Comparing theoretically-planned inbound transport costs with actual transport costs: A case study of a cement manufacturing company in South Africa

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DECLARATION

I, Elzané van der Wath, hereby declare that:

1. I understand what plagiarism is and am aware of the University's policy in this regard.

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3. Where other people's work has been used (either from a printed source, Internet, or any other source), this has been adequately acknowledged and referenced following departmental requirements.

4. I have not used work previously produced by another student or any other person to hand in as my own.

5. I have not allowed and will not allow anyone to copy my work and pass it off as their work.

6. The use of CHATGPT and other artificial intelligence writing tools was used in the ethical compilation of this report. This includes the use of language editing, idea generation, formulation, and automated logic checking.

DEDICATION

First and foremost, to my father Johan van der Wath, whose unshakable trust in me has been a beacon of hope, giving me a sense of self-assurance and direction in all my pursuits. Your confidence in my abilities has given me strength and constantly reminded me of my potential. Your unwavering commitment and ethical values have greatly inspired and guided me as I strive for excellence. Your belief in me will serve as a valuable resource for me going forward, directing my actions both within and outside the workplace.

To my sister, Lizel Stieger, whose strength and support of my ambitions have been genuinely inspiring. Your presence and encouragement have been as influential as the knowledge contained within these pages. To my family, who have been my steady source of support during this academic journey.

Marinus van den Berg, Elizma Fuller, and Rene Roux, my friends, you have all made unique contributions to my endeavours. The difficult journey to achieving this milestone has been made not just bearable but rewarding by your company and encouragement. The comfort of your support kept me going through the difficult times.

Lastly, I would like to express my sincere gratitude to my incredible study leader, Prof. Anet Smit, for her guidance and excellent leadership. Her frank and insightful feedback was priceless and revolutionary, creating a space for my ideas to grow and develop. The result of this study is, in fact, due to Prof. Smit's steadfast leadership and extensive knowledge. Her dedication to academic success has had a lasting impact on my professional and personal development and influenced this dissertation.

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ABC	Activity-based costing
CPI	Consumer Price Index
EOQ	Economic order quantity
ERP	Enterprise resource planner
NDA	Non-Disclosure Agreement
NPC	Natal Portland Cement
POPI Act	Protection of Personal Information Act 4 of 2013
PPE	Personal protective equipment
TCM	Transport costing model
TCO	Total cost of ownership
WCC	Workmen's compensation

ABSTRACT

The study focuses on inbound transportation, which is crucial in the manufacturing industry, particularly cement. In this research, inbound transportation refers to the effective movement of raw materials required for production. Monitoring and analysing the cost of inbound transportation ensures operational success. This study examined and compared the planned expenditures for incoming transportation in 2021 to the actual expenses paid, offering insights into the financial management of Sephaku Cement. Transportation accounts for a large component of the total manufacturing expenses, and differences between planned and actual expenditures can have a substantial impact on a manufacturer's net profit. Discrepancies between the budget and actual expenditures can have implications on strategic planning, profit margins, operational efficiency, pricing strategies and cash flow management.

The primary aim of this study is to compare the theoretical projected expenses of incoming transportation to the actual expenditures incurred by Sephaku Cement. Furthermore, it tries to identify and analyse the key variables contributing to disparities between planned and actual transportation costs for this cement plant. The study analysed key variables including fuel cost, administrative cost, depreciation, maintenance cost, tyre cost, insurance and the distance the vehicles travelled. The analysis will offer a thorough knowledge of the discrepancies, allowing for more accurate future budgeting and better operating plans.

Methodology: This case study takes a holistic approach to financial analysis by incorporating current literature as the underlying framework. It focuses primarily on the expenses of transporting raw materials from suppliers to Sephaku Cement's production facility. The researcher utilised a total cost of ownership model to achieve the analysis.

The theory behind variance analysis and standard costing lies in their ability to provide valuable insights into operational efficiency, cost control, and managerial performance. By analysing variances, managers can identify areas where performance is deviating from budget, understand why these deviations are occurring, and take corrective actions to align actual performance with organisational goals. This approach not only aids in budgetary control but also supports strategic decision-making by highlighting areas for improvement and resource optimisation.

