32.18%
	Average inventory full's	8	8	-0.056	-0.024	0.032	39.43%	8	-0.137	-0.105	0.032	37.36%	8	-0.183	-0.150	0.033	36.09%	8	-0.148	-0.116	0.033	36.90%	7	-0.538	-0.510	0.028	33.92%	8	36.72%
Return on investments	Returnable containers	1	5	-0.036	-0.036	0.000	0.00%	5	-0.100	-0.100	0.000	0.00%	5	-0.132	-0.132	0.000	0.00%	5	-0.108	-0.108	0.000	0.00%	5	-0.304	-0.304	0.000	0.00%	1	0.01%
	Average inventory empties	2	1	-0.036	-0.036	0.000	0.00%	1	-0.100	-0.100	0.000	0.00%	1	-0.132	-0.132	0.000	0.00%	1	-0.108	-0.108	0.000	0.00%	1	-0.304	-0.304	0.000	0.06%	2	0.05%
	Volume delivered	3	2	-0.036	-0.036	0.000	0.00%	2	-0.100	-0.100	0.000	0.01%	2	-0.132	-0.132	0.000	0.01%	2	-0.108	-0.108	0.000	0.01%	2	-0.304	-0.304	0.000	0.22%	3	4.13%
	Average unit sales price of product	4	4	-0.037	-0.035	0.002	3.40%	4	-0.101	-0.100	0.002	2.67%	4	-0.133	-0.131	0.002	2.86%	4	-0.109	-0.107	0.002	2.85%	4	-0.304	-0.304	0.000	1.64%	4	2.68%
	Average route distance	5	3	-0.038	-0.034	0.004	5.28%	3	-0.102	-0.099	0.003	4.36%	3	-0.133	-0.131	0.002	3.98%	3	-0.109	-0.107	0.003	4.25%	3	-0.304	-0.304	0.001	2.79%	5	0.00%
	Average unit cost of product	6	6	-0.043	-0.029	0.015	20.88%	6	-0.107	-0.094	0.013	22.60%	6	-0.139	-0.125	0.013	23.00%	6	-0.115	-0.101	0.014	22.63%	6	-0.308	-0.301	0.007	25.34%	6	22.89%
	Weekly Volume	7	7	-0.047	-0.026	0.021	30.40%	7	-0.110	-0.091	0.019	31.67%	7	-0.142	-0.123	0.019	32.39%	7	-0.118	-0.099	0.019	31.93%	7	-0.309	-0.299	0.009	33.83%	7	32.05%
	Average inventory full's	8	8	-0.050	-0.022	0.028	40.03%	8	-0.112	-0.089	0.023	38.68%	8	-0.143	-0.121	0.022	37.75%	8	-0.120	-0.097	0.023	38.32%	8	-0.309	-0.299	0.010	36.12%	8	38.18%
Rate per Case	Returnable containers	1	1	0.138	0.138	0.000	0.00%	1	0.207	0.207	0.000	0.00%	1	0.240	0.240	0.000	0.00%	1	0.272	0.272	0.000	0.00%	1	0.777	0.777	0.000	0.00%	1	0.00%
	Average inventory empties	2	2	0.138	0.138	0.000	0.00%	2	0.207	0.207	0.000	0.00%	2	0.240	0.240	0.000	0.00%	2	0.272	0.272	0.000	0.00%	2	0.777	0.777	0.000	0.01%	2	0.00%
	Volume delivered	3	4	0.138	0.139	0.001	3.11%	4	0.207	0.208	0.001	2.18%	4	0.239	0.240	0.002	2.26%	4	0.271	0.272	0.001	1.90%	4	0.777	0.778	0.001	0.65%	3	9.04%
	Average unit sales price of product	4	6	0.136	0.140	0.004	8.38%	6	0.205	0.209	0.004	6.02%	6	0.238	0.242	0.004	5.76%	6	0.270	0.274	0.004	5.03%	6	0.776	0.779	0.004	1.85%	4	2.02%
	Average route distance	5	8	0.136	0.140	0.004	9.01%	8	0.205	0.209	0.004	6.65%	8	0.238	0.242	0.004	5.87%	8	0.270	0.274	0.004	5.31%	5	0.775	0.779	0.004	2.07%	5	6.39%
	Average unit cost of product	6	5	0.136	0.140	0.004	9.84%	5	0.205	0.209	0.004	6.89%	5	0.237	0.242	0.005	7.15%	5	0.269	0.274	0.005	6.02%	8	0.775	0.780	0.004	2.08%	6	5.41%
	Weekly Volume	7	3	0.135	0.142	0.007	14.55%	3	0.204	0.210	0.006	10.27%	3	0.236	0.243	0.007	9.48%	3	0.269	0.275	0.006	7.83%	3	0.774	0.780	0.006	3.07%	7	71.35%
	Average inventory full's	8	7	0.127	0.152	0.025	55.12%	7	0.188	0.230	0.042	67.99%	7	0.218	0.266	0.048	69.46%	7	0.246	0.303	0.057	73.91%	7	0.698	0.874	0.176	90.26%	8	5.78%

Table B18: Compensation bands for large 3PLs.

Band	Average weekly sales			Cost per case	Weekly compensation range		
1	5,000	-	7,000	0.26	1,300	-	1,680
2	7,000	-	9,000	0.24	1,680	-	1,980
3	9,000	-	11,000	0.22	1,980	-	2,200
4	11,000	-	13,000	0.20	2,200	-	2,340
5	13,000	-	16,000	0.18	2,340	-	2,890
6	16,000	-	20,000	0.17	2,890	-	3,200
7	20,000	-	24,000	0.16	3,200	-	3,600
8	24,000	-	29,000	0.15	3,600	-	4,060
9	29,000	-	36,000	0.14	4,060	-	4,680
10	36,000	-	44,000	0.13	4,680	-	5,280
11	44,000	-	55,000	0.12	5,280	-	6,050
12	55,000	-	75,000	0.11	6,050	-	9,000
13	75,000	-		0.10	9,000	-	

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