

**EVALUATING AND ALLOCATING OUTBOUND LOGISTICS COST IN THE
FAST-MOVING CONSUMER GOODS (FMCG) INDUSTRY**

by
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DISSERTATION SUMMARY

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Logistics costs constituted 11.7%, 11.1% and 11.2% of South Africa's total GDP during 2012, 2013 and 2014 respectively. The risk of high transport cost (compared to global averages), a depressed South African economy and more competitive market conditions resulted in a renewed focus on logistics services and associated cost.

For most Fast-Moving Consumer Goods (FMCG) manufacturers in South Africa, outbound logistics cost amounts to between 5% and 15% of sales value. This percentage range hides the reality that logistics efficiency (and therefore cost) vary significantly between products (or categories), customers (or channels) and regions (or markets).

In this complex FMCG trading environment, many companies are experimenting with various ways to increase profit. Several programs are launched looking at ways to reduce cost, improve service levels and a significant amount of time is spent thinking about new products and logistics solutions to service more customers. The reality, however, is that in most instances companies do not understand the outbound logistics cost drivers and hence profitability of current (let alone new) channels, regions, products and customers. This is simply as a result of insufficient information available from traditional accounting statements. Customer profitability is usually calculated on a Gross Profit level (net sales contribution less cost of goods) and therefore excludes all other activity costs, including logistics.

Defining cost drivers for each outbound logistics process, namely (i) primary distribution, (ii) warehousing/storage, and (iii) secondary distribution, and related activities can be used to determine the true cost-to-serve (CTS) on a customer and product level. This is a critical understanding for making integrated product and customer network decisions and is a very

necessary building block for achieving optimised supply chains. It can also support what-if scenarios of the logistics network and the resultant impact on cost, service levels and resultant profit, assisting businesses to focus on the true cost drivers before they become costs.

The research posed three conjectures:

1. Current accounting systems provide insufficient insight into the outbound logistics cost-to-serve (CTS) on a product and customer level. The development of an alternative CTS allocation framework, underpinned by cost drivers, is required to translate and assign cost logically to customer transactions to determine the true CTS.
2. The cost drivers of outbound logistics in the South African FMCG industry are not well defined or understood. This is a key component to develop cost allocation logic for each cost driver on a customer transactional level.
3. An outbound logistics CTS allocation framework is a critical component of supply chain optimisation as (i) cost is linked to actual activity, (ii) it leads to business understanding of costs and cost drivers, (iii) it acts as a tool to identify customer servicing strategies to improve service and profit.

The research led to the following conclusions:

- Conjecture 1: Current accounting systems are lacking the insights to understand the outbound logistics CTS on a product and customer level. Being able to evaluate the CTS on a more detailed level is a key requirement to ensure that informed and appropriate business decisions are taken. The market interviews within the FMCG industry supported the notion that a CTS allocation framework, based on defined cost drivers, could be a critical input to supply chain optimisation and overall business profitability.
- Conjecture 2: The market interviews indicated that cost drivers for outbound logistics in the FMCG industry are not well defined. However, the literature study and structured interview questions evinced that standard cost driver(s) for each outbound logistics process and related activities can indeed be defined, albeit slight variations might exist due to different supply chain intricacies. However, the principle of using the cost driver(s) to develop a CTS allocation framework on a customer and product level holds true.
- Conjecture 3: The study established that it's probable that costs can be ringfenced for the respective outbound logistics processes. Evaluating the cost drivers for the activities associated to the processes will lead to a better understanding of the logistics costs and the drivers thereof. The suggested CTS allocation framework determines the true CTS on customer and product level and is therefore a valuable decision-support

tool to identify improvement initiatives and optimisation. Applying the tool to shape customer servicing strategies whilst reducing the outbound logistics CTS (and hence increase profit) is a significant competitive advantage.

– This report should preferably be read and printed in full colour –

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LIST OF ABBREVIATIONS

Abbreviation	Description
ABC	Activity Based Costing
ABM	Activity Based Management
BU	Business Unit
CDC	Central Distribution Centre
CPG	Consumer Packaged Goods
CPI	Consumer Price Index
CTS	Cost-to-Serve
DC	Distribution Centre
EBIT	Faculty of Engineering, Built Environment & Information Technology
EVA	Economic Value Add
FMCG	Fast-Moving Consumer Goods
FTL	Full Truck Load
GDP	Gross Domestic Product
KPI	Key Performance Indicator
LSP	Logistics Service Provider
MHE	Material Handling Equipment
MOQ	Minimum Order Quantity
NIV	Net Invoiced Value
POD	Proof of Delivery
ROA	Return on Assets
ROE	Return on Equity
ROI	Return on Investment
SCM	Supply Chain Management
SKU	Stock Keeping Unit
SOH	Stock on Hand
TA	Throughput Accounting
TAT	Turn Around Time (relates to the total delivery time at a location)
TOC	Theory of Constraints

GLOSSARY

1. Fast-Moving Consumer Goods (FMCG): The FMCG industry operates with consumer items that are usually produced in large quantities and turnover rates for these products are relatively quick. FMCG companies provide these consumable products to the customer through certain predetermined distribution channels/segments.
2. Cost Driver: An activity that consumes resource(s) with an associated cost.
3. Cost-to-Serve (CTS): Methodology used to determine what the true activity cost on a customer and product level is.
4. Outbound Logistics: This entails the planning and execution of the storage and physical flow of finished goods from the point of origin (i.e. manufacturing) to the point of delivery (i.e. retailer). The processes are mainly (i) primary distribution, (ii) warehousing and (iii) secondary distribution.
5. Primary Distribution: This defines the transport of finished goods from point of manufacturing to point of storage, which is normally a regional distribution centre, or the movement of product between storage locations. It could also be referred to as bulk haul. The quantity moved are typically full vehicle loads and products are palletised.
6. Secondary Distribution: This refers to distribution from point of storage to the end customer. In the FMCG environment this is typically a retail outlet where the consumer will purchase goods.
7. Supply Chain: Is a network to deliver goods to customers that involves the planning and physical flow of products, information and cash.
8. Warehousing/Storage: In the context of outbound logistics, warehousing is where finished goods products are received and stored prior to distribution to customers.

1 INTRODUCTION

“South Africa’s logistics costs totalled R429 billion in 2014 and equated to 11.2% of gross domestic product (GDP) or 51.5% of transportable GDP. Logistics costs increased by 9.2% between 2013 and 2014.” (Havenga *et al.*, 2016:3). The upward trend of logistics cost, as part of operating cost, is identified as a major risk to consumer inflation and economic growth.

Besides the recent economic slowdown, with an average GDP growth for South Africa equalling 2.1% between 2011 and 2015 (Havenga *et al.*, 2016:4), the Fast-Moving Consumer Goods (FMCG) industry has shown a modest annual volume growth (Pick ‘n Pay, 2014; Shoprite Holdings, 2014 and Massmart, 2014). However, relatively low operating profit margins in the FMCG industry necessitates the need to reduce logistics cost whilst maintaining acceptable service standards to its customers (PWC, 2012).

Barloworld Logistics (2016:8) states that in line with previous surveys, it is clear that logistics operating costs are still a big constraint of a business. It is therefore “more prudent to understand the relationship of costs relative to the value they derive”. The true determination of the sources of profit and/or profit erosion is clearly a growing need. It is therefore of high importance to understand the real cost of service and the cost efficiency of activities contributing to the logistics services, through enhancing the capabilities of management accounting systems (Bokor and Markovits-Somogyi, 2014). This understanding provides valuable insights into the sustainability of business and highlights where possible corrective actions are required.

The enhancement of management accounting systems was recognised by Christopher (1998:71) who stated that traditional cost accounting procedures often provided unreliable insight into profitability. Activity based costing (ABC) is not a new concept and was introduced to solve the distortion problems of traditional costing systems (Cooper and Kaplan, 1988). This costing methodology started out predominantly focussing on manufacturing because of the significant costs involved, but La Londe *et al.* (1994) pointed out ABC can be a useful tool in logistics management as well. Using ABC to assign costs to determine the profitability of customers and products is widely accepted (Foster *et al.*, 1994).

However, Jooste and Van Niekerk (2009) state that the degree to which South African FMCG companies truly understand the impact of outbound logistics cost on profitability of current (let alone new) market channels, regions, products and customers is ambiguous. The contribution of this study is to develop a customised cost-to-serve (CTS) framework for the South African

FMCG industry that includes the major outbound logistics cost components and its associated cost drivers¹ for each respective activity. Applying the framework to calculate the CTS of customers and products can be a significant competitive advantage as it leads to an understanding of the cost contribution and resultant profitability on a more granular level. Appropriate business decisions can be taken based on this understanding to ensure the sustainability of the overall business.

The scope of the CTS framework is contained to the South African FMCG industry and outbound logistics operations, which are discussed in Section 1.1 and 1.2 respectively.

1.1 THE FAST-MOVING CONSUMER GOODS INDUSTRY

FMCG, also known as consumer-packaged goods (CPG), are characterised by a quick rate of sale and do not require an extensive decision-making process or financial investment for purchase (CSIR, 2006). Examples of products include a wide range of frequently purchased products such as food, beverages, tobacco, household products, confectionery, toiletries, as well as health and beauty products.

The Economist Intelligence Unit reported that the South African FMCG retail industry surpassed a trillion rand in 2011, for the first time in history. In volume terms, the retail industry grew by an average of 3.45% in nominal terms over the period 2012 – 2016 (PWC, 2012).

FMCG has many characteristics that distinguish it from other industries, and these include the following (CSIR, 2006 and PWC 2012):

- Demand is seasonal and fluctuates with changes in consumer disposable income, tastes and preferences. Sales cycles typically peak on weekends and month ends as well as over the Easter and Christmas periods.
- Profit margins on FMCG products, especially at retail level, are usually low, but large quantities are sold.
- Due to relative low customer loyalty, product branding and availability are extremely important. “Disloyalty” occurs frequently when the product of choice is not available and is substituted for an alternative brand. The industry therefore realised that it is difficult to win in the market on price alone – supply chain speed, responsiveness and flexibility are critical to maintain a competitive edge.

¹ Cost driver can be defined as something that cause costs because they consume resources (Christopher, 1998).

1.2 THE SUPPLY CHAIN AND OUTBOUND LOGISTICS

Although logistics activity is literally thousands of years old (dating back to the earliest forms of organised trade), it only became a study field in the early 1900's (Stock et al., 2001). A couple of decades later, and still today, logistics remains very relevant to businesses.

There are various views on the difference between logistics (or Logistics Management) and supply chain (or Supply Chain Management). Christopher (1998:12-14) argues that the supply chain involves “the network of organisations that are involved through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate consumer”.

A more recent definition, according to The Association for Operations Management (APICS), states that a *supply chain* is “a global network used to deliver products and services from raw materials to end customers through an engineered flow of information, physical distribution, and cash” (APICS, 2017). Figure 1 illustrates a simplistic view of a supply chain:

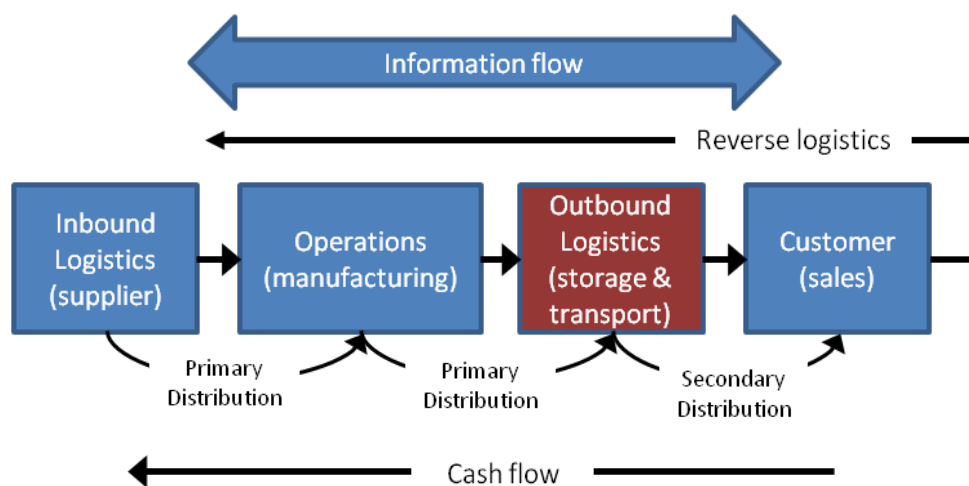


Figure 1: Simplistic View of a Supply Chain

According to Burger (2003) logistics is “the process of strategically managing the acquisition, movement and storage of materials, parts and finished inventory (and the related information flows) through the organisation and its marketing channel in such a way that current and future profitability is maximised through the cost-effective fulfilment of orders”. APICS (2017) supports the notion, defining logistics “in a supply chain management context, is a subset of supply chain management that controls the forward and reverse movement, handling, and storage of goods between origin and distribution points”.

For the purposes of this study, the *outbound logistics* scope definition is based on the latest APICS dictionary that defines outbound logistics as “every process that is involved in the shipping and holding of products after they are completed until they are received by the customer” (APICS, 2017). Outbound logistics, within the simplistic view of a supply chain in Figure 1, is indicated in burgundy.

Logistical characteristics and challenges could be unique to a specific region or country. Section 1.3 elaborates on the status of logistics in a South African context.

1.3 THE STATUS OF SOUTH AFRICAN LOGISTICS

Razzaque and Sheng (1998) argue that a growing trend has emerged where the delivery process is as much responsible for competitive advantage as the product itself. They continue to say that logistics is ideally positioned to achieve this as it cuts across the traditional functions. Also, the logistics function can be the key facilitator in the cross-functional effort towards supply chain integration to meet future needs, which is now assumed to be of strategic importance (Barloworld Logistics, 2016:67). This supports Lin, Collins and Su (2001:703) viewpoint and familiar phrase that “customer service involves getting the right product, to the right customer at the right place, in the right condition, at the right time at the lowest possible cost”.

In 2007 the *supplychainforesight* stated the most important supply chain objectives for South African companies are improving collaboration, improving service delivery to customers and reducing logistics cost (Barloworld Logistics, 2007:12). In recent times, these previously stated objectives are still relevant, however companies are now also required to adapt to changing market conditions due to “the current economic and political climate”. Retaining and sustaining financial returns is the supreme objective and “the real opportunity lies in a company’s ability to ensure costs are managed in relation to creating value going forward” (Barloworld Logistics, 2016). Companies therefore place a strong focus on cost management and how this contributes to overall value generation – a key underlying principle when considering the intent of CTS analysis.

Figure 2 provides a trend view of South African logistics cost as a percentage of total GDP and transportable GDP from 2003 to 2016 [red line]. It’s evident that the year-on-year actual logistics costs since 2013, and estimations for 2015 and 2016, are on the increase [grey line] (Havenga *et al.*, 2016:5).

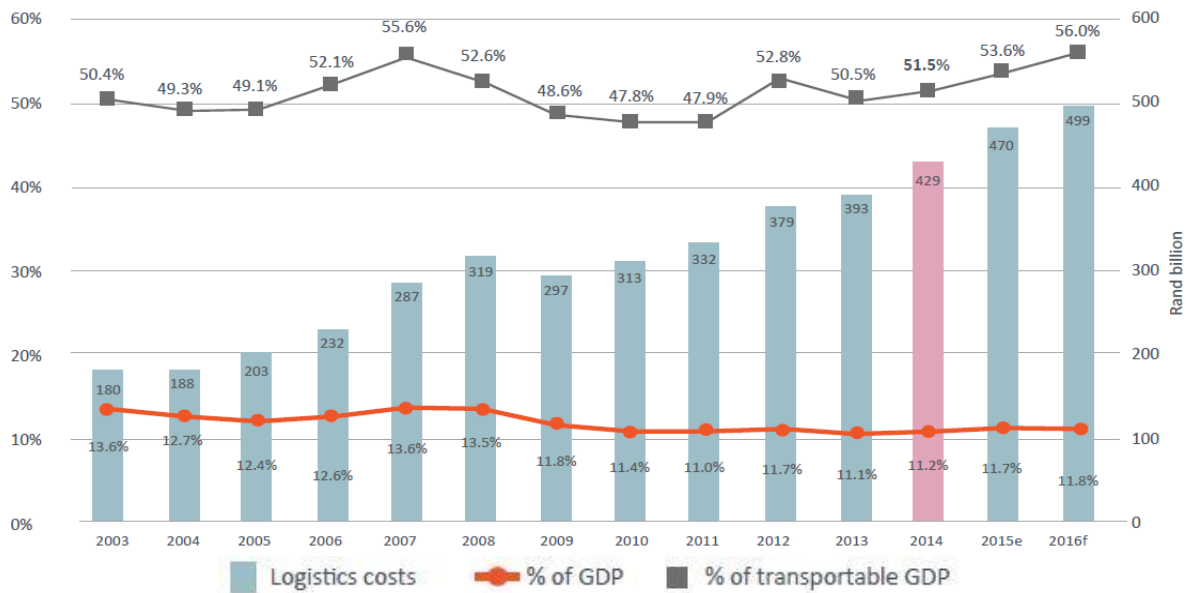


Figure 2: South Africa Logistics Cost Trend

The CSIR (2013:iii) states that logistics costs comprises out of four components, namely transport costs, inventory carrying costs, warehousing and management and administration. Havenga and Simpson (2016: 5) report that logistics cost as a percentage of transportable GDP is estimated to be more than 50% in 2014 – a dire situation. When logistics cost is broken down into the four components, it’s evident that transport cost is on the increase and contributes more than 55% of logistics cost. The comparative cost components are depicted in Figure 3 (Havenga *et al.*, 2016:9).