The study's findings reveal that Sephaku Cement's budgeting process lacked standardisation, employing varying assumptions in the planning phase. This lack of uniformity in the budgetary approach significantly impacted the accuracy of their financial projections. Furthermore, the study highlights that the fixed annual budget was not adaptable enough to account for fluctuations in the primary cost driver: the distance travelled. The actual distance travelled was less than anticipated, affecting the budget's efficacy. A re-evaluation through a flexible budget, recalculated by the research, demonstrated that had Sephaku Cement travelled the initially planned distance, it would have resulted in an overspend for the year. The discrepancy between budgeted and actual cost results in R 6 674 563 for the year. This insight underscores the need for more dynamic and responsive budgeting practices to manage transportation costs effectively in the cement industry.

The research provides valuable information on the financial elements of Sephaku Cement's inbound transportation budgetary procedures. It emphasises the importance of distance travelled as a critical cost driver and the need to identify and closely monitor all aspects that impact incoming transportation costs. In the face of fluctuating market conditions, the findings emphasise the need for more flexible and responsive financial planning strategies. As a result, the key recommendation is to use rolling forecast models in conjunction with flexible budgeting practices. These techniques will allow Sephaku Cement to better predict and adapt to environmental changes, improving financial management and overall operational efficiency in transportation. Improved budgeting procedures and thorough oversight will help Sephaku Cement obtain a competitive advantage in the industry by reducing costs and optimising planning.

Key terms: Inbound transport cost, budget cost, actual cost, distance travelled, flexible budget, variables

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CHAPTER 1 INTRODUCTION TO THE STUDY

1.1 Introduction

Any nation's economic development and growth depend heavily on the movement of products, in South Africa transport expenses account for 29.35% of the national GDP (Selamolela, 2018). The expense of shipping a company's goods to the final consumer is accounted for in the costing process, eventually affecting the product's selling price and profitability. Reliability and speed are also considered when selecting a transportation option, in addition to the initial cost of the journey (Dedík *et al.*, 2018:202).

There are several ways to move commodities, and each has benefits and drawbacks of its own. The most popular technique is land transportation, which is both economical and effective. Although air travel is more expensive and faster, it is also more effective and can travel to more places. Although it is the most costly and time-consuming option, sea transportation is also effective since it can carry a substantial volume of merchandise.

Any industrial company's supply chain relies on transportation expenses, which influence the productivity and profitability of the organisation as a whole. Businesses use transportation to transfer raw materials and completed products from suppliers to manufacturing facilities, distributors, and consumers. Companies that import raw materials or run industrial plants in remote areas must pay close attention to inbound transportation expenses (Waters, 2021:310).

Companies frequently use planned transportation cost models, which calculate transportation costs based on theoretical calculations, to control transportation expenditures (Guajardo & Rönnqvist, 2016:372). These models give an anticipated cost for transportation by considering several factors, including distance, fuel costs, and vehicle type. Yet, unanticipated delays, route adjustments, and fuel price changes can cause transportation expenses to fluctuate dramatically from projected expenditures. To enable companies to evaluate performance, the utilisation of budget and cost analysis are employed (Arnold & Artz, 2019:52). Continuous evaluation of costs can result in operational improvements and cost savings. Without continuous evaluation and analysis, organisations operational efficiency and cost control can result in reduced profitability and market share.

Every economy depends on the movement of commodities, and the cost of transportation is a crucial variable that impacts an industry's ability to compete. With a manufacturing capacity of more than 13 million tons annually, the cement industry in South Africa significantly contributes to the country's economy (Cokayne, 2023). The sector primarily relies on road freight transit to convey its goods from the manufacturing facilities to the distribution hubs and, finally, to the end consumers.

1.2 Background

In South Africa, the cement manufacturer is among the top cement producers. The business runs two cement factories, one in Delmas, Mpumalanga Province, and the other in Lichtenburg, North West Province. Cement manufacturers produce and utilise various cement products across multiple construction projects, such as residential, infrastructural, and commercial construction (SephakuCement, 2023). Sephaku Cement produces approximately 1.9 million tons of clinker, 1.3 tons of fly ash and 3.9 million tons of cement (SephakuCement, 2023). To manufacture these quantities Sephaku Cement budgeted for a total distance of 7 812 924 km to transport the raw materials to the production facilities (SephakuCement, 2020). With the high distances travelled and fluctuating demand, various factors can influence the profitability of Sephaku Cement.

Like other manufacturers, the cement manufacturer has to deal with various transportation issues, including shifting fuel prices, route rerouting, and unforeseen delays. These difficulties might result in considerable differences between anticipated and actual transportation costs, affecting the supply chain's overall effectiveness and profitability (Christopher, 2016:111). Sephaku Cement has discrepancies with inbound transportation costs that directly influence the performance of the company. Fluctuating costs and production requirements influence the actual inbound transport cost for Sephaku Cement. Sephaku Cement requires a deeper comprehension of the discrepancies and the key variables involved.

This study will examine the accuracy of anticipated transportation costs compared to actual transportation expenses by performing a case study on the cement manufacturer, Sephaku Cement. The research will compare planned and actual transportation costs for raw materials and finished goods and investigate the causes of any differences.

The results of this study will assist not just cement manufacturers but also other South African industrial firms dealing with comparable transportation issues. The study may help to enhance supply chain management procedures and eventually lower transportation costs for businesses operating in the South African manufacturing sector by identifying the variables that affect disparities between planned and actual transportation expenses.

This study compares the theoretically anticipated incoming transport costs with the actual transport expenses for a Sephaku Cement. The study aims to pinpoint the differences between anticipated and actual expenses and the variables that influence these differences. The study will offer insights on how to improve the accuracy of expected transport costs, which will eventually enhance the effectiveness of the company's supply chain.

1.3 Problem statement

The problem addressed in this study is the accuracy of theoretical planned inbound transportation costs compared to actual transport costs for a leading cement manufacturing company in South Africa, Sephaku Cement. It is unclear how accurate planned transportation cost models are in forecasting actual transportation costs in the real world, even though businesses utilise them to estimate transportation costs.

Discrepancies between planned and actual transportation expenses can dramatically impact the efficiency and profitability of Sephaku Cement’s supply chain. For businesses to improve their supply chain management strategies and save transportation costs, it is crucial to understand the elements that lead to variations between planned and actual transportation expenses. Misuko (2015:46) stated that there is a positive relationship between inbound transportation and a reduction in product costs. Shabani-Naeeni and Yaghin (2021:3) found that the volatility of inbound transport plays a vital role in an organisation's profitability, and the accurate planning and controlling of inbound transport it an essential exercise.

During 2021 Sephaku Cement planned for inbound transport cost to accumulate to R 124 027 043, while the actual cost resulted to R 117 352 481. The discrepancy between the planned cost and actual expenses resulted in R 6 674 563 for 2021. Without an accurate estimate on expenses, inefficient planning on product pricing and reduced profitability follows (Shabani-Naeeni & Yaghin, 2021:2).

By examining the accuracy of anticipated inbound transportation costs and offering suggestions on how businesses may enhance their supply chain management techniques to cut expenses, this research seeks to add to the body of knowledge on supply chain management. The results of this study might impact South Africa's manufacturing sector, as transportation costs account for a sizable portion of firms' supply chain expenditures.

1.4 Research objectives and questions

1.4.1 Primary objective

- To compare theoretical planned inbound transportation costs with actual transport costs for the Sephaku Cement and to identify the factors contributing to any differences between the two.

1.4.2 Secondary objectives

- To review the existing literature on transportation cost models as part of supply chain management to provide a theoretical framework for the study.

- To analyse Sephaku Cement's transportation costs and compare the planned and actual transportation costs.

- To identify the factors contributing to differences between planned and actual transportation costs for Sephaku Cement.

- To provide recommendations for Sephaku Cement and other manufacturing companies in South Africa on how they can optimise their supply chain management strategies to reduce transportation costs.

1.4.3 Research questions

1.4.4 Primary research question

- How does the theoretical, estimated inbound transport cost compare against the actual inbound transport cost?

1.4.5 Secondary research question

- What are the key variables affecting inbound transportation costs for Sephaku Cement?

- How can the gap between estimated and actual inbound transportation costs be minimised?

1.5 Scope of the study

1.5.1 Field of study

The field of study will be financial and operations management, as this study will indicate the relationship between theoretical and actual inbound transportation costs.

1.5.2 Industry under investigation

The researcher will conduct this study on the inbound transport department in the cement manufacturing industry. The researcher will use a specific manufacturer, Sephaku Cement, a large cement manufacturer in South Africa.

1.5.3 Geographical demarcation

Geographic demarcation refers to the process of defining and establishing the boundaries of a geographic area or region. Researchers can also use it to limit study areas for research projects by specifying the boundaries of the geographic area that will be examined or sampled. The geographic location will be the cement manufacturer’s Lichtenburg plant in the North West Province.