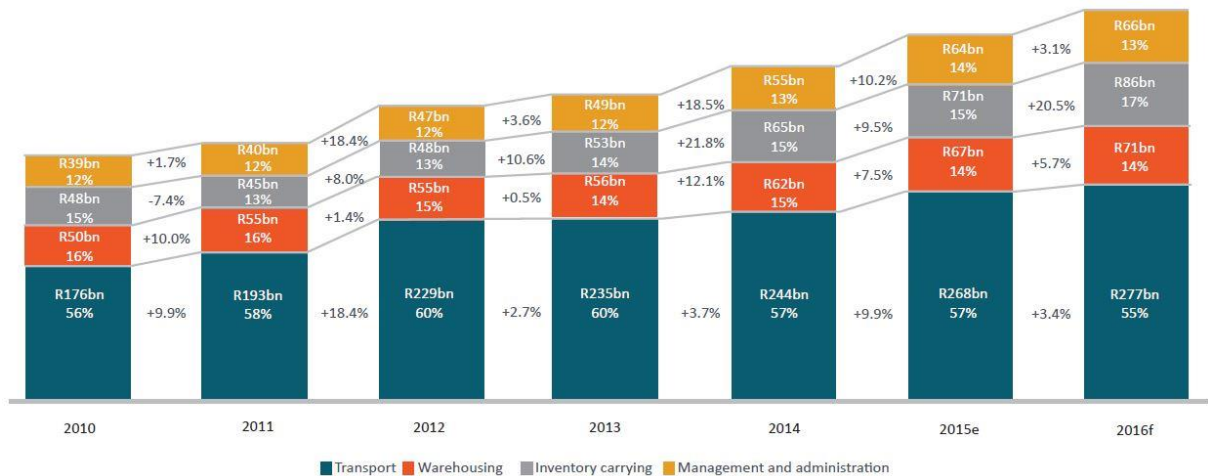


Figure 3: Trends in South Africa’s Logistics Costs Stack Elements

Havenga *et al.* (2016:12) also compare the road and rail transport network, stating that the split was 85% and 15% respectively of freight volumes (tonnage) during 2014. Although rail has shown a slight increase the last couple of years, road remains the most significant mode of transport in South Africa. This trend is mainly due to the absence of appropriate rail solutions

(that lead to a divergence between rail services and customer requirements) as well as the lack of investment in rail infrastructure (Havenga *et al.*, 2016).

Logistics remains a key focus area for companies' due to the high costs involved. South Africa's vast geographic disposition is a further challenge for companies to minimise logistics cost whilst maintaining or even improving reliable customer service. Expressing logistics cost as a percentage of revenue or a Rand per unit are both over-simplified measures. Merely breaking down logistics into high-level cost categories will provide insight and identify focus areas. However, understanding the true CTS (and resulting profitability) on a more granular customer and product level will produce a fitting logistics improvement agenda for different supply chains within a company. To determine the true CTS, the cost drivers associated with the outbound logistics processes and activities need to be evaluated. The significance of cost drivers is discussed in Section 1.4.

1.4 COST DRIVERS IN OUTBOUND LOGISTICS

The FMCG industry is a complex, dynamic and low margin trading environment and many companies are experimenting with various ways to increase profit. Several undertakings are launched to consider ways to reduce cost and a significant amount of effort is spent to develop new products and expand the customer footprint (Jooste *and Van Niekerk*, 2009).

The key problem is usually not the undertaking or the intent, but the integrated focus and approach used to determine priorities as well as the ability of all affected parties to understand the impact of the change on the overall company financials. This is often as a result of insufficient information available from traditional accounting statements as discussed earlier. Furthermore, logistics cost is often buried in overheads and are not well understood (Havenga *et al.*, 2016:3). This implies that customer and product profitability is usually calculated on a Gross Profit level, and therefore excludes all other supply chain and logistics activity costs.

Norek & Pohlen (2001:38) state: "Not knowing the cost to perform specific functions will make the development of optimal supply chain structures difficult if not impossible". The end customer is arguably the most important stakeholder in the supply chain. However, many companies don't understand the profit (or lack thereof) they make from each customer, let alone up and cross selling opportunities. This lack of understanding might lead to suboptimal supply chain development and business strategies (Jooste *et al.*, 2009).

The challenge is to develop a framework for the FMCG industry to evaluate and define the cost drivers for outbound logistics activities and to determine the CTS on a customer and product

level. The understanding of CTS, as part of a business strategy, is a critical component for building future optimal, agile and sustainable logistics solutions.

1.5 CONJECTURES

From the literature review the following is evident:

1. The FMCG industry is a complex, dynamic and low margin trading environment and many companies are experimenting with various ways to increase profit. Supply chain optimisation, including outbound logistics, remains a key focus area.
2. Companies are focusing on cost management in order to understand how this translates into business value. However, most companies calculate customer and product profitability on a Gross Profit level (net sales contribution less cost of goods), and therefore exclude all other activity costs, including outbound logistics, which is usually hidden in overhead cost.
3. Supply chain costs, especially in view of outbound logistics, are substantial in order to get the right product, in the right quantities, in the right time to the right customer, profitably.
4. There is a need to develop a CTS framework that models and translates *inter alia* outbound logistics activities into financial value in order to determine a customer and product's true CTS and resultant contribution to an organisation's bottom line.

The research problem reads as follows: Evaluating and defining outbound logistics cost drivers for FMCG companies is essential to create a CTS framework that will provide an understanding of the true impact of outbound logistics cost on differentiated customers, products, channels and/or geographical regions.

Based on the above, the following three inductive conjectures are formulated:

1. Current accounting systems provide insufficient insight into the outbound logistics cost-to-serve (CTS) on a product and customer level. The development of an alternative CTS allocation framework, underpinned by cost drivers, is required to translate and assign cost logically to customer transactions to determine the true CTS.
2. The cost drivers of outbound logistics in the South African FMCG industry are not well defined or understood. This is a key component to develop cost allocation logic for each cost driver on a customer transactional level.
3. An outbound logistics CTS allocation framework is a critical component of supply chain optimisation as (i) cost is linked to actual activity, (ii) it leads to business understanding of costs and cost drivers, (iii) it acts as a tool to identify customer servicing strategies to improve service and profit.

1.6 RESEARCH OBJECTIVE AND DESIGN

The primary research objective of this study aimed to evaluate the cost drivers for outbound logistics to develop a cost allocation framework within a South African FMCG industry context. To achieve this, the research design was structured to achieve the following secondary objectives:

1. Identify the characteristics of outbound logistics in the South Africa FMCG industry.
2. Understand current cost allocation methodologies and its application to field of outbound logistics.
3. Evaluate the cost components and cost drivers for each outbound logistics process namely (i) primary distribution, (ii) warehousing/storage, and (iii) secondary distribution.
4. Develop a CTS framework that will guide FMCG companies to determine the outbound logistics cost on a customer and product level.
5. Apply the CTS framework to a South African company's supply chain, as a case study, to validate the application of the framework and to showcase potential insights that can be derived.

The research methodology, assumptions and limitations, contributions and ethics are discussed in Sections 1.7 to 1.10 respectively.

1.7 RESEARCH METHODOLOGY

Mouton (2001) states that different types of studies and different design types exist to answer specific kind of questions. Yin (2014) suggests that five types of strategies can be applied to research studies, namely: experimental, survey, archival analysis, history and case study. Furthermore, the appropriate study strategy (and consequent methodology) depends on the research question, the control over events and the focus on historical or current events.

The chosen research methodology incorporates various techniques to address the research problem and conclusively accept or reject the formulated conjectures. The researcher considered non-empirical as well as empirical study strategies;

1. Non-empirical entails a literature review (as a source of historical evidence) and the development of a CTS framework, both requiring minimal control over the behavioural events.
2. Empirical entails market interviews (based on a questionnaire) and the validation of the CTS framework through a case study application. The questionnaire, used during the interviews, focussed on current events that includes direct interviewing and observations to enrich non-empirical findings. The case study application is best for

understanding difficult problems and useful when analysing a problem in its natural setting (Gulsecen *et al.*, 2006 and Seuring, 2008).

The research methodology will therefore be conducted as follows:

1. Literature review that includes the following:
 - a. A thorough overview of FMCG in South Africa, its characteristics and trends;
 - b. Defining supply chain with specific focus on outbound logistics;
 - c. The status of South African logistics and associated costs;
 - d. Accounting methods or methodologies used to allocate costs to activities.
2. Qualitative methods of data collection will be used by means of conducting interviews with selected FMCG companies. Due to the author's association with Imperial Logistics (the author's employer, Resolve Solution Partners, is a division of Imperial Logistics South Africa Propriety Limited) and the sensitivity of the information, only three FMCG companies within Imperial Logistics client database will be interviewed. The aim and focus of the interviews will be the following:
 - a. Evaluating the company's outbound logistics activities and status (e.g. whether the activities are insourced or outsourced to a logistics service provider (LSP));
 - b. Understanding the company's current accounting systems and reports used to determine the logistics CTS on a customer and product level;
 - c. Determining the insights and shortcomings of the current accounting system and reports;
 - d. Specifying the key components, key performance indicators (KPIs) and cost drivers for each outbound logistics process and activity;
 - e. Assessing the value-add of a CTS framework and reasons why it either can or cannot work.
3. Development of a CTS framework, underpinned by cost drivers, based on the literature study and interview outcomes.
4. Initial validation of the proposed CTS framework through a case study application. The case study will allow for reliable data collection on a high level of granularity. The aim will be to demonstrate the significance of the CTS framework with examples of possible dashboards to inform logistics/business improvement initiatives based on the results.
5. The research will be concluded by a synthesis between the conjectures and the actual findings, with conclusions and recommendations.

The research methodology discussed above is depicted visually in Figure 4.

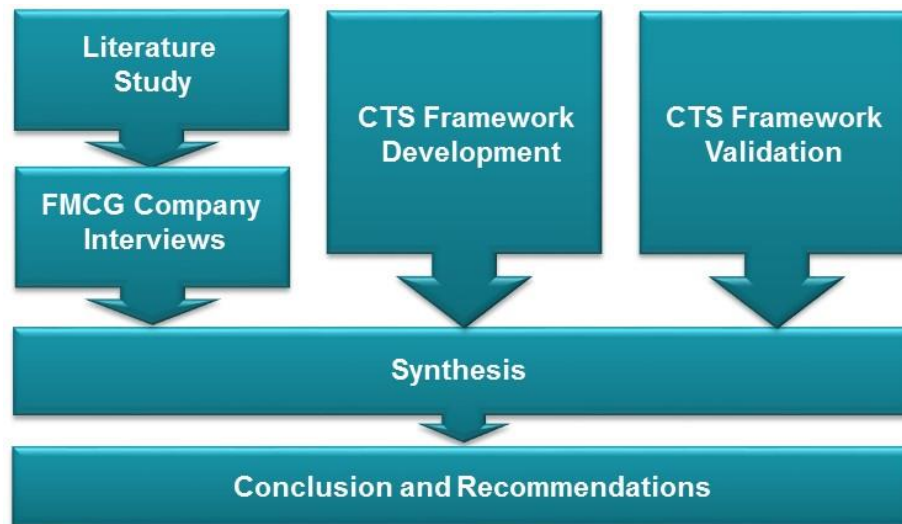


Figure 4: Research methodology

1.8 RESEARCH ASSUMPTIONS AND LIMITATIONS

The research will be confined to finished goods in the South African FMCG industry. The study will focus primarily on outbound logistics, a major supply chain cost contributor, and will be viewed as an integrated concept within Supply Chain Management (SCM). It will therefore include all activities associated with primary distribution² from manufacturing to the storage location (or directly to customer), warehousing, as well as secondary distribution³ from the storage facility to the customer. Excluded from the study are return logistics and all trading activities associated with sales and marketing, i.e. order capturing, invoicing, merchandising, after-market service etc. The latter could be included in further studies.

Although the market interviews conducted with three FMCG companies are likely not a representative sample of the FMCG industry, it is assumed that the responses obtained are adequate to give sufficient guidance to this study. The study should therefore not be used to derive generic industry trends. However, the author strongly believes that the responses will be very similar should more FMCG companies have been engaged, based on the author's professional experience and informal discussions with interested parties.

² Defines distribution from point of manufacturing to point of storage, which is normally a regional distribution centre. This is also referred to as bulk haul (APICS, 2017)

³ Refers to distribution from point of storage to the end customer. In the FMCG environment this is typically a retail outlet where the consumer will shop (APICS, 2017).

To ensure confidentiality, it should also be noted that the actual values of the company information used in the case study were substituted in reporting the case study results. However, the relationship between the values remains unchanged so that they reflect the true insights that can be derived when applying the framework. The case study company audited the actual values to establish the reliability and validity of the study. The case study results should however not be generalised as would be company specific.

1.9 RESEARCH CONTRIBUTIONS

The outcomes of the study can assist FMCG companies to understand the cost components and associated cost drivers for the activities related to outbound logistics. The author's contribution to the scientific knowledge base will be in the form of a cost allocation framework that can enable FMCG companies to determine and evaluate the outbound logistics CTS on a customer and product level. Appropriate business and continuous improvement decisions can be taken based on the results obtained from the framework. The framework can also serve as a foundation for future research that aims to incorporate additional supply chain processes or expanding the framework to other industries.

1.10 RESEARCH ETHICS

A questionnaire, used during interviews with pre-selected companies, was approved by the Faculty of Engineering, Built Environment & Information Technology (EBIT) Research Ethics Committee at the University of Pretoria. All the interviewees were briefed on the objective of the study and anonymity and confidentiality was ensured. The interviews were not recorded; the author rather relied on notes taken during the interview and follow-up discussions. Neither the company details or the interviewee's personal details are therefore disclosed in this report.

1.11 DOCUMENT STRUCTURE

This document is structured as follows:

- **Chapter 2: Introduction to FMCG and Logistics in South Africa.** A literature study is done to provide an overview of FMCG industry and outbound logistics in the South African context. Key characteristics, challenges and opportunities are identified.
- **Chapter 3: Existing Costing Models and Cost Drivers in Outbound Logistics.** The investigation of existing financial systems, reporting and alternative cost allocation methodologies is discussed. The approach to identify cost drivers is deliberated in order to evaluate the cost drivers in outbound logistics.

- **Chapter 4: Market Interviews.** Three market interviews were conducted, with the aim to ascertain whether current accounting systems are lacking, to identify the cost drivers for each outbound logistics process and activity, and to confirm whether a CTS framework will be value adding as a reporting and decision-making tool.
- **Chapter 5: Cost Driver Framework Development.** Amalgamation of the literature study and the outcomes of the market interviews to develop a framework of proposed cost drivers, and the allocation thereof, for each outbound logistics process.
- **Chapter 6: Framework Validation (A Case Study).** The proposed cost drivers and costing framework are validated through case study application. The section demonstrates, through practical reporting examples, the value-add of defining cost drivers to make informed business decisions relating to logistics improvement initiatives.
- **Chapter 7: Conclusions and Recommendations.** The findings of chapter 2 – 6 will be compared to the three conjectures defined in the introduction to the study to draw the research conclusions.

2 INTRODUCTION TO FMCG AND OUTBOUND LOGISTICS IN SA

This chapter focuses on understanding the scope of the study, namely outbound logistics in the South African Fast-Moving Consumer Goods (FMCG) industry. The chapter provides an overview of the FMCG industry, and investigates the unique South African challenges and the impact of these on outbound logistics.

2.1 FAST-MOVING CONSUMER GOODS

2.1.1 FMCG Market Overview

It's important to note that the corresponding supply chain activities are not the same for all supply chain industries with different products or services. In the FMCG industry the supply chain activities may change for example for services, perishable and non-perishable goods, since certain products must be sold in a specific time window that could be relatively short.

The FMCG supply chain is unique in the following ways:

- **Stable/Pure process:** Automated equipment, medium labour content, finite forward scheduling of production and machine limited.
- **Functional products:** Products that are relatively low-cost and produced in high volumes such as liquids (beer, soda) and canned goods. Innovative and new products occur regularly.

The South African FMCG industry has a number of key characteristics which distinguish it not only from other industries, but also from FMCG industries in other countries (inputs from CSIR, 2006:20 – 21; PWC, 2012; and Steyn, 2013):

1. Historically the industry experienced good growth with healthy profit margins. However, recently the industry has come under pressure due to a slower GDP growth, overall reduction in disposable income and a higher consumer price index (CPI) inflation.
2. The FMCG landscape is maturing and changing with new platforms being introduced, including increasing numbers of convenience stores, more discount retailers and online shopping (e-commerce). This generates fierce competition between FMCG companies.
3. South Africa has a unique combination of organised and informal trade. The organised grocery trade sector found mainly in the urban areas has grown significantly over the past decade, and although currently constituting a mere 5% of the stores, it accounts for 70% of the country's grocery turnover. Although the contribution of smaller counter- and self-service or traditional stores is small in comparison to the organised trade, it remains an important delivery channel.

4. The route to market is unique. In developed countries like Europe and in the United States of America a product is sold largely through the formal trade with product delivered to retail DC's which in turn is responsible for distribution and merchandising in retail outlets. In South Africa retail DC's are only partly utilised as some manufacturers still deliver directly to stores and manufacturers remain responsible for their own merchandising.
5. South Africa's consumer profile is very dynamic and is characterised by consumers who are exceptionally price sensitive, prioritising value for money as a driver of choice. As a result, the industry frequently has "special price sales" to attract consumers in the hope of higher purchase volumes of products at lower prices. It is, however, questionable if these special price deals realise better profit (and especially better economic value add (EVA)) across the supply chain once all the costs are included.
6. The industry is characterised by oligopolistic relationships between major producers and major retailers. As such the six major store groups in this industry are Pick 'n Pay, Shoprite Checkers, Spar, Massmart, Woolworths and Clicks with the first four accounting for about 80% of South Africa's retail sales. The major FMCG manufacturers include Tiger Brands, National Brands, Pioneer Foods, Unilever SA and SABMiller (recently acquired by AB InBev).

The introduction of a democracy in South Africa has created significant changes throughout the country and the FMCG industry was not left untouched. The impact of these changes includes (CSIR, 2006: 21; Kunc, 2005: 55; and PWC, 2012):

1. The potential local consumer base has grown significantly over the past decade and is continuing to grow. In the first decade of South Africa's democracy the population grew by 16%, while households increased by 26%. This has resulted in a wide consumer base and increased spending on household consumables.
2. There has been change in the consumer profile as well as an expansion of the middle class. South Africa is characterised by a high Gini-coefficient as illustrated by a recent survey by Statistics SA which has shown that the richest 20% of the country's households accounted for nearly two-thirds of total consumer spending. The income redistribution strategies have led to an increased number of households entering the middle and middle-lower income groups.
3. The change in consumer configuration has fuelled the need for more products, but also for different products and different distribution locations.
4. Although South Africa's diverse population is spread over a large geographic region, the large retail outlets are concentrated predominantly in the Western Cape and

Gauteng since more than 60% of South African retail sales occur in these two provinces.