1.6 Research methodology

1.6.1 Literature review

The literature review in Chapter 2 supplements the study, which explores many topics and relevant research. The literature review will introduce the reader to the transport industry and its impact on cement. The literature review emphasises the challenges and obstacles faced in inbound transport and the processes undertaken to combat these challenges. The researcher will source this information from Google Scholar and industry regulator websites.

Sources will include.

- Journals
- Publications
- Dissertations and papers on the subject
- News and internet articles

- Policy documents

Chapter 2 of this study will assess the literature on the numerous elements that affect inbound transport costs in the cement industry and the various tactics and procedures employed to control and reduce these costs. The chapter will examine prior research on incoming transportation costs, logistics costs, and other relevant subjects to frame the research issues and study aims. This chapter will detail the theoretical and conceptual framework that supports the study, define essential concepts, and evaluate pertinent literature on inbound transportation costs and logistics expenses in the cement sector. Empirical research will follow the literature study in Chapter 2.

1.7 Empirical study

An empirical study is a type of research that uses data gathering and analysis to address research issues and evaluate hypotheses. Observation, experimentation, or survey is a method of inquiry that is methodical and objectively designed to uncover new information or confirm accepted beliefs (Patten & Galvan, 2019:3). The principles of the scientific method, which emphasize the creation of testable hypotheses, the gathering of pertinent and reliable data, and the application of statistical or other quantitative techniques to the analysis and interpretation of the data, serve as the foundation for empirical studies (Ciubotariu & Bosch, 2022:178). Empirical investigations may use many study designs and procedures, which researchers can carry out in various sectors, such as the natural sciences, social sciences, and business.

The rest of this chapter will provide a brief overview of the empirical study the researcher will carry out for this study, including the methodology, research design, and procedures for gathering and analysing the study's data. Moreover, it will emphasize the study's possible contributions to the area of inbound transport cost control in the cement industry and examine the weaknesses and merits of transportation costs in the cement industry.

1.7.1 Research paradigm

There are three categories of approaches, namely positivism, interpretivism and critical theory (Rehman & Alharthi, 2016:52). The literature sometimes calls positivism the scientific method as the research strives to develop relevant and accurate statements, using data and evidence (Creswell & Cresswell, 2017:36). Wahyuni (2012:71) states the interpretivist research paradigm depends on the individual perspectives of the participants to create a theory. It employs subjective experiences to comprehend human behaviour. It assumes an objective reality can be studied and measured and that researchers should conduct research systematically, rigorously, and objectively.

This research will use the positivist technique due to the paradigm's nature.

1.7.2 Research approach

A research paradigm is a belief or assumption regarding the world in terms of ontology, epistemology, methodology and methods (Rehman & Alharthi, 2016:51). Zalaghi and Khazaei (2016:24) state that researchers can use deductive or inductive methodologies in management research. Deductive research is a branch of the positivistic research paradigm that involves formulating research hypotheses utilising the body of literature as a foundation and then testing them through an empirical study (Saunders, 2016:74). The logical method entails putting this theory to the test using quantitative information gathered from the cement manufacturer’s shipping logs. The researcher will examine the data to ascertain whether there is a sizable discrepancy between the anticipated and actual transportation costs.

On the other hand, inductive research uses the interpretivist research paradigm and consists of developing a new theory via observation of reality and obtaining primary data without considering earlier theories (Saunders, 2016:74).

The deductive methodological procedure will be applied as this study has adopted a positivistic research paradigm.

1.7.3 Methodological choice

Quantitative research aims to investigate the interrelated ideas of data analysis to explain the relationship between two or more variables. This method is based on numerical data and uses statistical or mathematical techniques to identify patterns and make predictions (Creswell & Cresswell, 2017:82). On the other hand, qualitative research focuses on finding connections between different data sets through in-depth analysis of non-numerical data such as text, images, and sounds (Pal, 2017:4854). Researchers can collect data directly from the source through observation, interviews, or surveys or indirectly from another source through secondary data analysis. Both methods have advantages and disadvantages, and researchers can apply them in various research fields, including clinical, biological, epidemiological, social, and commercial research (Adams *et al.*, 2014:6).

The financial analysis will include gathering and evaluating data using organized and defined procedures to guarantee that the outcomes are trustworthy and repeatable. The research will analyse the data using statistical approaches and variance analysis to compare the theoretical with actual costs.