5. Although formal trade has historically focussed on developed urban areas whilst informal trade had to service the urban and township areas, retailers have realised the tremendous opportunities in these previously poorer areas. This has resulted in the creation of numerous shopping centres and new retail outlets in disadvantaged areas in an attempt to adapt to the nation's changing consumer face.
6. The introduction of new varieties has been cemented on a more positive consumer attitude towards premium products over cheaper alternatives, as well as demographic and life-style changes. This situation played a vital role in determining the ability of suppliers to 'trade up' from lower-priced towards premium products. Trading up has also been fuelled by new product developments offering value-added benefits aimed at different lifestyles. The affordability of premium products and life-style changes is however directly linked to personal disposable income.
7. In the era of internet and social media, it's easier for consumers to compare products, prices and customer experiences online and in real-time. This bring unprecedented power to the consumer that will further intensify competition in the South African market.

2.1.2 FMCG Supply Chain Challenges

In recent times the impact of higher levels of consumer price index (CPI) inflation (Kelly, 2016 and StatsSA, 2017) leads to reduced consumer spend, makes it even more difficult for FMCG companies to be competitive. In addition, the change of retail/customer demographics, product mix and the need for agile, yet reliable supply chains add to the complexity.

Supply chain costs, especially outbound logistics, are substantial in order to get the right product, in the right quantities, in the right time to the right customer, profitably. Some challenges exposing outbound logistics cost includes the following (CSIR, 2006 and KPMG, 2015 and PWC, 2012).

1. South African organisations not placing emphasis on designing agility into their supply chains, which is required to respond effectively to changing consumer demands.
2. High levels of inventory (working capital) is kept to guard against the uncertainty of demand, especially in the case of seasonal products.
3. Distribution capacity to replenish product remains a challenge, as the need to distribute product to customers mimicking actual demand signals becomes more critical.

4. Since FMCG product margins are relatively low, logistics is constantly under pressure to reduce costs without compromising customer service.
5. The unique South African retail trade offers logistical challenges, both geographically and demographically. The vast retail outlet footprint results in a smaller delivery size per store (if demand increases at a lower rate than that of retail outlets).
6. Increased traffic volumes and back-door inefficiencies at retailers are still a concern, and seen as the key constraint rather than vehicle capacity (weight or volume).

The above discussion clearly highlights that the South African FMCG supply chain and logistics is severely pressured to increase customer service constantly, whilst reducing cost. This should be achieved despite significant growth in consumer outlets and the increased number of stock keeping units (SKU's) to service the unique and changing consumer market. (CSIR, 2006: 22). The unique challenges of outbound logistics within the South African context are discussed in Section 2.2.

2.2 OUTBOUND LOGISTICS AND FMCG

According to the Havenga *et al.* (2016: 5), the absolute cost of South African logistics in 2012 was R379 billion, increasing by 3.5% in 2013 to R393 billion and increased further with 9.3% to R429 billion in 2014. It is estimated to have grown by 9.5% during 2015 and 6.3% in 2016 (the final growth percentages are not published yet).

In 2007 the *supplychainforesight* stated the most important supply chain objectives for South African companies are improving collaboration, improving service delivery to customers and reducing logistics cost (Barloworld Logistics, 2007:12). The CSIR (2013:ii) further states that the demand for logistics and the performance of the logistics industry (specifically the cost of logistics) has a severe impact on the global competitiveness of South African industries. This is affirmed by the 2014 *supplychainforesight*, stating that “businesses that successfully combine value-creating customisation with **cost-effective delivery** outperform industry peers two-to-one in revenue growth and generate profit margins 5 – 10% above their competitors.” (Barloworld Logistics, 2014:2). Retaining and sustaining financial returns is the supreme objective and “the real opportunity lies in a company’s ability to ensure costs are managed in relation to creating value going forward” (Barloworld Logistics, 2016).

South Africa’s road network is the longest of any African country and about 89% of the country’s freight relies on this mode of transport (CSIR, 2012). Logistics outsourcing is still a prevalent trend in today’s business environment, with no exception to the FMCG industry. There is a large number of reasons why outsourcing is an attractive option, including cost

savings, flexibility, need for better skills and management, focus on strategy and core functions as well as optimal flow of goods, finances and information in the FMCG supply chain.

Respondents to the research conducted by the 2014 *supplychainforesight* again ranked the cost of transport as the top supply chain constraint. This is not a surprise, since transportation costs typically constitutes more than 50% of supply chain cost for South African businesses (Barloworld Logistics, 2014:15).

As mentioned previously, the high logistics cost as a percentage of transportable GDP in 2014 could either mean that:

- i. Logistics are becoming less efficient, or
- ii. That the cost drivers to deliver the same amount of volume are growing faster than the value of the goods transported.

FMCG industries are primarily make-to-stock⁴ environments with some exceptions of make-to-order⁵. The strategy of each FMCG industry organisation can change, but the most common is a productivity or revenue growth strategy and to ensure quality products at the lowest price. To maximise profit, the logistics function should be geared to get the product to the customer on time, in the right quantities and in the fashion required at the lowest possible cost.

This vast logistics cost spent by companies is the result of the ultimate goal of supply chain and logistics: to satisfy end-customer value. The term end-customer can be defined as the last point in the supply chain where an FMCG manufacturer delivers a product for consumption (APICS, 2017). An example of end-customer could be a retailer DC, a retailer store, caterer, convenience store, or in the world of on-line shopping even a consumers' home. Companies still view supply chain and logistics optimisation as a key focus area to outperform its competition, especially in the FMCG industry where client centricity and superior customer service becomes more-and-more prevalent.

⁴ A production environment where products can be and usually are finished before receipt of a customer order. Customer orders are typically filled from existing stocks, and production orders are used to replenish those stocks (APICS, 2017).

⁵ A production environment where a good or service can be made after receipt of a customer order. The final product is usually a combination of standard items and items custom-designed to meet the special needs of the customer (APICS, 2017).

2.3 LINKING LOGISTICS AND CUSTOMER SERVICE

As stated in Section 2.2, companies believe that the delivery process is as much responsible for a competitive advantage as the product itself. FMCG companies are under pressure to reduce logistics cost to maintain or improve profits, without compromising customer service levels. Measuring the performance and underlying cost of the entire delivery process, also termed *outbound logistics cost-to-serve (CTS)*, will bring about a mindset change in companies to benefit/profit from improved customer service. This notion is supported by Christopher *et al* (2005) confirming the important link between logistic-base activity costs and customer satisfaction.

“For a long time, we have accepted the convention that as service levels rise, so also does the cost-to-serve, exponentially” (Christopher *et al.*, 2005). The comparison between the CTS and customer service levels is an important measure to determine both over- and under servicing of customers that leads directly to cost-effectiveness and hence profit potential. It is therefore essential, through CTS modelling, to realistically compare the true CTS with the service profile on a customer and product level. This would enable a company to design a cost-effective logistics solution to “find the optimal or appropriate level of service” (Christopher *et al.*, 2005).

2.4 CONCLUDING REMARKS

Logistics remains of strategic importance to companies due to the high costs involved and the direct link to customer service. Although the absolute logistics costs and the logistics costs as a percentage of transportable GDP is rising, it is not a question of logistics efficiency, but rather of the increase in the underlying cost drivers. The latter needs to be understood in detail in for companies to react appropriately, which will assist management to focus on the true cost drivers before they become costs.

In a consumer centric FMCG industry, companies realise that an effective and efficient supply chain and logistics could unquestionably be a competitive advantage. By purely focussing on reducing logistics costs could be detrimental to service levels; therefore, the industry’s challenge remains to optimally balance the logistics CTS with good and reliable customer service. Without sufficient insight into the logistics cost drivers the trade-off becomes problematic.

Evaluating the cost drivers of outbound logistics shouldn’t only retrospectively measure efficiency and costs, but can also be used to ascertain the impact of future what-if scenarios. The what-if scenarios, for example, could entail understanding the sensitivity of the cost drivers or quantifying the impact of changes in the logistics network.

3 ACCOUNTING AND COST DRIVERS IN OUTBOUND LOGISTICS

Chapter 2 introduced the Fast-Moving Consumer Goods (FMCG) industry and provided an overview of logistics as part of supply chain management (SCM). The link between the logistics cost-to-serve (CTS) and customer service levels is essential to improve profits through the design of an appropriate and cost-effective outbound logistics solution. Measuring and understanding the true logistics CTS on customer and product level is a key enabler to achieve potential cost reductions and increased profits, required by the FMCG industry.

This chapter will firstly provide an overview of current financial reporting in view of logistics management, focussing on its importance and potential shortfalls. Secondly, it examines how cost allocation methodologies, specifically activity based costing (ABC), can be used to improve the accuracy and understanding of logistics costs to overcome the shortfalls of traditional accounting practices. Lastly, the method of identifying cost drivers will be discussed which are essential to measuring a company's logistics cost performance on a more granular level.

3.1 FINANCIAL REPORTING

Profitability measurement is a key FMCG business objective: to improve return on equity (ROE) for the company shareholders (Bansal 2014). In simple terms ROE equals net profit divided by equity. It is therefore clear that this involves both the maximisation of income statement value (net profit) as well as the optimisation of the balance sheet (equity) items.

The DuPont model (Correria *et al.*, 2003) is a financial management technique with the objective to maximise wealth and measures how effectively this objective is achieved. The DuPont equation focusses on ROE as the overall indicator of success, considering three key levers namely Leverage, Activity and Profitability. The ROE formula is shown in the following formula:

$$\begin{aligned} ROE &= L \times A \times P \\ &= \left(\frac{d}{e} + 1 \right) \times \frac{r}{a} \times \frac{p}{r} \end{aligned}$$

Where:

L = Leverage; with variables debt (d) and equity (e)

A = Activity; with variables revenue (r) and net assets (a)

P = Profitability; with variables net profit (p) and revenue (r)

Figure 5 is a graphical representation of the model, which can be explained as follows:

1. **Leverage**, which is the relationship between Debt and Equity in the organisation. Hence the financing of the organisation directly impacts the return of equity holders.

2. **Activity or Asset Turnover**, which is revenue divided by Net Assets. This can be maximised by minimising the investment in assets (such as inventory) and once again improving revenue as mentioned above. The term “sweating the assets” comes to mind.
3. **Profitability**, which is net profit (revenue – variable and fixed expenses) divided by revenue. In simplistic terms, this can be targeted by reducing expenses (fixed and variable) but also by maximising the sales price and product mix. Hence profitability in itself can be maximised by increasing revenue and/or reducing costs.

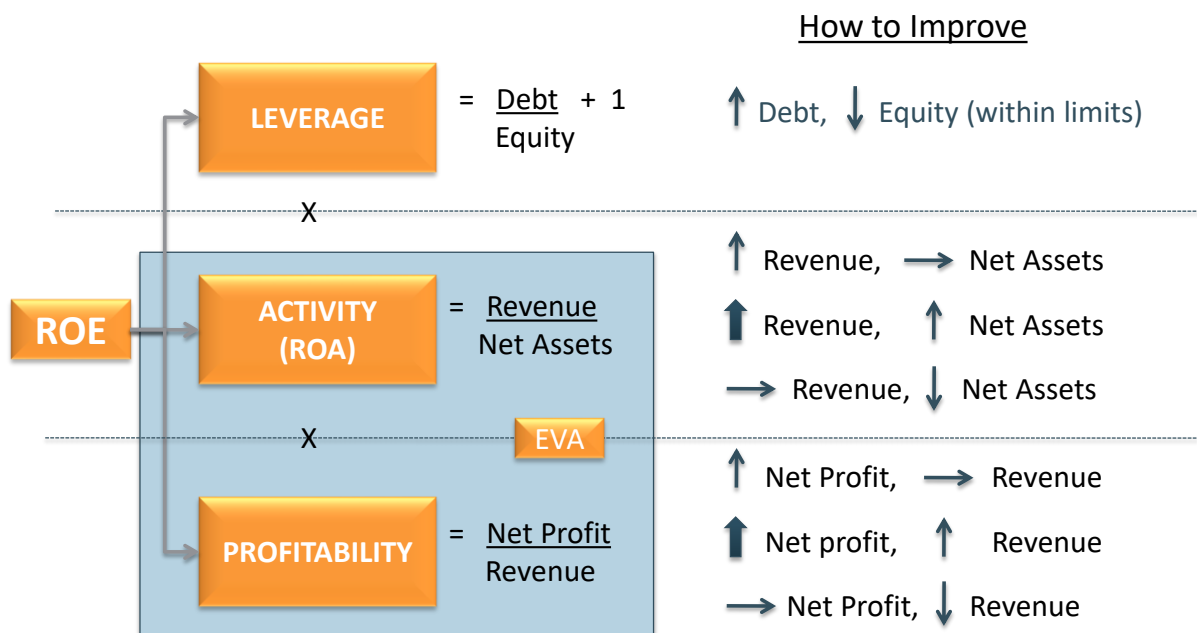


Figure 5: The Du Pont Model

In the context of the scope of this study, the blue highlighted area in Figure 5 would be applicable if one considers outbound logistics. With this reference, the following are important notes:

1. Increased revenue impacts both Profitability and Activity. However only increasing revenue (without increasing profit) will have a zero impact. As discussed in section 2.2, outbound logistics cost is a significant expense which reduces overall profit. Any customer service related business decisions that could impact outbound logistics activities and associated cost should be evaluated in relation to the potential upside in revenue.
2. The ideal is to determine the lowest outbound logistics cost that generates the highest possible revenue, that will overall improve both economic value add (EVA) and ROE.
3. Reduction in cost, specifically outbound logistics, needs to be understood in the context of overall customer service and supply chain objectives. Hence if superior customer

service is an order winner in a specific segment of the market and the cost reduction objective will imply a reduction thereof, then it is obviously not advisable to consider both. The CTS results should therefore be considered in the context of the overall business strategy.

Outbound logistics cost reduces overall profitability, which as discussed, is a key financial measure. However, Hill (2013) argues that businesses still don't have the financial controls to understand the true cost of the product or service they sell, which is required to accurately calculate customer or product profitability. Ryals (2008) mentions that income statements or management accounts are traditionally setup where logistics or distribution cost is reported on an aggregated level in the income statement (also known as the profit and loss account) as an overhead, and not at individual customer level.

Figure 6 depicts an approach to determine customer profitability after allocating all company costs (Christopher 1998, and Ryals 2008), which follows a similar income statement format still relevant today. The "Distribution Service costs" component in the diagram, except for *trade credit* and *order processing*, is the key focus area of this study.

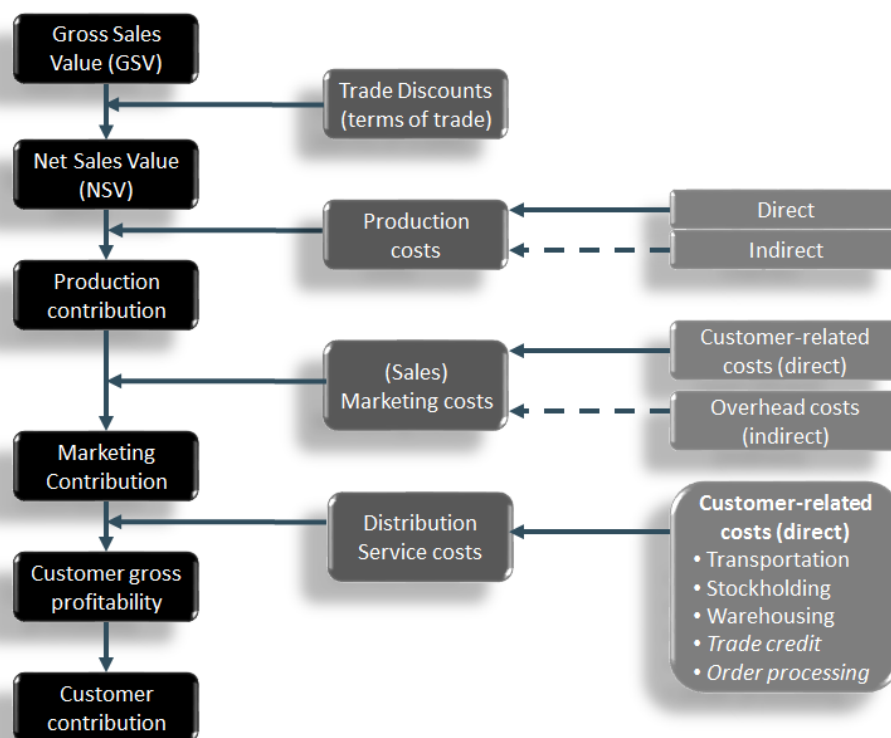


Figure 6: Customer Profitability Analysis

Gross Contribution after Production is generally easy to obtain at company level. To convert from this to customer profitability does however require fair allocation of sales, marketing and logistics costs to customer transactions. As mentioned before the value is not just the overall answer of customer profitability, but also the understanding of what drives the cost. Therefore, alignment between key stakeholders regarding the different cost drivers is vital.

The 80:20 rule is often cited, which is that 80% of sales often come from 20% of customers (Ryals, 2008), therefore implying that it's very likely that FMCG companies are servicing unprofitable customers. All customer service related expenses should be allocated to fully understand the true profitability of individual customers and products. Outbound logistics is a significant customer service expense, and its associated cost drivers should therefore be evaluated and defined as input to the CTS allocation framework.

Pohlen and Coleman (2005) considered a framework in which activity based costing (ABC) is used to quantify the considerations of an economic value added (EVA) analysis in terms of costs. Determining customer profitability considering the activity based costing (ABC) methodology (Schulze et al., 2012; Cooper and Kaplan, 1991; Foster and Gupta, 1994) and the impact on ROE (DuPont analysis) are widely applied in companies (Ye, 2001; Krajnc *et al.*, 2012). ABC can be a useful cost allocation methodology, since it provides a structured approach to measure how products and customers consume logistics resources (Bokor, 2015).

3.2 ACTIVITY BASED COSTING

'Activity Based Costing is a methodology that measures the cost and performance of activities, resources and cost objects, assigns resources to activities and activities to cost objects based on their use, and recognises the causal relationships of cost drivers to activities'

(Thermido, Arantes, Fernandes, and Guedes, 2000:1149)

The ABC methodology has been around since the early 1980s and was first advocated by Harvard Business School Professor Robert S. Kaplan. The concept of activity based costing was designed to solve the distortion problems of traditional costing systems (Cooper *et al.*, 1988). Stapleton *et al.* (2001:585) illustrated that ABC identifies cost pools and assigns it to products or services based on the number of events associated in the process to provide such products or services.

ABC methodologies improved cost accounting for many companies, since it could offer more accurate product cost than traditional accounting systems. Using ABC to assign costs to determine the profitability of customers and products is widely accepted (Foster *et al.*, 1994). Although this costing methodology started out predominantly focussing on manufacturing because of the significant costs involved, La Londe *et al.* (1994), Pirttilä and Petri (1995:327) point out that the methodology can be applied to other fields, including logistics. Since logistics cost is a significant company expense, and usually buried in overheads, ABC is applied more often in logistics to unlock the understanding of these costs (Stapleton *et al.*, 2001:590).

The following is important to understand about ABC (adopted from Thermido *et al.*, 2000:1150):

1. Activities are tasks that consume resources and result in the completion of the product or service. It is therefore important to distinguish between value-adding and non-value adding activities.
2. The cost objective is the final product or service created as a result of the activities mentioned in the previous point.
3. Resources are in essence the “ingredients” necessary to “produce” the goods or service.
4. A cost driver is a variable, with a rational cause and effect relationship between the utilisation of the resource, the performance of activities and final cost objectives.
5. Operational cost drivers, or cause of cost, are those variables that determine the workload and hence explain why activities are performed.

Table 1 and Table 2 summarise the most noteworthy advantages and disadvantages of ABC respectively:

**Table 1:
Advantages of ABC**

#	Advantages	Source
1	It provides a clearer view of business and provides inputs to managing the costs of organisations strategically.	Grundy (1996, 61-62); Griful-Miquela (2001: 135 – 136)
2	ABC analysis will allow a company to evaluate which activities are being performed efficiently, or not. This will allow for re-evaluating which parts need to be improved and also focus attention on getting activities done more efficient.	Stapleton <i>et al.</i> (2001:595 – 596) Wong (2000: 9);
3	ABC provides a clear understanding of where resources are being spent, where customer value is created and where money is lost.	Stapleton <i>et al.</i> (2001:595 – 596); Griful-Miquela (2001: 135 – 136)
4	ABC highlights areas where changes in the operational costs will allow the company to satisfy customer demands better.	Stapleton <i>et al.</i> (2001:595 – 596); Griful-Miquela (2001: 135 – 136)

#	Advantages	Source
5	ABC aids in eliminating non-value adding activities.	Stapleton <i>et al.</i> (2001:595 – 596)
6	ABC provides more accurate product and service costing, especially where non-volume related overheads are significant.	Griful-Miquela (2001: 135 – 136)
7	ABC assists in determining customer and product profitability.	Griful-Miquela (2001: 135 – 136)

**Table 2:
Disadvantages of ABC**

#	Disadvantages	Source
1	ABC is resource consuming and is costly for the firm to adopt as a result of the accounting changes involved.	Stapleton <i>et al.</i> (2001:595 – 596); Griful-Miquela (2001: 135 – 136)
2	ABC is time consuming as a result of the lengthy procedures it entails.	Stapleton <i>et al.</i> (2001:595 – 596); Griful-Miquela (2001: 135 – 136)
3	ABC is not appropriate for every firm and firms with low overhead costs will achieve limited benefits by adopting this.	Stapleton <i>et al.</i> (2001:595 – 596)
4	ABC implementation benefits are not always equal to the costs incurred with the system	Stapleton <i>et al.</i> (2001:595 – 596)
5	The selection of cost drivers could be quite difficult since data needs to be easily obtained, consumption should correlate with the activity and the cost driver needs to induce the correct behaviour.	Cooper (1990) as referred to by Griful-Miquela (2001: 135 – 136)

From the above tables, it is clear that ABC could provide companies with a better understanding of costs and the causal relationship of activities to resource consumption. This understanding leads to better decision making, through the efficient management of activity and associated costs to ultimately improve customer and product profitability. However, applying ABC could be a time and resource consuming exercise. Furthermore, ABC offers little benefit for companies with low overhead costs – which is untrue for the FMCG industry as discussed in Section 1.4 and 3.3. Lastly, the selection of *cost drivers* proves to be difficult for companies. The study should therefore consider the evaluation and selection of cost drivers within outbound logistics, subsequently discussed in Section 3.4.

ABC methodologies measure the cost and performance of products by assigning resourcing cost (cost driver) to activities and therefore recognises that there is a causal relationship of cost drivers to activities (Thermido *et al.*, 2000:1149). The underlying principle of the ABC methodology is therefore the identification of cost drivers for the activity to which it will be applied. The purpose of this study, evaluating the cost drivers for outbound logistics in the FMCG industry to determine the true CTS, has a strong correlation with the ABC methodology (Ryals, 2006). The suitability of ABC is further explored when compared to an alternative costing methodology, called Throughput Accounting.

3.3 THROUGHPUT ACCOUNTING VS. ACTIVITY BASED COSTING

Another philosophy challenging existing cost accounting and productivity improvements is called the Theory of Constraints (TOC), developed by Dr. Eli Goldratt in the early 1980's (Spector, 2006: 45). TOC proposes an alternative accounting structure, called Throughput Accounting (TA) which consists of the following three basic operating measures (Cox & Spencer, 1998: 19; Sheu, Chen & Kovar, 2003: 434; Simatupang, Sridharan, Wright, 2004: 67):

1. Throughput (T), which is the rate at which the system (organisation or supply chain) generates money through sales, in other words, revenue generated through the production of sold products.
2. Inventory (I), which is the money invested in things the system intends to sell. The "value-added" aspect of inventory is not accounted for to eliminate the temptation to overproduce unneeded inventory to simply look good on paper. This includes inventory as well as fixed assets and it is viewed as a liability rather than an asset.
3. Operating expense (OE), which is the money the system spends in turning inventory into sales. This includes direct labour, manufacturing overhead as well as selling and administrative costs.

Like the Du Pont analysis as discussed in section 3.1, Net Profit (NP), Productivity (P), Return on Assets (ROA) and Return on Investment (ROI) are key financial measures, calculated as follows:

$$NP = T - OE$$
$$P = \frac{T}{OE}$$
$$ROA = \frac{(T - OE)}{I}$$
$$ROI = \frac{NP}{I}$$

As with ABC, TA has predominantly been applied to decision making in manufacturing. No research could be found where TA was applied specifically to logistics, likely since the cost of manufacturing is typically higher than that of logistics and that the focus is rather on a scarce resource such as manufacturing (as defined by Simatupang, Sridharan & Wright, 2004).

One of the most fundamental differences between ABC and TA is how each deal with fixed and variable costs. According to Mohr and Fourie (2004: 236) variable costs and fixed costs are defined as follows:

1. Variable cost is defined as cost that changes when the total product volume, level or quantity changes, therefore it corresponds to the cost of variable inputs. It is also referred to as direct costs, prime costs or avoidable costs. In logistics, these costs can be defined as the costs associated with the activity of distribution, and includes costs such as fuel, tyres and toll fees. Labour is generally not a variable cost since the cost is payable even if there is no activity. Hired labour are paid a rate per hour and hired on a day to day basis, required to conduct an activity, may be considered as a variable cost.
2. Fixed cost is defined as a cost that remains constant irrespective of the quantity of output produced. These are therefore the costs incurred when no activity occurs and include overheads, indirect or unavoidable costs. In terms of distribution, fixed costs will be incurred whether the vehicle moves or is stationary. For vehicles this will include depreciation, cost of capital, vehicle licences, insurance, as well as driver and assistant salaries (assuming they are not labour hired on a day to day basis).

As explained previously, ABC splits costs between variable (direct) and fixed (indirect) which is unlike TA, which doesn't see the split as useful or applicable. This is because manufacturing, where TA is mostly applied, is typically considered an indirect or fixed cost (adapted from Dugdale and Jones, 1998:207; Sheu, Chen and Kovar, 2003:436; Simatupang, Sridharan, Wright, 2004: 57 – 70). However, this is not the case for outbound logistics since it does comprise variable costs as described above. For this reason, the ABC is more appropriate for this study and therefore the chosen costing methodology.

As discussed in Section 3.2, ABC requires that cost drivers be defined for each activity in question. Like the ABC methodology, the CTS framework will consider outbound logistics processes and its related activities with associated cost drivers. The steps of identifying the cost drivers and evaluating the causal relationship to activities is an important consideration.

3.4 IDENTIFYING COST DRIVERS

A company needs to clearly define the costs associated with deploying resources/activities within the outbound logistics operation/process and then to ascertain the cost driver behind each activity. This is to ensure accurate and fair allocation to customers and products when calculating the CTS. The following steps are recommended to identify cost drivers for a function or process (inputs from Stapleton, 2001: 586 – 590):

1. Create a process overview of the activities performed. This is important as it identifies all the activities performed in the scope of the function being studied.

2. Obtain data on activities performed, which are also termed “cost drivers”. This includes the quantity and type of activities required to produce/supply in each step of the process.
3. Determine the costs associated with the process, therefore source all the relevant costs (fixed and variable) associated with the process. Attention to detail is important to ensure that all value and non-value adding costs are identified.
4. Allocate costs to each activity or group of activities. It is important that the understanding of costs and activities be sufficient to allow for correct allocation of costs. In many instances, fixed costs will need to be allocated to more than one group of activities and the best available information or best guess should be used to determine which portion of costs is allocated where.
5. Critically evaluate each group of activity. This helps to determine which activities are cost effective, and steps can then be initiated to reduce costs or increase profit. Outsourcing, cutting back or elimination are possibilities of such steps that may be initiated to deal with activities that are cost prohibitive. The implementation of these changes is known as activity based management (ABM). More relevant to this study, this also forms the basis of product/service/customer profitability. By comparing the Gross Contribution spent on these products/services/customers to the allocated costs (as allocated via the CTS framework), companies can determine which product/service/customer is profitable and which is not. This forms the basis of understanding the reasons for profitability or non-profitability and will enable companies to re-focus on increased profitability and underlying cost drivers.

For purposes of this study, the accuracy of ABC is reliant upon understanding the cost of outbound logistics, the activities performed and the associated cost drivers. Table 3 summarises likely cost drivers for the outbound logistics environment, split between warehousing and distribution (Lyly-Yrjänäinen and Paranko, 2001:1; Stapleton *et al.*, 2001:592; Griful-Miquela, 2001:139 – 142):

**Table 3:
Theoretical Outbound Logistics Cost Drivers**

Process	Activity Group	Activities	Cost Drivers
Warehousing	Handling In	Unloading incoming goods	Quantity and packaging (pallets or cases or units)
		Palletise	Quantity and packaging (pallets or cases or units)
		Check incoming goods	Quantity and packaging (pallets or cases or units) as well as the quality of the supplier

		Put away	Quantity and packaging (pallets or cases or units)
	Storage	Storage	Shelf space used
		Replenishment	Quantity
	Handling Out	Picking ⁶	Quantity and packaging (pallets or cases or units) as well as number of visits to the pick location
		Packaging and labelling	Number of orders picked
		Load outgoing goods	Quantity
Distribution	Transport	Delivery to site	Distance and m ² of pallet throughput
		Trucking	Distance and m ² of pallet throughput
		Unloading at customer	Number of consignments and type of consignee
		Sorting	Number of consignments and number of cases/pallets per consignment
	Return	Empty container return	Space and time required
		Collection at consignor location	Distance and number of collections
	Admin	Proof of delivery	Number of consignments
		Invoicing	Number of consignments

The cost drivers summarised in above Table 3 provides a valuable understanding of the cost drivers linked to an activity within a specific outbound logistics process. These cost drivers will be exploited in Chapter 5 as a contributing consideration in the development of the CTS framework.

It is worth noting that the FMCG industry is mostly making use of wooden *pallets* (as mentioned in Table 3), on which product is loaded (Wiggill, 2016). A pallet is “a platform designed to be loaded with packages and moved by forklift” (or other suitable material handling equipment) (APICS, 2017). A pallet would therefore typically contain a number of units or cases of the same or a mix of finished product on the same pallet.

3.5 CONCLUDING REMARKS

Companies still don't have the financial controls to understand the true CTS of the product or service they sell. Costing methodologies, such as ABC and TA, were developed to overcome this challenge. ABC provides a systematic approach to identify activities and considers fixed/variable cost for each process which is an important consideration in this study. However,

⁶ Picking is the “process of withdrawing goods from stock to ship to a distribution warehouse or to a customer (APICS, 2017)

both methodologies are seldom applied to outbound logistics, especially in the South African context.

The contribution of the study is to evaluate the cost drivers within the South African FMCG industry and to design a cost allocation framework to calculate and allocate the true outbound logistics CTS on a customer and product level. The value proposition is for FMCG companies to understand whether all customers and products are making a positive contribution to the company's bottom line and where potential improvement opportunities could be.

The *inter alia* potential benefits of identifying cost drivers and the CTS framework are:

1. A systematic approach to increase profitability;
2. A platform to develop the appropriate route to market strategy;
3. An understanding of drivers (of cost and performance) and their impact (not just their result);
4. An opportunity to increase service levels;
5. A pro-active approach to managing an efficient route to market strategy;
6. An understanding of transactions from a customer rather than internal perspective.

A structured interview process, to deal with current events, was followed to gather relevant information from preselected FMCG companies.

4 MARKET INTERVIEWS

The aim of this chapter is to test the conjectures defined in chapter 1 against the market perception and to enrich the literature review findings. Due to the author's association with Imperial Logistics (the author's employer, Resolve Solution Partners, is a division of Imperial Logistics South Africa Propriety Limited) as well as the sensitivity of the information, only three Fast-Moving Consumer Goods (FMCG) companies were interviewed. It is therefore important to note that the findings from the interviews are not representative of the FMCG industry as a whole, but rather a useful and valuable indication.

4.1 INTRODUCTION

A questionnaire was developed to use as a guideline during interviews to gather information pertaining to the following key questions:

1. Do current accounting systems and reporting techniques provide sufficient insight into true logistics cost on a product and customer level?
2. What are the cost drivers of outbound logistics activities in the FMCG industry?
3. What are the potential benefits of designing an outbound logistics CTS framework?

This questionnaire was divided into five main sections;

- The first two sections provide limited detail of the respondents' role within the FMCG company and the company itself. This is to ensure that the feedback is relevant and meaningful to the purpose and scope of the study.
- The third section tested the respondents' experience with current accounting systems and reporting techniques used within the company, and possible benefits or limitations thereof.
- The fourth section tested the respondents' view whether an outbound logistics CTS framework, by evaluating cost drivers and allocation logic, can be value adding to the company. Any limitations of such framework were prompted, followed by discussing each outbound logistics process namely (i) primary distribution, (ii) warehousing/storage, and (iii) secondary distribution. The following key aspects were addressed in the questions for each respective process:
 - a. What the key performance indicators (KPIs) are and why;
 - b. Whether it's straightforward to ring-fence the operating cost associated to the process;
 - c. What the typical cost components are;
 - d. Identifying the key operational activities that drives the cost components.

- The fifth section inquired whether other activities should be included in future studies, and lastly if there's any other considerations or remarks regarding the research.

4.2 INTERVIEW RESULTS

The interview results are summarised in this section. Since the interviews were restricted to three FMCG companies, the results are tabled for all three respondents representing their respective companies.

4.2.1 Respondents

To ensure a common understanding, all respondents were briefed on the purpose of this research study and all supply chain definitions were agreed upon to ensure a comparable outcome. This was achieved through verbal discussion and clarification making use of an introduction page and diagrams to illustrate the research scope and logistics terminology as used in the questionnaire and in this research report.

Table 4 provides information about the respondents' position and division within in the FMCG company, who has partaken in the interviews. The respondents had a detailed understanding of their respective company's outbound logistics operations and financial mechanisms to respond appropriately to the questions posed.

**Table 4:
Market Interview: Respondents**

Company	Respondent 1	Respondent 2	Respondent 3
Division	Supply Chain Development	Planning & Logistics	Supply Chain
Position	Manager: Network Development	Manager	Executive

4.2.2 Company Overview – Supply Chain Focused

Supply chains likely differ between FMCG companies and even in the company itself (mainly due to different product origins). The purpose of this section is to get a basic understanding of the outbound logistics network of each company, and to understand how this should be incorporated into the final CTS framework solution. Table 5 provides an overview of the company's supply chain.

**Table 5:
Market Interview: Company Overview**

Question	Respondent 1	Respondent 2	Respondent 3
Is your company in the FMCG industry?	Yes	Yes	Yes
Do you outsource any of the following to Logistics Service Provider(s)?			
a) Primary distribution	Partially	Yes	Partially
	i. Long distance outsourced ii. Short distance insourced	No comment	Hybrid model of primary fleet (both owned and outsourced)
b) FG warehousing at manufacturing sites	No	No	Yes
c) Other FG warehousing in the network	Partially	Yes	Yes
	i. Main warehousing facilities are owned ii. Overflow facilities are rented	No comment	No comment
d) Secondary distribution	Partially	Partially	Partially
	i. Own secondary distribution function ii. Some outlying regions are outsourced to distributors	Make use of own fleet for larger deliveries, and agents for smaller deliveries in remote areas.	Making use of own fleet and distributors in outlying areas.

All the FMCG companies acknowledged that all the outbound logistic processes, as defined in the scope of the study, are applicable to their supply chain. The respective processes could however be owned and executed by the company itself or fully/partially outsourced to a logistics service provider (LSP). The difference between own versus outsourced operations, for each respective process, will need to be considered when defining the cost driver(s) and allocation thereof.