However, utilizing secondary data obtained directly from the company's records and reports, this study will employ a financial analysis of a case study on the secondary data to examine the cement manufacturer's projected and actual inbound transport expenses. The statistical and mathematical methods used will aid in locating any differences between the costs that the researcher anticipated and those that occurred. They will also shed light on the variables influencing inbound transport costs in the cement business.

1.7.4 Research strategy

After the researcher has decided on the research paradigm, approach, and preference, the next step is to select a data-gathering methodology (Bryman & Bell, 2015:100). Administrative records and papers serve as the main data source in an archive research approach (Saunders, 2009:178). As the goals of this study are specific, the researcher will use archive research to acquire the necessary data. A case study technique entails an in-depth analysis of a particular phenomenon, such as a business, organization, or person (Elman *et al.*, 2016:376).

The research will gather information on the cement manufacturer’s transportation expenses during a predetermined time frame, such as a year, and evaluate the data to identify whether there is a gap between anticipated and actual transportation expenses. The researcher will do this using a case study approach. Using a case study approach, the researcher can analyse the cement manufacturer’s transportation expenses and identify the variables affecting any discrepancies between anticipated and actual prices.

Additionally, the case study strategy will allow the researcher to explore the transportation costs of the cement manufacturer in the context of the wider industry and to draw comparisons with other manufacturing companies in South Africa or similar contexts. This will enable the researcher to make generalizations about the factors that influence transportation costs for manufacturing companies in South Africa.

1.7.5 Time horizon

The time horizon determines the length of the investigation, whether it be a cross-sectional or short-term study that involves data collecting at a certain period or a longitudinal that repeatedly collects data over a lengthy period to compare that data (Melnikovas, 2018:34).

The time horizon of the empirical study will focus on the financial year 2022. This will investigate the cement manufacturer’s incoming transport expenses for that particular time. By concentrating on a specific time, the research can offer conclusions and suggestions that are pertinent and useful for the cement manufacturer’s current activities. The researcher will use data from the financial year 2022 to compare the manufacturing company's actual transport expenditures to its expected incoming transport costs.

1.7.6 Study population and sampling

A study population is the full set of variables from which the researcher wants to conclude (Blumberg *et al.*, 2014:338). Unfortunately, due to restricted access and resources, many research projects typically cannot obtain data from the whole population under study (Saunders, 2019:292).

The study population for this research is a cement manufacturing company in South Africa. The sampling frame will be all inbound transportation activities carried out by the company during a specific period.

The researcher will use systematic sampling as the sampling strategy. Systematic in that internal data is systematically collected and presented as numerical data with and without significant intervals, such as financial years and monthly reports (Bryman & Bell, 2017:178).

The sample will be selected using a purposive sampling technique, which involves selecting elements based on specific criteria. In this study, the researcher will choose the transportation activities based on their relevance to the research question to compare planned and actual inbound transportation costs. The transportation activities that the researcher will sample will involve the inbound transportation of raw materials, such as limestone, shale, clay, and other goods required for manufacturing.

There are various cement manufacturers within South Africa, which include PPC Cement, AfriSam, Lafarge, Natal Portland Cement (NPC), Sephaku, and Mamba Cement. Due to the large amounts of data available from the main manufacturers of cement products, the researcher will conduct the study on one specific organisation within the industry. The researcher will use a cement manufacturer for the case study.

1.7.7 Collection of data

Data collection refers to the methodical process or tools used to compile information (data) from several sources. Data that is intrinsically quantitative and reliant on numbers is known as numerical data. The primary method of data collection will be secondary data sources. It is possible to retrieve secondary sources of information from both internal and external sources, including databases, industrial association businesses, and governing authorities. Data will be obtained electronically from the company database, and company reports, Google Drive data dumps, and e-mails from cement manufacturers in the cement industry. This study will have no human participants, and the researcher will purely base it on analysing administrative and numerical data from the 2022 financial year.

The use of secondary historical data has the advantages of being less time-consuming to gather, being a more economical method, and allowing for the compilation of several data sets (Dunn *et al.*, 2015:1297). This is the reason why the researcher will employ business software. The purpose of historical data is to present descriptive information about a specific sector, setting, or organization based on historical occurrences.