4.2.3 Accounting Procedures

Companies make use of different accounting systems and financial reporting. The aim of this section is to ascertain whether current reports provide sufficient insight to make accurate and appropriate business and logistics decisions. The key consideration of this section is to test whether the contribution of this study will add value to the company, and the FMCG industry. Table 6 summarises the responses.

**Table 6:
Market Interview: Accounting Procedures**

Question	Respondent 1	Respondent 2	Respondent 3
Is understanding the true logistics CTS (to ultimately measure product profitability) important to the company? Why?	Yes	Yes	Yes
	<ul style="list-style-type: none"> i. CTS and profitability assessments could inform discontinuation of products (and the need of new products). ii. Profitability assessments must include outbound logistics cost. 	Product profile review as part of S&OP to rationalise products	To understand whether a customer or product attracts more cost than the actual margin made.
Is measuring customer profitability important to the company? Why?	Yes	Yes	Yes
	<ul style="list-style-type: none"> i. Current internal measurement inaccurate, since it doesn't take all logistics cost into account. ii. Measuring profitability needs to be based on a dynamic/ updateable model. 	Very volume focused, sometimes at a loss. Price should be the same to all customers to ensure fair dealing.	To determine whether making a delivery (and the associated logistics cost) to a customer is worth doing so from a financial perspective.
Does the company's existing accounting procedures allocate outbound logistics cost to <i>products</i> ?	Yes	No	No
	High-level view. The most accurate way to allocate cost to customers remains a challenge.	<ul style="list-style-type: none"> i. In discussions with finance department. ii. Currently takes the full bucket of logistics cost and divide by all products (every product is therefore treated the same). This is incorrect. 	No comment
Does the company's existing accounting procedures allocate outbound logistics cost to <i>customers</i> ?	Yes	No	No
	High-level view. The most accurate way to allocate cost to customers remains a challenge.	Similar approach than allocating cost to products (previous answer)	No comment

Do you believe that the outbound logistics cost drivers are well defined to allocate activity and cost fairly to different products or customers?	No	No	No
	<ul style="list-style-type: none"> i. The company has a good understanding of costs, but it's poorly allocated to customers/products. ii. Secondary distribution cost seems to be the most complex allocation. 	Not a thorough understanding of cost drivers. All logistics costs are bucketed and not allocated correctly	It would be a great advantage if everyone with the company had a common understanding of cost drivers to shape behaviour/decisions.
Other shortcomings from the company's accounting procedures or reports?	Partially	Yes	Yes
	<ul style="list-style-type: none"> i. Logistics costs are "bundled" and sometimes difficult to split out. ii. Various internal manual reports/spreadsheets. iii. The accounting procedures (for cost allocation) are not agreed/formalised. iv. Improvement is required to get value out of the reports. 	Insufficient reports to understand the actual CTS of customers or products.	Pricing updates trends
Are you aware of any existing logistics cost-to-serve models implemented by FMCG companies?	Partially	No	No
	Aware of companies attempting to allocate cost, but believe they experience similar challenges.	No comment	No comment

All respondents agreed that the outbound logistics cost-to-serve (CTS) on both customer and product level is an important consideration, and that current financial systems do not adequately meet this requirement. The CTS is an important input to understand customer and product profitability and common understanding of cost drivers within an organisation could drive the right behaviour and decisions. Notably all respondents agreed that the cost drivers for outbound logistics processes aren't well defined, which is a key prerequisite to develop a CTS framework on a customer and product level.

4.2.4 Outbound Logistics Cost-to-Serve and Cost Drivers

Table 7 lists the responses to determine whether identifying the outbound logistics cost drivers (and the allocation thereof) will add value to the company and if any limitation could be foreseen.

Table 7:
Market Interview: Outbound Logistics CTS

Question	Respondent 1	Respondent 2	Respondent 3
	Yes	Yes	Yes
Will an outbound logistics cost-to-serve methodology, by identifying cost drivers and allocation logic, be value adding to the company?	Providing logistics services to other companies (principals) as well. The methodology might assist to understand the actual cost for the company and its principals.	<ul style="list-style-type: none"> i. Don't understand the true CTS on product/customer level. ii. Will aid in product pricing to customers. iii. Is it worth to service some customers? Or what service (distribution model) is sufficient. 	<ul style="list-style-type: none"> i. Definite need to identify unprofitable customers and ii. Accurate allocation on product level will highlight if cross-subsidising occurs
	Possibly	Possibly	Possibly
Any limitations or reasons why such a methodology cannot work?	Concerned that even a generic methodology might still require some customisation.	Agree that a methodology could work, but finance likes simplicity. The model might introduce some complexity in accounting principles.	Different perspective of definitions.

All the respondents agreed that a CTS framework would add value to the company. It is however noted that the CTS framework might need some level of customisation to reflect the company's outbound logistics realities and that keeping the framework simple is important. The outbound logistics processes, namely Primary Distribution, Warehousing/Storage and Secondary Distribution, were discussed to understand the realities of each company. The discussion also specifically focused on the availability of costing information and the identification of activities that drives the cost (cost driver) for each respective outbound logistics process was encouraged. This is an important consideration to understand the availability of data and to select cost drivers that will inform the CTS framework.

4.2.5 Primary Distribution

Table 8 lists the key performance indicators (KPIs), cost components and the activities that drives the cost components relating to the primary distribution process.

**Table 8:
Market Interview: Primary Distribution**

Question	Respondent 1	Respondent 2	Respondent 3
What key performance indicators (KPIs) do you measure?	i. Vehicle utilization (volumetric and weight) ii. Fixed and variable cost	None	Cost per ton
Is it easy to ring-fence primary distribution cost?	Yes	Yes	Yes
What are the typical cost components in primary distribution?	<u>Own fleet:</u> i. Fixed cost: <ul style="list-style-type: none"> • Vehicle drivers • Depreciation • Insurance ii. Variable cost: <ul style="list-style-type: none"> • Fuel • Tyres • Lubrication • Maintenance <u>Outsourced transport:</u> i. Lane ⁷ rate (fixed and variable)	i. Fixed & Variable costs ii. Utilization of vehicle – impacting fixed cost iii. Warehouse loading/offloading efficiency (to turnaround a vehicle to potentially reduce fixed cost)	i. Vehicle ii. People (labour) iii. Fuel
What is the key operational activity that drives each of the cost components?	i. Challenge is to load vehicles as full as possible ii. The number of network nodes (source and demand points)	Utilization of the vehicle drives the number of trips achieved (and even carbon emissions).	i. Kilometres travelled ii. People and asset management iii. Vehicle utilization

All the respondents agreed that primary distribution cost can be ringfenced and are aligned to the cost components and associated activities. Owned versus outsourced operations are realities and were understood from the company’s point of view. The CTS framework should therefore acknowledge that the cost allocation of own versus outsourced operations may differ.

4.2.6 Warehousing / Storage

Table 9 lists the key performance indicators (KPIs), cost components and the activities that drive the cost components relating to the warehousing/storage process.

⁷ A “lane” in this case refers to a from-to between two locations (e.g. Johannesburg to Cape Town)

**Table 9:
Market Interview: Warehousing**

Question	Respondent 1	Respondent 2	Respondent 3
What KPIs do you measure?	i. R/kg ii. Stock losses % iii. Storage space utilisation % iv. Throughput (kg) v. Customer Service (ordered vs. picked) vi. Stock accuracy (system focus)	i. Picking – case fill rates ii. Material Handling Equipment (MHE) utilization and efficiency iii. People utilization and efficiency	i. In-full ii. Returns iii. Cost per ton
Is it easy to ring-fence warehousing cost?	Yes	Yes	Yes
What are the typical cost components in warehousing?	i. Employees – variable cost ii. Utility – fixed cost iii. Maintenance – fixed cost iv. Depreciation – fixed cost v. Lease/rental – fixed cost vi. Material Handling Equipment (MHE) – variable cost	i. Building – lease (rates and taxes and margin) ii. Variable cost – electricity, gas and diesel (for MHE) iii. People – fixed cost (hours) iv. Part time labour – variable cost	i. Building / lease – fixed cost ii. People – variable cost iii. MHE – variable cost iv. Losses – variable cost
What is the key operational activity that drives each of the cost components?	i. Throughput ii. Number of vehicles received/ dispatched iii. Full pallet vs. fine picking iv. Balancing of workload (people)	People (fixed and flex staff) – throughput efficiency	Planning of warehouse activities to drive effectiveness and efficiency (people and MHE)

The respondents agreed that warehousing cost can be ring-fenced. Notably the cost components can be split between:

- Variable costs: operational handling activities, executed by people and MHE, are directly related to the volume throughput.
- Fixed costs: All building related expenses (lease, utility, maintenance etc) to store the product, unrelated to throughput handling.

4.2.7 Secondary Distribution

Table 10 lists the key performance indicators (KPIs), cost components and the activities that drive the cost components relating to the secondary distribution process.

**Table 10:
Market Interview: Secondary Distribution**

Question	Respondent 1	Respondent 2	Respondent 3
What KPIs do you measure?	<ul style="list-style-type: none"> i. R/kg ii. Delivery turnaround time iii. Vehicle utilisation (weight) iv. Deliveries per vehicle per day v. Number of multiple trips per vehicle per day vi. Planned deliveries vs. actual deliveries 	<ul style="list-style-type: none"> i. Order vs. pick vs. invoice quantity ii. Proof of Delivery (POD) iii. Kg per delivery – minimum order quantity (MOQ) 	<ul style="list-style-type: none"> i. In-full ii. Cost per ton
Is it easy to ring-fence secondary distribution cost?	Yes	Yes	Yes
What are the typical cost components in secondary distribution?	<ul style="list-style-type: none"> i. Fixed cost: <ul style="list-style-type: none"> • Vehicle Drivers and Assistants • Vehicle Lease ii. Variable cost: <ul style="list-style-type: none"> • Fuel • Tyres • Lubrication • Maintenance 	<ul style="list-style-type: none"> i. Rate card (for outsourced fleet), ii. Split between fixed and variable cost for own fleet 	<ul style="list-style-type: none"> i. Vehicle / rental ii. People iii. Fuel
What is the key operational activity that drives each of the cost components?	<ul style="list-style-type: none"> i. Turnaround time per delivery ii. Number of deliveries iii. Delivery size iv. Distance (km) travelled 	<ul style="list-style-type: none"> i. Load utilization ii. Number of deliveries iii. Turn-around-times is very important – sweating the assets. 	<ul style="list-style-type: none"> i. Actual vs. planned delivery routes (deliveries & time) ii. Kilometres travelled

All the respondents agreed that secondary distribution cost can be isolated and are aligned on the cost components. The activities that drive the cost can be summarised as maximising time utilization, which is a function of number of deliveries and delivery size, whilst minimising distance travelled.

The questionnaire primarily focussed on the outbound logistics processes as defined in the research scope. However, a closing section was included in the questionnaire to ascertain whether other logistics activities or supply chain costs should be included in future studies (with the aim to expand the CTS framework). The respondents were also given the opportunity to provide any further remarks or considerations concerning the research that may have been omitted in the previous questions.

4.2.8 Closing

Table 11 summarises the responses to closing interview questions.

**Table 11:
Market Interview: Closing**

Question	Respondent 1	Respondent 2	Respondent 3
	Yes	Yes	No
Are there any other logistics activities and/or costs that should be included in future studies?	i. Source of products (inbound logistics) ii. Manufacturing costs	i. Inbound logistics ii. Manufacturing This will provide a holistic view of product cost to inform pricing decisions.	This study is a good start.
Any other remarks/considerations (not covered in the previous questions) regarding the study?	No	No	No

Worth noting is that the respondents suggested that the scope of the research could be extended in future studies to include other supply chain functions, for example inbound logistics and manufacturing. No further remarks or considerations were received from the respondents.

4.3 CONCLUDING REMARKS

This chapter summarised the responses of interviews conducted with three FMCG company representatives. Although the market interviews are likely not a representative sample of the FMCG industry, it is assumed that the responses obtained are adequate to give sufficient guidance to this study. The author strongly believes that the responses will be very similar should more FMCG companies have been engaged, based on the author's professional experience and informal discussions with interested parties.

The following is evident from the interviews:

1. Current accounting procedures provide insufficient detail of the true CTS on customer or product level. At best all customers and products are treated equally when allocating costs on a high-level, which is not a true reflection of the actual logistics CTS.
2. Understanding the outbound logistics cost drivers and true CTS on a customer and product level will provide significant insight, for example:
 - a. Customer and product margin contribution (profitability) can be calculated to decide which customers and products to retain;
 - b. Could serve as an input to tactical planning processes, i.e. Sales & Operations Planning;

- c. Could inform product pricing;
 - d. Understanding the logistics cost associated to service levels;
 - e. Common understanding within the organisation will drive the correct behaviour and business decisions.
3. The operating cost of the outbound logistics processes is easy to ring-fence. However, the cost driver(s) of each of these processes is currently not well understood in order to aptly allocate costs on a customer and product level.
4. Outsourcing of logistics services are still prevalent and worth noting that the cost drivers will likely differ between in-house versus outsourced logistics activities, mainly due to the charge model agreed with the LSP.
5. The interviews confirmed that it is possible to define a generic list of cost drivers for each outbound logistics activity that could be representative of the FMCG industry.
6. Other supply chain functions, e.g. inbound logistics, manufacturing and trading activities, can be included in future studies to provide a holistic view of the total supply chain CTS. Although not mentioned during the interviews, the impact of the increasing trend of e-commerce (e.g. home shopping and deliveries) will also be worth considering. The outbound logistics CTS framework, considering the scope of this study, could therefore be elaborated to include additional supply chain functions and markets.

The following chapter synthesises the findings gathered from the interviews and the literature study that evaluated and defined the activities and associated cost drivers for each respective outbound logistics process. The activities and defined cost drivers will then serve as input to ultimately design a CTS framework that can be applied by the FMCG industry.

5 COST DRIVER FRAMEWORK DEVELOPMENT

5.1 INTRODUCTION

The accurate calculation of the cost-to-serve (CTS) on both customer and product level has become critically important to a business' survival, and even small costing disparities (or cross-subsidising) can have an overwhelming impact on whether a company survives over the long term.

Activity based costing (ABC) is a costing methodology that identifies activities in a process and assigns the cost of each activity resource to all products and services according to the actual consumption by each. Its application can therefore be used to understand the outbound logistics CTS on customers and product level. Although ABC is well known, the activities and cost drivers for outbound logistics in the South African Fast-Moving Consumer Goods (FMCG) industry are not well defined.

The aim is to therefore identify cost drivers that can be applied uniformly, mainly in the FMCG industry, which includes the definitions of fixed and variable cost and cost drivers for each outbound logistics process and associated activities. To move from conventional financial reporting to a method of calculating the true CTS requires fair and detailed allocation of all logistics operating costs. Based on the discussion thus far, the following is of importance:

1. Separation of fixed and variable costs per activity;
2. Allocation of fixed and variable costs to the correct cost drivers.

5.2 IDENTIFICATION OF THE COST DRIVERS

As discussed in Chapter 3 (section 3.4), the method to identify cost drivers is a step-by-step approach. This section focusses on the key processes of outbound logistics (namely primary distribution, warehousing and secondary distribution as part of the scope of this study), the activity/activities associated to the process, and the underlying cost driver(s) for each respective activity. The recommended cost drivers, activity data and cost components are an amalgamation of the literature study and market interview responses. The activity data measures the magnitude of a cost driver and the associated cost. For example; if the cost driver is *pallets*, then *number of pallets* is required as activity data to determine the rate of the cost driver within the activity. The cost to execute the activity is also part of activity data.

5.2.1 Primary Distribution

Table 12 provides a description of the cost driver, activity data, cost components and CTS outputs for the primary distribution process.

**Table 12:
Primary Distribution Cost Drivers**

Primary Distribution			
This is the activity of transporting products from manufacturing sites to storage locations, or in-between storage locations. The product is typically moved in full pallet quantities and the distribution capacity is constrained by the number of pallets per load. The volume of pallets to be transported determines the number of primary distribution loads and resultant operating costs.			
Cost Driver	Activity Data	Cost Components	Output
Pallets	i. Actual pallets transported ii. Primary transport cost	<u>Own fleet:</u> i. Fixed cost, <i>inter alia</i> : <ul style="list-style-type: none"> • Vehicle drivers • Depreciation or Lease amount • Insurance ii. Variable cost, <i>inter alia</i> : <ul style="list-style-type: none"> • Fuel • Tyres • Lubrication • Maintenance <u>Outsourced transport:</u> Transport rate (could be expressed as a R/lane, R/pallet, R/kg etc.)	R/pallet

5.2.2 Warehousing

The warehouse cost allocation is based on the principle that different activities within the warehouse attract different costs and has dissimilar cost drivers. Warehousing is therefore split into three main activities, namely (i) Handling-In, (ii) Storage and (iii) Handling-Out. Table 13 provides a description of the cost driver, activity data, cost components and CTS outputs for each respective warehousing activity.

**Table 13:
Warehousing Cost Drivers**

Warehouse Activity: Handling-In			
The activity of receiving product at the warehouse and moving the product to storage. The product is usually delivered in full pallet quantities. The handling workload is therefore a function of the number of pallets received.			
Cost Driver	Activity Data	Cost Components	Output
Pallets	i. Number of pallets received ii. Handling-In operating cost	Partial inclusion of: <ul style="list-style-type: none"> i. Material handling equipment (MHE) as a fixed cost. ii. People/labour (permanent is fixed cost and hired is a variable cost) 	R/pallet
Warehouse Activity: Storage			
The activity of storing the product. Generally, the costs associated with storage is fixed and constraint by the number of pallet positions available for storing products. The storage capacity is a function of the number of pallets that can be stored within the available floor space. Often pallets are stacked on			

top of each to increase the pallet storage capacity per square meter of floor space. The stacking height per SKU will be required to calculate the resultant floor space utilisation on a SKU level, called “adjusted stock on hand”. Adjusted stock on hand is calculated by dividing the stock on hand with the stacking height. In the case where stacking is not applicable (e.g. when a warehouse is fully racked), then the stacking height can be set to one to ensure that all SKUs are treated equally.			
Cost Driver	Activity Data	Cost Components	Output
Pallets stored	i. Storage capacity (Pallets) ii. Stacking height per SKU iii. Stock on hand (Pallets)	All fixed cost relating to the storage facility (building, municipal services, management etc.)	R/pallet/SKU
Warehouse Activity: Handling-Out			
The activity of picking, moving the product to the dispatch bay and loading of the vehicles. The product picked and loaded could either be in full pallets or part-pallet (known as break bulk).			
Cost Driver	Activity Data	Cost Components	Output
Full Pallet and break-bulk picking	i. Picking and loading volumes – split between full and break pallets ii. Handling-Out operating cost	Partial inclusion of: i. MHE as a variable cost ii. People/labour (permanent is a fixed cost and hired is a variable cost)	R/pallet/SKU

5.2.3 Secondary Distribution

Table 14 provides a description of the cost drivers, activity data, cost components and CTS outputs for the secondary distribution process.