The researcher will collect the data for this study from the cement manufacturer's transportation records, which include information on inbound transportation activities, such as transportation costs, transportation routes, transportation modes, and transportation times. The researcher will obtain the transportation records from the company's transportation department or logistics department.

To ensure the accuracy and completeness of the data, the researcher will conduct a preliminary assessment of the transportation records before collecting the data. This assessment will involve reviewing the transportation records to ensure they contain the information required for the study.

The data collection process will involve extracting data from the transportation records for a specific period, the 2022 financial year. The researcher will systematically perform the data extraction process and enter the data into a structured data collection tool, such as a spreadsheet. The researcher will check the data for accuracy and completeness, and any errors or missing data will be corrected or obtained from the transportation department.

1.7.8 Statistical/data analysis

Financial analysis is employed to analyse raw data to comprehend essential aspects of the data, such as distribution, variation, and central tendency (Quinlan *et al.*, 2015:359). Using descriptive statistics, the researcher can better comprehend and summarize the data (Adams *et al.*, 2014:171).

Because it serves as the foundation for many other studies, correlation is one of the most common types of data analysis. The goals of regression are to find a relationship between the different variables, including logistical, transport and risk costs, and create a model (Adams *et al.*, 2014:202). The researcher will use it to describe how certain phenomena change due to influencing variables. Estimating the explanatory variable, independent variable, or stimulus coefficients used to predict the dependent variable or response is required (Adams *et al.*, 2014:202). The researcher will use re-coding to analyse the numerical data to provide detailed categories for increased precision.

Various externalities that influence the financial cost of inbound transportation will be analysed. Once all the costs have been identified, collected, and formalized, the measuring instrument, variance analysis, will be utilised. It involves comparing the planned transportation costs against the actual costs and identifying the sources of variance between the two. This can help identify areas where the researcher can reduce transportation costs by improving planning or identifying and managing cost drivers.

The researcher will use descriptive statistics to summarize and describe the data collected from the cement manufacturer’s transportation records. The researcher will analyse the transportation costs concerning routes, modes, and times.

The researcher will analyse the data using statistical software such as SPSS or Excel. The researcher will present the analysis results using tables, charts, and graphs. The researcher will discuss the findings in relation to the research objectives and the study's contribution to the existing literature. The researcher will also discuss any study limitations and provide recommendations for future research.

1.7.9 Reliability and validity

An instrument is valid if it accurately measures the target variable. Sürücü and Maslakci (2020:2695) also state the tool has attained criterion validity if it measures what it claims to measure. The data gathered will contain the details required to respond to the research question, giving the study validity. The repeatability of the results and the degree to which a measurement of an event yields a steady and constant outcome are both referred to as reliability. The researcher bolstered this study's credibility by including data from the manufacturing company's corporate system under investigation.

Reliability refers to the consistency and stability of the research findings over time, while validity refers to the accuracy and truthfulness of the research findings. To ensure the reliability of the study, the researcher will use standardized data collection methods, such as a structured data collection tool, to collect the data. The researcher will also systematically conduct the data collection process, following the same procedures for each data point. Additionally, the researcher will use statistical tests such as the paired t-test to analyse the data, which is a reliable method for comparing planned and actual transportation costs.

The researcher will utilize complete, correct transportation records from the cement manufacturer that contain all the necessary information for the study to guarantee the authenticity of the findings. To ensure the data is accurate and reflects the actual situation of the incoming transportation expenses for the organization, the transportation records utilized will also span a sizable period, such as a year.

The researcher will also take measures to reduce the possibility of bias, such as ensuring that the data collection process is objective and unbiased and using statistical tests to analyse the data.

Finally, the researcher will consider potential limitations of the study, such as sampling bias, and acknowledge them. The study will discuss the limitations to ensure that the researcher interprets the findings appropriately and provides guidance for future research.

Overall, by ensuring the reliability and validity of the study, the researcher can trust the findings to provide meaningful insights into the relationship between planned and actual inbound transportation costs for the cement manufacturer, which can have implications for other manufacturing companies in South Africa.

The instrument for analysis and the data used for this study are valid and reliable.

1.8 Ethical considerations

Ethical issues are crucial in a research project (Bryman *et al.*, 2014:128). A business research study must adhere to certain ethical requirements to support the research's goals. According to (Bryman et al., 2014:128), the ethical questions the researcher must consider are:

- Will participants suffer harm as a result?
- Will informed consent be lacking?
- Will someone's privacy be violated?
- Will deception be included in the study, too?