**Table 14:
Secondary Distribution Cost Drivers**

Secondary Distribution			
The activity whereby a loaded vehicle delivers to the end customer. Generally a vehicle performs multiple deliveries on a route. This activity has two key constraints, namely (i) distance travelled to the customer and (ii) the turn-around-time at the customer to make the delivery.			
Cost Driver	Activity Data	Cost Components	Output
i. Customer’s distance (kilometres) from the facility ii. Delivery turn-around-time at the customer iii. Number of deliveries	i. Number of deliveries. ii. Volume (e.g. pallets) delivered iii. Secondary Transport Cost	<u>Own fleet:</u> i. Fixed cost, inter alia: • Vehicle drivers and assistants • Lease and/or depreciation ii. Variable cost: • Fuel • Tyres • Lubrication • Maintenance <u>Outsourced Fleet:</u> Delivery rate (e.g. R/ton, R/pallet or R/delivery)	R/pallet

5.3 CTS FRAMEWORK: COST DRIVERS AND ALLOCATION

This section describes a cost allocation framework for each outbound logistics processes, based on the identified cost drivers for each activity discussed in the previous section. The framework details the variables and calculation formulas for each respective activity. The distinctive variables for each activity consist out of three main components:

1. Activity information: data about the activity occurrence (e.g. number of trips)
2. Quantity: the quantity (e.g. pallets) managed during the activity
3. Cost: the cost to perform the activity (e.g. Rand per trip)

5.3.1 Primary Distribution

Table 15 suggests a cost allocation framework for the primary distribution process.

**Table 15:
Primary Distribution Cost Allocation Framework**

Primary Distribution				
Owner-ship	Cost Driver	Activity Variables	Calculation	Output
Outsourced Fleet	Pallets / kg / volume transported (depending on charge model)	Example: <ul style="list-style-type: none"> • PP = total pallets transported per lane • T = number of Trips per lane • Rp = lane rate (Rands) • CPP = cost per pallet 	$CPP = \frac{(T \times Rp)}{PP}$	R/Pallet
Inourced / Own Fleet	Number of trips	<ul style="list-style-type: none"> • TATp = turnaround time at delivery location • TA = total TAT time for all trips • dp = distance (km) between dispatch and receiving nodes • dTp = total distance for all trips • Sp = average travel speed between nodes (km/h) • T = number of trips between nodes • PP = total pallets transported per lane • Fp = fixed cost • Vp = variable Cost • Xp = time ratio per node • FL = fixed cost per lane • VL = variable cost per lane • FLP = fixed cost per pallet per lane • VLP = variable cost per pallet per lane • TLP = total cost per pallet per lane 	<p><u>Fixed cost per lane:</u></p> $Xp = \left(\frac{(TATp + \left(\frac{d}{Sp}\right)) \times T}{(TA)} \right)$ <p>Then;</p> $FL = X \times Fp$ <p>Then;</p> $FLP = \frac{FL}{PP}$ <p><u>Variable cost per lane:</u></p> $VL = \left(\frac{dp \times T}{dTp} \right) \times Vp$ <p>Then;</p> $VLP = \frac{VL}{PP}$ <p><u>Total cost per lane:</u></p> $TLP = FLP + VLP$	% Rand R/Pallet Rand R/Pallet

5.3.2 Warehousing

Table 16 gives a breakdown of each of the activities costed and provides the calculation that will be applied to allocate warehousing cost per depot per SKU for each activity.

**Table 16:
Warehousing Cost Allocation Framework**

Activity	Cost Driver	Activity Variables	Calculation	Output
Handling-In	Pallets	<ul style="list-style-type: none"> PI = pallets received HIVC = Handling-in variable cost HIFC = Handling-in fixed cost HIVCP = Handling-in variable cost per pallet HIFCP = Handling-in fixed cost per pallet HITCP = handling-in total cost per pallet 	$HIVCP = \frac{HIVC}{PI}$ $HIFCP = \frac{HIFC}{PI}$ Then; $HITCP = HIVCP + HIFCP$	R/Pallet/SKU R/Pallet/SKU R/Pallet/SKU
Storage	Pallets	<ul style="list-style-type: none"> SOH = average pallets stock on hand per SKU in location H = stacking height per SKU SC = storage cost ASOH = Adjusted stock on hand (n = number of SKUs) TSOH = total adjusted SOH for all SKUs n = number of SKUs SCP = storage cost per pallet per SKU 	$ASOH = \frac{SOH}{H}$ Then; $TSOH = \sum_1^n ASOH$ Then; $SCP = \frac{ASOH}{TSOH} * SC$	Pallets/SKU Pallets R/Pallet/SKU
Handling-Out	Pallets (or equivalent unit) picked for dispatch	<ul style="list-style-type: none"> PO = pallets picked/loaded HOVC = Handling-out variable cost HOFC = Handling-out fixed cost HOVCP = Handling-out variable cost per pallet HOFCP = Handling-out fixed cost per pallet HOTCP = handling-in total cost per pallet 	$HOVCP = \frac{HOVC}{PO}$ $HOFCP = \frac{HOFC}{PO}$ Then; $HOTCP = HOVCP + HOFCP$	R/Pallet/SKU R/Pallet/SKU R/Pallet/SKU

5.3.3 Secondary Distribution

Secondary distribution cost is allocated per SKU per customer on a fixed and variable basis to account for vehicle operating (including labour) costs. The cost drivers for:

- Fixed costs are allocated per customer by apportioning the cost based on Turnaround Time (TAT) and time travelled (distance from depot divided by travelling speed).
- Variable costs are allocated per customer based on the distance from the depot.

Table 17 gives a breakdown of the costs and provides the calculation that will be applied to allocate secondary distribution cost per SKU per customer.

**Table 17:
Secondary Distribution Cost Allocation Framework**

Ownership	Cost Driver	Activity Variables	Calculation	Output
Outsourced Fleet	Pallets / kg / volume / deliveries (charge model dependant)	<p>Example:</p> <ul style="list-style-type: none"> PS = total pallets (or equivalent) delivered to customer D = number of deliveries to customer Rs = rate charged (e.g. Rand/delivery) TDC = total delivery cost 	$TDC = \frac{(D \times Rs)}{PS}$	R/Pallet/customer
Insourced / Own Fleet	Number of Deliveries	<ul style="list-style-type: none"> TATs = average turnaround time (TAT) at customer TTAT = total TAT time for all deliveries ds = distance from dispatch point to customer (km) dTs = total distance for all deliveries Ss = average travel speed to customer (km/h) PS = pallets (or equivalent) delivered to customer D = number of deliveries to customer Fs = fixed cost Vs = variable cost Xs = time ratio allocated per customer FC = fixed cost per customer VC = variable cost per customer FCP = fixed cost per pallet per lane VCP = variable cost per pallet per lane TCP = total cost per pallet per lane 	<p><u>Fixed cost per customer:</u></p> $Xs = \left(\frac{\left(TATs + \left(\frac{ds}{Ss} \right) \right) \times D}{(TTAT)} \right)$ <p>Then;</p> $FC = X \times Fs$ <p>Then;</p> $FCP = \frac{FC}{PS}$ <p><u>Variable cost per customer:</u></p> $VC = \left(\frac{d \times D}{dT_s} \right) \times Vs$ <p>Then;</p> $VCP = \frac{VC}{PS} = R/pallet$ <p>Then;</p> $TCP = FCP + VCP$	<p>%</p> <p>Rand/customer</p> <p>R/Pallet/Customer</p> <p>Rand</p> <p>R/pallet/customer</p> <p>R/Pallet/customer</p>

5.3.4 Consolidated View

Each outbound logistics process and related activity or activities can be translated to Rand per pallet per customer. This is based on the premise that as the finished product physically moves along the supply chain from origin to the final storage location (before being sold), it will attract

cost since it consumes resources as defined by the cost driver. The reality is that the final product attracts logistics costs before being sold to a customer, which implies that the total CTS can only be allocated on a customer level once the product has been delivered (or collected by the customer). *Primary Distribution*, *Warehouse Handling-In* and *Warehouse Storage* activities are typical examples of outbound logistics processes that attract cost prior to the product being sold. *Warehouse Handling-Out* and *Secondary Distribution* activities are triggered once a customer order is received to prepare and deliver the product.

Table 18 illustrates the cost allocation unit of measure for each outbound logistics process on a customer and product level. The principle is illustrated, as part of the validation step, in chapter 6.

**Table 18:
Consolidated Cost Allocation Outcome**

Logistics Process	Customer Level	Product Level
Primary Distribution	R/pallet (similar for all SKUs on the same transport lane)	
Warehouse: Handling-In	R/pallet (similar for all SKUs at the same warehouse)	
Warehouse: Storage	R/pallet (different per SKUs due to inventory levels and storage or stacking configuration)	
Warehouse: Handling-Out	R/pallet (similar for all SKUs at the same warehouse)	
Secondary Distribution	R/pallet (differs between customers)	R/pallet (similar for all SKUs at the same customer)
TOTAL CTS	R/pallet/customer	R/pallet/SKU

The total logistics CTS R/pallet on SKU level can also be expressed as R/case for the same SKU. For example, if the total logistics R/pallet for an SKU is R1,000 and one pallet contains 20 cases, then the R/case will be R50. Since the number of cases per pallet typically differs between products/SKUs, the R/case will therefore be distinct for each SKU. The R/case can then be compared to the sales value per case, on SKU level, to for example calculate the CTS as a percentage of sales value. Continuing with the example; if the sales value is R100/case and the logistics CTS is R50/case then it implies that the CTS as a percentage of sales value is 50%. Incorporating all other product costs (e.g. production costs) will allow a company to calculate the marginal contribution or profitability on SKU and customer level.

Applying the CTS framework inherently requires the gathering of data to prepare the variables used in the calculation formulas. Section 5.4 elaborates on the types of data, level of detail considering the modelling complexity and time period considerations.

5.4 DATA COLLECTION

The cost drivers, inputs and cost components described in the previous section intrinsically require a business to collect data on some level of detail. An individual undertaking CTS modelling should have strong analytical skills with a comprehensive understanding of financial statements and supply chain processes (specifically outbound logistics) to gather the correct data or make assumptions if required.

Based on the suggested CTS framework, Figure 7 provides a high-level overview of the data requirements that aligns with the cost drivers discussed in the previous section. The data is typically divided into two categories, namely:

- Master Data; containing information *inter alia* about customers, products and warehouses.
- Transactional Data; containing the information of the physical product flow in the network (whether internally or deliveries to customers) as well as the associated operating cost.

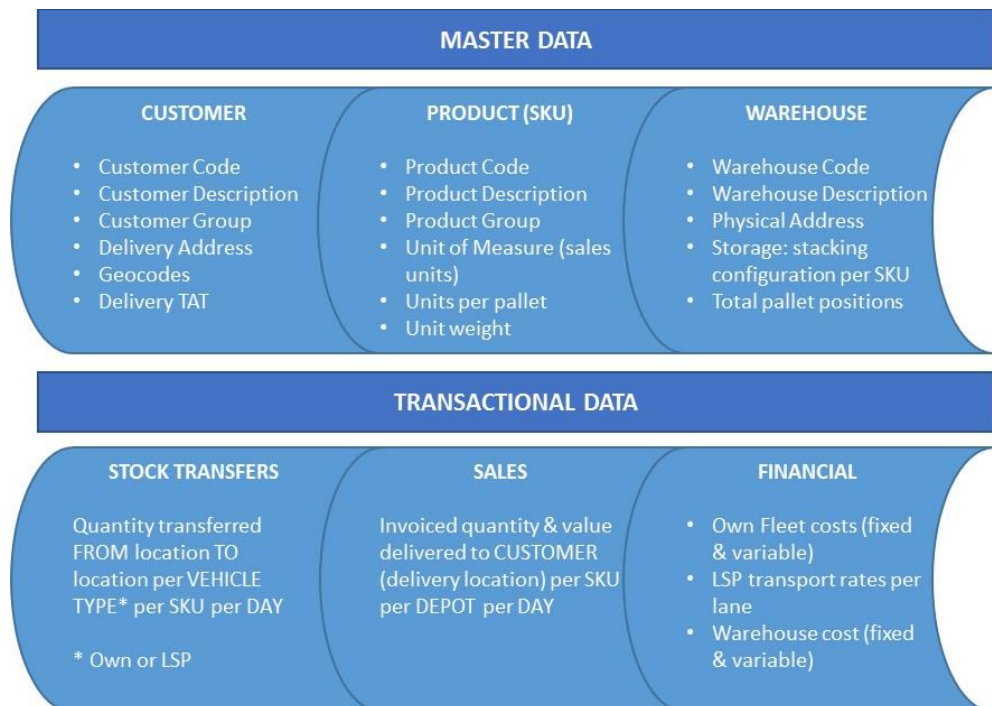


Figure 7: Data Collection

The size and complexity of the CTS modelling can vary from relatively simple for a model built on customer account and product group level, to quite complex for a model built on a SKU and customer level. The complexity of the outbound logistics network (influenced by the number of supply nodes and warehouses, double handling, number of customers etc.) will also have an influence on the size and complexity of the CTS analysis.

The suggested CTS framework can be applied at varying levels of sophistication; from simple spreadsheets (e.g. MS Excel®) to advanced relational databases storing the data and performing the calculations. The decision of analytical tool(s) should be based on the particular circumstances of the company in terms of both the complexity of the business, level of detail required in terms of the analysis, availability of data and the type of decision support required from the outcomes.

Lastly, the time period for which the data will be gathered should be decided. It's recommended that a company analyses a full year of data to ensure that the outcomes are representative in terms of outbound logistics activities affected by product seasonality (which is a familiar characteristic of the FMCG industry). A longer time period will also allow for comparative analysis to identify trends, as an example. It's also important that a reconciliation step is introduced to ensure that the CTS results (in terms of cost and volume per outbound logistics process) balance back to actuals.

5.5 CONCLUDING REMARKS

The chapter assimilates the insights gained from the literature study and market interviews to define a generic outbound logistics cost driver framework. The framework speaks to outbound logistics processes, the respective activities, associated cost drivers and illustrates cost allocation calculations.

Based on the discussion thus far, the following is of importance:

1. Separation of fixed and variable costs
2. Allocation of variable costs to the correct cost drivers, understood by both parties.

For the CTS framework to be relevant for the FMCG industry, it's vital that companies apply the principles uniformly, which includes the definitions of fixed and variable costs as well as the identification of cost drivers. The following outbound logistics cost drivers are recommended as defined in the CTS framework (based on section 3.4, 4.2 and 5.2):

1. Primary distribution. This is the activity of transporting products from manufacturing sites to storage locations, or in-between storage locations. The product is typically moved in full pallet quantities and the distribution capacity is usually constrained by the number of pallets per load. The quantity of pallets to be transported determines the number of primary distribution loads and resultant operating costs. *Therefore, the cost driver is pallets.*

2. Warehousing. This includes the following number of activities:
 - a. Handling In. The activity of receiving product at the warehouse and moving the product to storage. The product is usually delivered in full pallet quantities. The handling workload is therefore a function of the number of pallets received. *Therefore, the cost driver is pallets received.*
 - b. Storage. The activity of storing the product. Generally, the costs associated with storage is quite fixed and constrained by the number of pallet positions (or bin locations) available for storing the product. *Therefore, the cost driver is pallets stored.*
 - c. Handling Out. The activity of picking, moving the product to the dispatch bay and loading of the vehicles. The product picked and loaded could either be in full pallets or part-pallet (known as break bulk). *Therefore, the cost driver is pallets picked.*
3. Secondary Distribution. The activity whereby a loaded vehicle delivers to the end customer. This activity has two key constraints, namely (i) distance travelled to the customer and (ii) the turn-around-time at the customer to make the delivery. This activity therefore has multiple constraints, which include the location of the customer (to account for distance), waiting time at customers (known as turnaround time), quantity delivered (impacting the turnaround time) as well as delivery frequency (how often a customer receives a delivery). *To simplify this and yet keep the cost drivers applicable, the suggested cost drivers is delivery frequency, coupled with distance and turnaround time (TAT).*

The CTS framework will provide a valuable understanding of the outbound logistics cost as well as emphasise the cost drivers to effect efficiency throughout the supply chain. The CTS framework is a tool that can support strategic logistics decisions such as pricing, customer profitability, product profitability, outsourcing, and the identification and measurement of process improvement initiatives. Applying the CTS framework will yield the following additional benefits:

1. All transactions are understood from a customer point of view rather than merely an internal/ functional point of view. This will assist in better understanding the associated cost of specific customer service as well as the customer profitability and what can be changed to improve this.
2. Drivers of outbound logistics activities are understood, not only the resultant effect in the management accounts. This will assist in careful consideration of which costs or actions are necessary and which are not and assist in aligning profitability with action.

3. Assist in aligning the organisation, whereby a route to market platform is created to focus adequate service to the right customers through the correct product range. These historic functions of marketing, sales and logistics will better understand their different costs/contribution/impact on overall CTS and customer profitability.
4. Creating a systemic approach for increasing profitability, rather than just adopting the latest management fad. Hence companies should understand the drivers of specific behaviour and focus on managing these drivers rather than just reducing cost as a result of some local or international benchmark.

Intrinsically the CTS framework alludes to extensive data gathering and analysis for each activity and associated cost driver(s). The CTS framework relies on the availability of accurate and comprehensive cost and activity data for each outbound logistics process. The quality of the data inputs will impact the success of the CTS output. Understandably not all data might be readily available, in which case a company should spend time to gather the data or make informed assumptions.

Lastly, it must also be emphasised that the CTS framework is not intended to replace the general ledger accounts, but should rather be used as a diagnostic tool to understand outbound logistics costs at a much lo-wer level (as well as the associated cost drivers). The CTS modelling should therefore be owned by the supply chain department (or similar) within the company, as opposed to the finance department. The finance department can however be helpful to provide cost information, splitting variable and fixed costs and assist with reconciliation.

Chapter 6 illustrates the application of the CTS framework, through a case study, and the expected benefits. Due to the sensitivity of the information presented, the name of the company will remain confidential.

6 CTS FRAMEWORK VALIDATION (A CASE STUDY)

6.1 INTRODUCTION

This case study, to build a conceptual cost driver validation framework, was conducted at a large South African based Fast-Moving Consumer Goods (FMCG) company. The company is one of the largest manufacturers, marketers and distributors FMCG products in Southern Africa. The company has grown over several decades through the acquisition and clustering of businesses and now owns leading food, confectionary and personal care brands. As with most FMCG companies, the supply chain underpins the company's strategy to provide superior customer service at the lowest possible outbound logistics cost.

The aim is to illustrate the concept of a cost-to-serve (CTS) framework that allocates outbound logistics cost to customers and products, based on defined cost drivers for each outbound logistics activity. The output is expressed as: CTS Rand/customer/product.

The high-level approach, as depicted in Figure 8, has three main steps:

1. Gathering of required data (inputs);
2. Identification of cost drivers and allocation logic (calculation);
3. Portraying of results in a dashboard format (output).

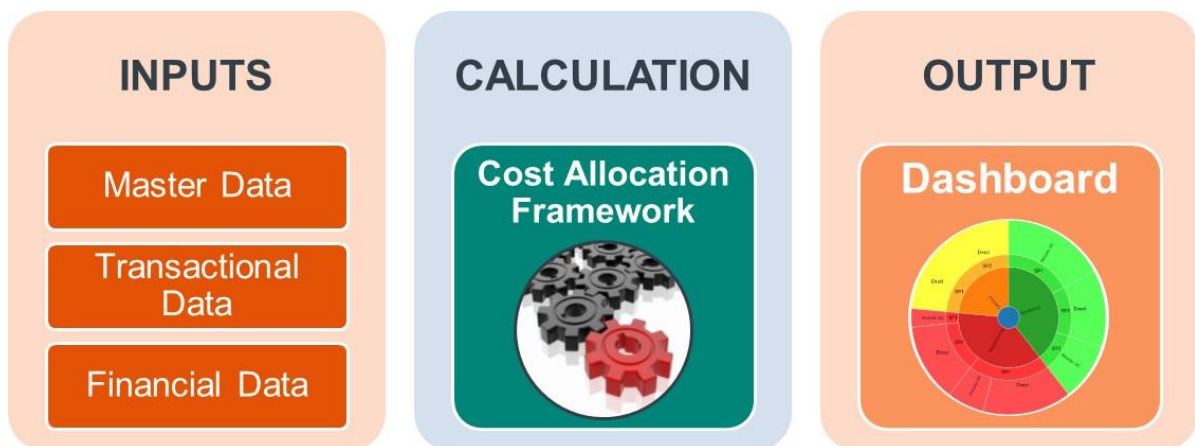


Figure 8: High-level Case Study Approach

The scope of the CTS will cover outbound logistics operations (after manufacturing), excluding return logistics, in line with the scope of the study. The scope therefore includes the physical warehousing and "forward" movement of finished products from manufacturing, through the supply chain network to customers.

6.2 COMPANY'S SUPPLY CHAIN OVERVIEW

The company's outbound logistics network includes numerous manufacturing and warehousing facilities across South Africa, with significant logistics capabilities to store and transport product. The product range exceeds 450 SKUs, delivered to more than 3,500 customers nationally.

Figure 9 aids in the visual presentation of all outbound logistics activities considered in the CTS modelling. Each activity is explained in subsequent Table 19.

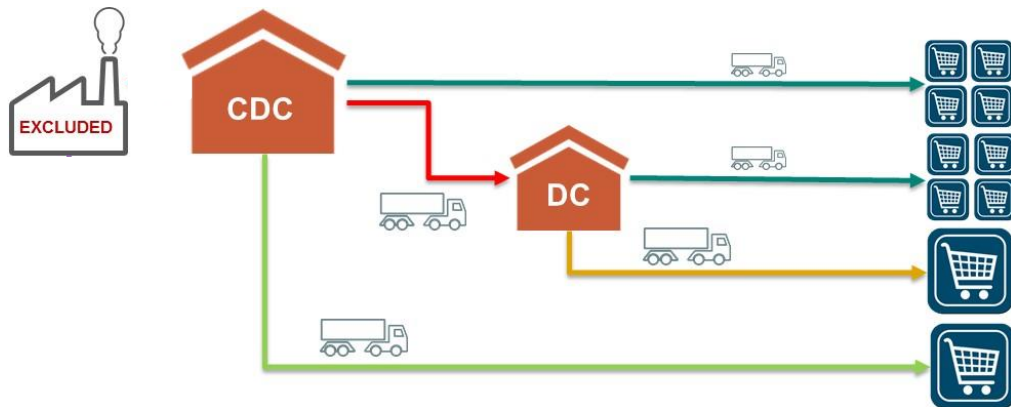









Figure 9: Case Study's Supply Chain Definition

Table 19:
Case Study: Outbound Logistics Activities

Icon / Line	Description	Definition
	Manufacturing	Inbound movement of raw materials into manufacturing sites, as well as the manufacturing operation and associated cost are excluded from the scope.
	Central Distribution Centre (CDC)	Warehousing facility of finished goods at manufacturing site that could also store the full basket of product. CDC distribution model: <ul style="list-style-type: none"> • Secondary distribution to regional customers • Full truck load (FTL) delivery to one customer (also considered primary distribution). • Replenish smaller depots / distribution centres (DCs)
	Distribution Centre	Regional DCs that store the full basket of products. DC distribution model: <ul style="list-style-type: none"> • Secondary distribution to regional customers • Full truck load (FTL) delivery to one customer (also considered primary distribution)

	Primary/ Replenishment	All intercompany transport typically between a CDC and a DC.
	FTL	Full truck loads (FTL) from product source's CDC to one customer of one product group
		Full truck load delivery to one customer with mixed products.
	Secondary	Multi-drop deliveries from DCs to customers. Note that customer return logistics are excluded from the research and case study scope.

6.3 APPLYING THE FRAMEWORK: COST DRIVERS AND ALLOCATION

For illustrative purposes, each logistics activity is translated to a Rand per pallet per customer value, based on the cost drivers. Upon consultation with the company, the stakeholders agreed to the cost driver(s) for each outbound logistics process as listed in Table 20. The identified cost drivers clearly relate to the framework explained in section 5.2.

**Table 20:
Case Study: Company's Outbound Logistics Cost Drivers**

Activity	Cost Driver
Primary	<ul style="list-style-type: none"> a. Number of Pallets/Weight transported per product type b. Turn Around Time (TAT) – especially for own fleet
Secondary / FTL	<ul style="list-style-type: none"> a. Number of Deliveries at a customer b. Turn Around Time (TAT) at a customer c. Distance of the customer from CDC/DC (to account for travel time)
Warehousing	<ul style="list-style-type: none"> a. Handling-In: Pallets received/handled b. Storage: Number of Pallets (Stock on Hand) c. Storage: Stacking configuration d. Handling-Out: Number of Pallets/Cases picked for dispatch to customers

Once the cost drivers were defined (for the three main logistics activities listed in Table 20), the cost allocation framework is applied as discussed in Section 5.3. Due to the sensitivity of the FMCG company's data, an example of the allocation will be discussed in the following section. Thereafter, a dashboard in Section 6.5 portrays examples of CTS results to illustrate the insights that can be derived after applying the framework. To ensure confidentiality, it should also be noted that the actual values of the company information were substituted in the dashboard results. However, the relationship between the values remains unchanged so that they reflect the true insights that can be derived when applying the framework.

6.4 COST DRIVER ALLOCATION EXAMPLE

6.4.1 Example inputs

A hypothetical example of an outbound logistics network is depicted in Figure 10.

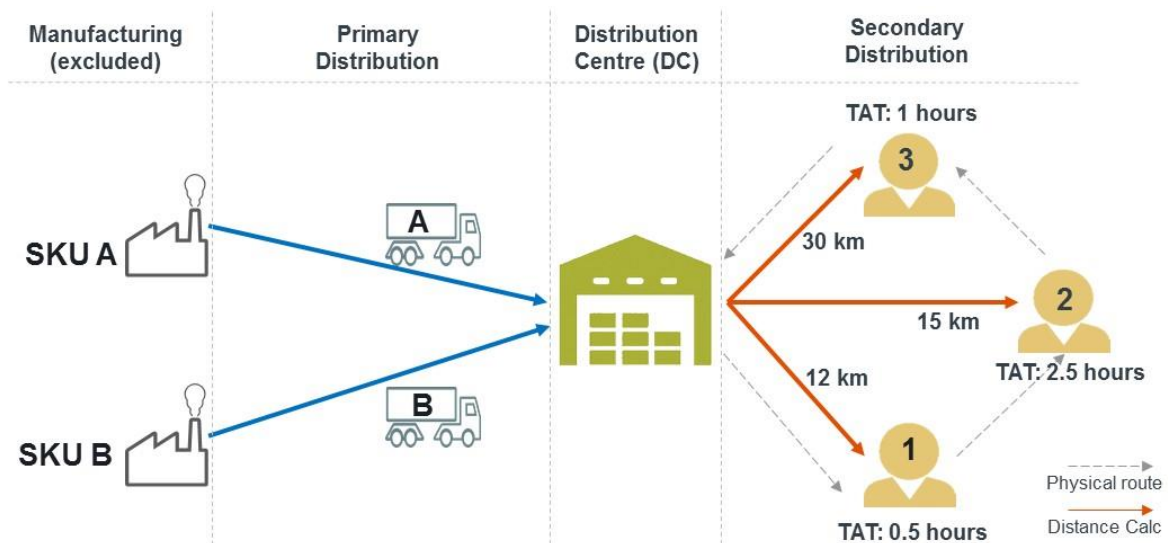


Figure 10: Case Study's Supply Chain Example

For the example, the following notes/assumptions apply:

1. The timeframe: movement and costs occurred during the same predefined timeframe.
2. Finished Goods SKU A and SKU B are manufactured at different locations (manufacturing costs are excluded from the study).
3. The SKU product handling and selling unit is pallet quantities.
4. Further data inputs and assumptions pertaining to the outbound logistics processes are included in Table 21.

**Table 21:
Case Study: Data & Assumptions**

Primary Distribution															
Data Input Assumptions	Operating Cost														
A logistics service provider (LSP) transported the following number of pallets from the respective manufacturing sites to the DC:	The trip transport cost for the respective SKUs from origin to the DC is:														
<table border="1"> <thead> <tr> <th>SKU</th> <th>Pallets</th> </tr> </thead> <tbody> <tr> <td>SKU A</td> <td>28</td> </tr> <tr> <td>SKU B</td> <td>30</td> </tr> <tr> <td>Total</td> <td>58</td> </tr> </tbody> </table>	SKU	Pallets	SKU A	28	SKU B	30	Total	58	<table border="1"> <thead> <tr> <th>SKU</th> <th>Trip Cost (ZAR)</th> </tr> </thead> <tbody> <tr> <td>SKU A</td> <td>R7,000</td> </tr> <tr> <td>SKU B</td> <td>R12,000</td> </tr> </tbody> </table>	SKU	Trip Cost (ZAR)	SKU A	R7,000	SKU B	R12,000
SKU	Pallets														
SKU A	28														
SKU B	30														
Total	58														
SKU	Trip Cost (ZAR)														
SKU A	R7,000														
SKU B	R12,000														

Warehousing					
Data Input Assumptions			Operating Cost		
The number of pallets handled is:			The cost for each warehouse activity is:		
SKU	Handling-In	Handling-Out	Activity	Cost per day (ZAR)	Comment
SKU A	28	5	Handling-In	R6,380	Total of MHE and people cost
SKU B	30	8	Storage	R12,000	Total of all related storage and facility costs
Total	58	13	Handling-Out	R3,900	Total of MHE and people cost
Average inventory or stock on hand (SOH) and the stacking height per SKU:			Total	R22,280	
SKU	SOH	Stacking Height			
SKU A	12	1.5			
SKU B	21	3			
Total	33				

Secondary Distribution					
Data Input Assumptions			Operating Cost		
The following products were delivered from the DC on one vehicle/route to three delivery points (customers):			The cost for the route, split between fixed and variable, is as follows:		
Customer	SKU A	SKU B	Cost	Route cost (ZAR)	Comment
Customer1	2	0	Fixed	R3,000	Total of all fixed cost components
Customer2	2	5	Variable	R1,500	Total of all variable cost components
Customer3	1	3	Total	R4,500	
Total	5	8			
The straight-line distance (in kilometres) from the DC to the customer, and the average turn-around-time (TAT) for each delivery is tabled as follows:					
Customer	Straight-line Distance from depot (km)	Turn-around-time (TAT)			
Customer1	12	0			
Customer2	15	5			
Customer3	30	3			
Total	5	8			
Average travelling speed for the route: 45km/h					

Considering the input assumptions for each process tabled above, the cost allocation can be calculated guided by the CTS framework discussed in Chapter 5, Section 5.3. The results of the allocation are illustrated in the following section.

6.4.2 Example calculation

Table 22 demonstrates the cost allocation calculation for each outbound logistics process (based on the data inputs and assumptions listed in the previous section).

Table 22:
Case Study: Cost Allocation Calculations

Primary Transport		
Cost Driver	Cost Allocation	Unit of Measure
Pallets	$SKU A = \frac{R7,000}{28} = R250.00$ $SKU B = \frac{R10,000}{30} = R400.00$	R/SKU/pallet

Warehouse / Distribution Centre (DC)		
Cost Driver	Cost Allocation	Unit of Measure
Handling-In Pallets	$HandlingIn = \frac{R6,380}{58} = R110$	R/pallet
Stock on Hand (Pallets)	<p>Storage:</p> $Adjusted\ SKU\ A\ SOH = \frac{12}{1.5} = 8$ $Adjusted\ SKU\ B\ SOH = \frac{21}{3} = 7$ $Total\ Adjusted\ SOH = 8 + 7 = 15$ $SKU\ A\ allocation = \frac{8}{15} * R12,000 = R6,400$ $SKU\ B\ allocation = \frac{7}{15} * R12,000 = R5,600$ $Storage\ SKU\ A = R6,400 / 12 = R533.33$ $Storage\ SKU\ B = R5,600 / 21 = R266.67$	<p>Number of Pallets</p> <p>Rand</p> <p>R/SKU/pallet</p>
Handling-Out Pallets	$HandlingOut = \frac{R3,900}{13} = R300$	R/pallet

Secondary Distribution			
Cost Driver	Cost Allocation	Unit of Measure	
Fixed Cost:	Theoretical travel time to customers: <i>Customer 1 Travel Time</i> = 12 / 45 = 0.27 <i>Customer 2 Travel Time</i> = 15 / 45 = 0.33 <i>Customer 3 Travel Time</i> = 30 / 45 = 0.67	Hours	
	Travel time and TAT: <i>Customer 1</i> = 0.27 + 0.5 = 0.77 <i>Customer 2</i> = 0.33 + 2.5 = 2.83 <i>Customer 3</i> = 0.67 + 1 = 1.67 <i>Total Hours</i> = 0.77 + 2.83 + 1.67 = 5.27		Hours
	$Customer\ 1 = \frac{(0.77)}{(5.27)} * R3,000 = R218.35$		
	$Customer\ 2 = \frac{(2.83)}{(5.27)} * R3,000 = R230.56$		
	$Customer\ 3 = \frac{(1.67)}{(5.27)} * R3,000 = R237.34$		
	Variable Cost:	<i>Total straightline distance</i> = 12 + 15 + 30 = 57	R/pallet/customer
	$Customer\ 1 = \frac{(12)}{(57)} * R1,500 = R157.89$		
	$Customer\ 2 = \frac{(15)}{(57)} * R1,500 = R56.39$		
	$Customer\ 3 = \frac{(30)}{(57)} * R1,500 = R197.37$		

The outcome of the calculations above yields the following insights for each outbound logistics process:

1. Primary Distribution: the R/pallet value varies on SKU level for the following reasons;
 - a. The path and distance an SKU physically moves through the supply chain, from origin to final storage destination, could differ. Therefore, the allocated primary transport cost might be different, e.g. if an SKU pallet travels further it will likely cost more.
 - b. The vehicle capacity and utilization thereof have an impact on the R/pallet (e.g. 28 versus 30 for each respective trip in the example above). The higher the utilization, the lower the R/pallet. The vehicle capacity (in pallets) will also be a function of the SKU characteristics and usually either constrained by weight or volume.

2. Warehousing:

- a. The R/pallet will be the same for all SKUs for the *handling-in* and *handling-out* activity. The only differentiation will be if the R/pallet is converted to R/case (if the number of cases stored on a single pallet differs between SKUs).
- b. The R/pallet for the *storage* activity is likely to be different between SKUs, since it is a function of the stock-on-hand levels and stacking configuration of the SKU.

3. Secondary Distribution: The R/pallet on product level will be the same for all SKUs at the same customer (delivery location). However, the R/pallet for the same SKU will likely differ between customers since the distance travelled and TAT to deliver product are distinctive on a customer level. This also implies that the total R/delivery per customer will differ between customers (assuming varied distance and TAT).

Consolidating the calculations for each logistics activity provides a CTS per product and per customer, illustrated in Table 23.

**Table 23:
Case Study: Output**

Product	Primary Transport	Warehouse				Secondary			Total R/pallet
		In	Storage	Out	Total	Var	Fix	Total	
SKU A	250	110	533	300	943	125	227	352	2 489
SKU B	400	110	267	300	677	109	233	342	2 096

Customer	Primary Transport	Warehouse				Secondary			Total R/pallet	Pallets Delivered	R/ delivery
		-In	Storage	-Out	Total	Var	Fix	Total			
Customer 1									1 570	2	3 139
SKU A	250	110	533	300	943	158	218	376	1 570	2	3 139
SKU B	400	110	267	300	677	158	218	376	1 453	0	-
Customer 2									1 397	7	9 779
SKU A	250	110	533	300	943	56	231	287	1 480	2	2 961
SKU B	400	110	267	300	677	56	231	287	1 364	5	6 818
Customer 3									1 541	4	6 162
SKU A	250	110	533	300	943	197	237	435	1 628	1	1 628
SKU B	400	110	267	300	677	197	237	435	1 511	3	4 534

The benefit of Table 23 is that for each customer, and each product, the delivery costs are known compared to the sales revenue generated. It is therefore possible to calculate the profitability of a customer or product, by comparing the delivery cost to the margin (before outbound logistics cost) of the goods sold. At this point the company can make strategic decisions i.e. pricing models, discontinuing products or customers, customer discounts, adjusting delivery frequency on a customer level (as part of service levels) etc.

Applying the CTS framework, as illustrated through the conceptual calculations above, to the company's transactional data yields very insightful results. The following section provides examples of dashboards in which the CTS results can be reported and interpreted. Integrating the CTS framework with the existing systems, and the details to be included in the dashboards, depends on a company's system architecture, reporting preferences and the business application.

6.5 DASHBOARD

The aim of this section is to provide an overview of potential CTS dashboards that can be created after applying the CTS framework. These dashboards can provide different users with a single source of information of the outbound logistics activities per customer per product to assist in visibility, performance measurement and quick decision making.

For illustrative purposes, products are moved to customers though the physical network, will be measured in tons, pallets and sales value. All the physical movements attract logistics cost which was split into three main processes, namely:

1. Primary transport,
2. Warehousing (split between handling-in, storage and handling-out activities), and
3. Secondary transport.

Figure 11 provides a summary of the cost to serve dashboard over a predefined time period. It contains the following information (labelled on the graph accordingly):

1. Key facts over the time period, e.g. total CTS, pallets delivered, CTS R/pallet etc.
2. A total cost breakdown for each outbound logistics activity (amounting to total CTS).
3. The total CTS, in Rand value and expressed as a percentage of net invoice value (NIV), for each depot / distribution centre.
4. Reconciliation or verification that the total CTS balances to the actual management accounts or income statement (tying back to the cost base of the business).

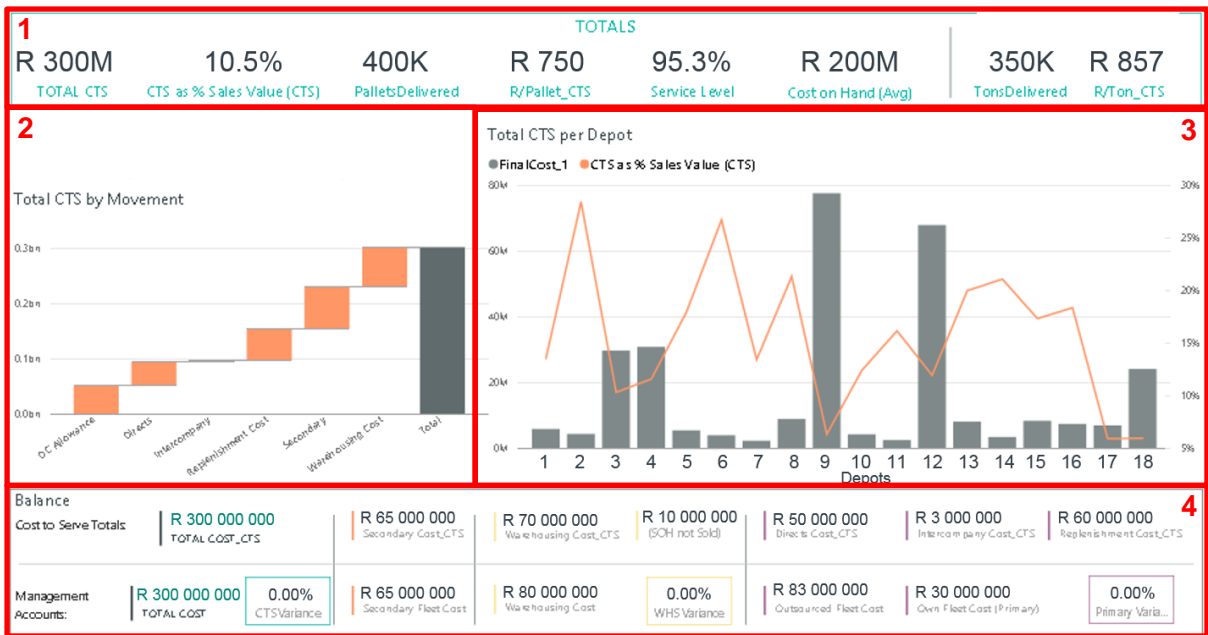


Figure 11: Cast Study Dashboard (CTS Summary)

The following dashboard, Figure 12, provides insight into the CTS for each individual customer (each dot on the graph represents an individual customer), to clearly illustrate the CTS as a percentage of a customer's NIV on the y-axis and pallets delivered on the x-axis. In the table, customers are grouped into CTS categories. A company could therefore quickly identify customers with a high CTS (e.g. >20% of Sales Value, which is higher than the industry benchmark) for further investigation. A similar dashboard could be developed on product SKU level.

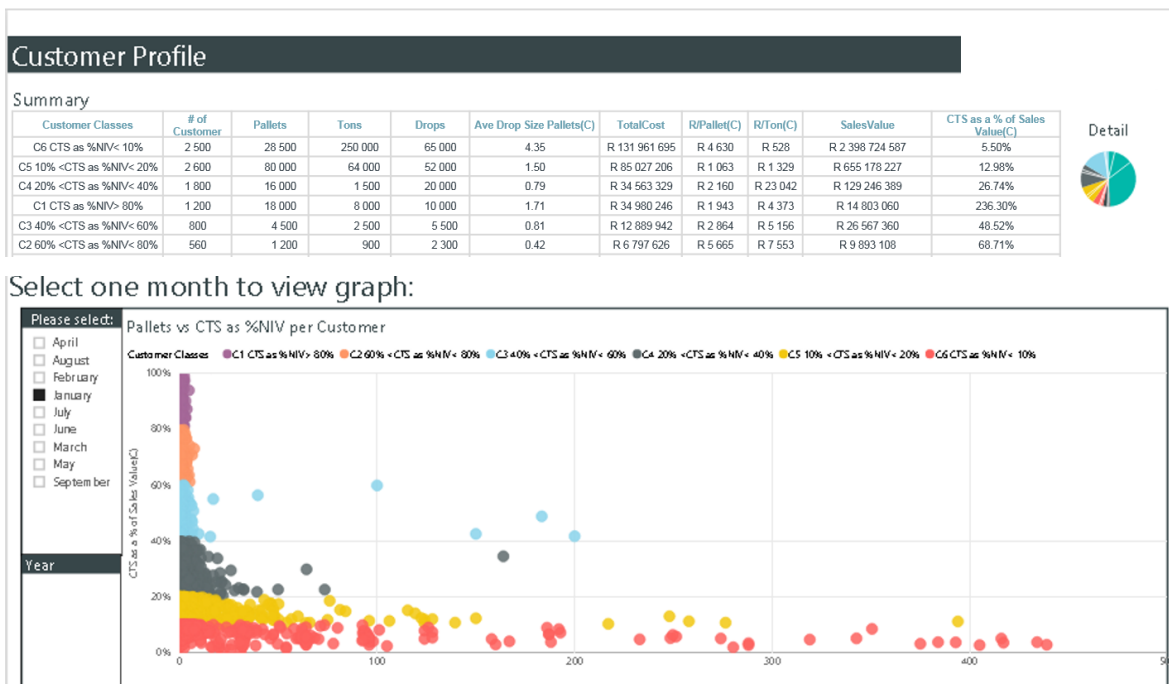


Figure 12: Case Study Customer Classification

The company considers that an outbound logistics CTS (as a percentage of NIV) of greater than 40% will completely erode profit margins. From above results, 27% of customers have a CTS of greater than 40% which illustrates that these customers offset the profits of others. It is important for a business to understand which products and customers these are and what impact they have on the company, hence illustrating why identifying cost drivers to determine the CTS is so important for decision-making purposes.

The final dashboard (Figure 13) provides a comparison view of different business units (BUs) within the company, each having a unique supply chain. It's therefore possible to clearly understand each business unit's respective CTS (on a total and R/pallet or R/ton level), which would enable the determination of respective profitability. Even though the cost drivers for the business units are the same, the resultant margin contribution could be substantially different.

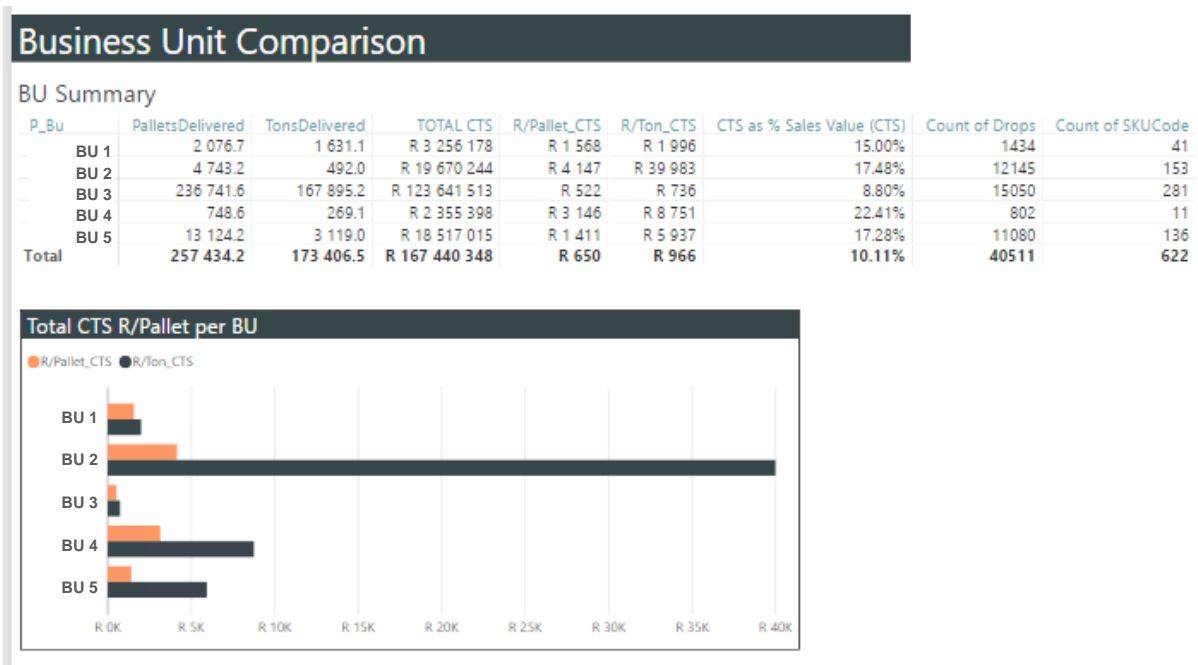


Figure 13: Case Study Business Unit Comparison

The following insights can be derived from above dashboard:

- BU3 has the highest SKU range and the highest sales (pallets) compared to the other BUs. On an aggregated level (not on customer or product level), it seems to be a profitable BU with a CTS of 8% of NIV.
- BU4, on the other hand, is the smallest SKU range and low sales (pallets) with a relatively high CTS % (>22%). It would be necessary to understand the percentage margin of each product (that could be higher for i.e. a high-value low-volume product), before inferences can be made with regards to profitability.

- c. Expressing the CTS as R/pallet and R/ton shows interesting differences between the BUs. The total R/pallet for BU2 is the highest. It is noteworthy that the R/ton for BU2 by far exceeds that of the other BUs. This is due to the light weight of the product on the pallet. Since pallets is the handling unit in logistics operations, this illustrates the importance of appropriate metrics. For example, should the company measure CTS expressed as R/ton, it will completely distort the outcome and interpretation thereof and any benchmark will seem unreasonable. It is therefore recommended to express the CTS as R/pallet for comparison purposes between BUs.

6.6 CONCLUDING REMARKS

Most companies know exactly what a product costs to produce, but yet don't understand what costs are involved to deliver the product on a customer level. The understanding of cost drivers in outbound logistics based on the combinations of products and customers is essential to identify the business issues associated with logistics, as part of the supply chain, and to ultimately increase the business profitability. The demonstrated drivers and framework is a powerful decision support methodology of deciding what to change, and how to prioritize such changes.

The outcomes of the example boasted the following benefits:

1. Providing visibility of non-value-added activities and biggest cost contributors.
2. Improving overall business profitability by monitoring and reporting customer and product CTS compared to product gross margin.
3. Improve the overall process of budgeting by identifying the cost/performance relationship for different customers and product types.
4. Defining appropriate KPIs for the holistic outbound logistics function, that can be customised for specific customer and product groups.

Finally, the intent of the example is to demonstrate a simplistic method of using the defined outbound logistics cost drivers to enable cost allocation on a customer and product level. The allocation calculations don't need to descend to excessive detail, since the purpose thereof can be used for setting strategic direction.

7 CONCLUSION

Management accounts are typically reported in business functional silos (e.g. marketing, production, administration, logistics etc.) and not on a customer transactional level. This is a major shortcoming since Fast-Moving Consumer Goods (FMCG) companies have a need to understand the true cost-to-serve (CTS) and resultant profitability of individual customer and product combinations. Existing cost methodologies were developed many years ago to overcome the accounting shortcoming, of which activity based costing (ABC) is the most prevalent. A key prerequisite of these costing methodologies is to identify the cost driver(s) for the process and activities in question. For this study, outbound logistics processes and activities were considered since they are significant cost contributors in the FMCG industry to deliver product to customers.

The study evaluated the cost drivers and the development of a cost allocation framework, specifically for outbound logistics processes within the South African FMCG industry. To ensure sufficient background to the problem, a detailed literature study and market interviews were undertaken, with particular attention to the following:

1. An overview of outbound logistics in South Africa and the significant costs it represents.
2. It is clear from the review that the FMCG industry poses several unique logistics challenges. This includes *inter alia* the following:
 - Highly competitive industry, typically selling high volumes at low margins.
 - Prevalent seasonality trends across the year, months and weeks.
 - The consumer and retail market are constantly changing, for example major retailers “forcing” manufacturers to make use of the retailer’s centralised logistics network.
 - Continuous focus on product development with the added complexity of delivering the product across large geographic regions to an expanding customer footprint (especially the informal market).
3. Current accounting systems are insufficient to understand the CTS of customers and products. The outbound logistics cost drivers, as a prerequisite to calculate the CTS, are also not well defined for the FMCG industry.
4. The controlled market interviews confirmed that the outcomes of the study could be a significant competitive advantage, however currently the cost drivers are not well understood or homogenous.
5. The study evinced the activity cost drivers, based on the ABC methodology, for each respective outbound logistics process and its application through a CTS allocation framework for the FMCG industry.

Once a company defined the outbound logistics cost drivers and understand its costs to a sufficient degree of accuracy, then it has a platform capable of making informed continuous improvement decisions. The process of building and updating the platform is a unique skill and one that must be learned and internalised. The CTS framework can assist a FMCG company with the process of learning and internalising the valuable insights that can be derived from the suggested framework and approach.

In the introduction of the dissertation three conjectures were formulated that needed to be tested. These are:

1. Current accounting systems provide insufficient insight into the outbound logistics cost-to-serve (CTS) on a product and customer level. The development of an alternative CTS allocation framework, underpinned by cost drivers, is required to translate and assign cost logically to customer transactions to determine the true CTS.
2. The cost drivers of outbound logistics in the South African FMCG industry are not well defined or understood. This is a key component to develop cost allocation logic for each cost driver on a customer transactional level.
3. An outbound logistics CTS allocation framework is a critical component of supply chain optimisation as (i) cost is linked to actual activity, (ii) it leads to business understanding of costs and cost drivers, (iii) it acts as a tool to identify customer servicing strategies to improve service and profit.

Based on the literature review, market interviews as well as the validation of the suggested CTS allocation framework the conclusions are:

- Conjecture 1: Current accounting systems are lacking the insights to understand the outbound logistics CTS on a product and customer level. Being able to evaluate the CTS on a more detailed level is a key requirement to ensure that informed and appropriate business decisions are taken. The market interviews within the FMCG industry supported the notion that a CTS allocation framework, based on defined cost drivers, could be a critical input to supply chain optimisation and overall business profitability.
- Conjecture 2: The market interviews indicated that cost drivers for outbound logistics in the FMCG industry are not well defined. However, the literature study and structured interview questions evinced that standard cost driver(s) for each outbound logistics process and related activities can indeed be defined, albeit slight variations might exist due to different supply chain intricacies. However, the principle of using the cost driver(s) to develop a CTS allocation framework on a customer and product level holds true.

- Conjecture 3: The study established that it's probable that costs can be ringfenced for the respective outbound logistics processes. Evaluating the cost drivers for the activities associated to the processes will lead to a better understanding of the logistics costs and the drivers thereof. The suggested CTS allocation framework determines the true CTS on customer and product level and is therefore a valuable decision-support tool to identify improvement initiatives and optimisation. Applying the tool to shape customer servicing strategies, whilst reducing the outbound logistics CTS (and hence increase profit), is a significant competitive advantage.

The research focused on FMCG outbound logistics activities and therefore excludes other supply chain functions and trading activities. The key cost drivers for each outbound logistics process, namely (i) primary distribution, (ii) warehousing/storage, and (iii) secondary distribution, was identified identified through the literature study and market interviews. Subsequently a CTS allocation framework was developed as a practical tool for FMCG to determine the CTS on a customer and product level. Further studies could evaluate the cost drivers and allocation framework that includes other supply chain processes for example manufacturing, return logistics and trading activities associated with sales and marketing (e.g. order capturing, invoicing, merchandising, after-market service etc.). It could also be valuable expand the scope of the study to other industries, i.e. Financial, Mining and Petrochemical, and note the potential cost driver and allocation differences.

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