The study will have no human participation, which entails limited ethical issues. The cement manufacturer, the researcher, and any other participants who will use or see the data will sign A Non-Disclosure Agreement (NDA). The NDA is of utmost importance when external researchers are used to ensure the researcher does not exchange data or information gained or use the data or information for gains. A conflict of interest is a circumstance in which a person or group has opposing loyalties or interests that could prevent them from acting impartially. The cement manufacturer and the researcher will sign a conflict-of-interest form to address and admit the notion of an inherent bias. Although quantitative research methodology reduces the impact of any potential personal bias, prejudice should still be acknowledged and reported before any data collecting or dataset analysis (Prada-Ramallal *et al.*, 2019:142).

No information not consented to by all parties involved will be shared to ensure the study falls within the Protection of Personal Information Act 4 of 2013 (POPI Act). The researcher will send all findings and information derived from the data received to the company for approval to ensure this.

Firstly, the study may involve collecting and analysing sensitive data, such as transportation costs, and obtaining the company's permission and informed consent is essential before collecting any data. The researcher should respect the company's privacy and confidentiality, and any data collected should be securely stored and anonymized.

The researcher must also perform the study honestly and transparently and report any possible conflicts of interest. The research should also adhere to applicable legal requirements, such as the POPI Act, which governs research.

Thirdly, the research should ensure that the methodologies and research design are dependable and acceptable. This entails ensuring the sample size is adequate to make solid conclusions, the data gathering methodologies are acceptable, and the data analysis techniques are valid and trustworthy.

Last but not least, the study should go by the ethical standards of research, such as ensuring that the researcher carries out the research in a way that does not damage the participants and that the researcher accurately and impartially presents the results. Also, the researcher should clarify any potential research flaws or limits in the paper.

1.9 Contribution of the study

The research will add to the knowledge of inbound transportation cost models.

The cement manufacturer, a major manufacturer in South Africa, would benefit from this study's comparison of theoretical planned incoming transportation costs to actual transport prices. By identifying the elements that lead to variations between planned and actual transportation costs, the study's findings will assist in closing the gap between theory and practice.

In addition, this research will offer a case study illustration of how manufacturing firms in South Africa might enhance their supply chain management tactics to cut down on transportation expenses. Other businesses in the sector, as well as academics and practitioners interested in improving the efficacy and efficiency of supply chain management in the area, will find the recommendations in this research helpful.

Thirdly, by giving a real-world illustration of how businesses can use transportation cost models to calculate transportation costs and improve their supply chain management strategies, this study will add to the knowledge already available on transportation cost models and supply chain management. Academics, practitioners, and policymakers in supply chain management and logistics will be interested in the study's conclusions.

In general, this study will offer information about the precision of transportation cost models and the variables that affect the discrepancies between anticipated and actual transportation costs. Researchers, academicians, and politicians interested in enhancing the efficacy and efficiency of supply chain management in South Africa may find the study's conclusions interesting.

1.10 Limitations of the study

One of its limitations is that the cement manufacturer is the sole manufacturing business examined in this study from South Africa. Hence, it's possible that researchers cannot apply the results to other sectors or manufacturing firms in the area. Additionally, the study only compares planned and actual inbound transportation costs. It does not consider other factors impacting transportation costs, such as weather conditions, road infrastructure, and political instability.

Another potential limitation of this study is that it relies on data collected from the cement manufacturer’s transportation operations. The accuracy and completeness of this data may be limited, and there may be variations in data collection methods that could impact the study's results.

Finally, this study focuses only on inbound transportation costs and does not consider outbound transportation costs or the overall supply chain costs of the cement manufacturer. As transportation costs are only one component of a company's supply chain costs, the findings of this study may not provide a complete picture of the cement manufacturer’s supply chain management efficiency and effectiveness.

1.11 Layout of the study

The layout of the mini-dissertation will be as per Figure 1-1.

Chapter 1: Introduction and context

This chapter will cover the background, causes, problem statement, aims, scope, and constraints of the study, as well as the research technique. The subsequent chapters will follow this format.

Chapter 2: Literature review

The literature review will discuss and explain the factors influencing the cement industry's decision to use a transportation model.

Chapter 3: Research methodology and results

The researcher will explain the study’s implementation methodology and the statistical software utilized to analyse the data gathering and the measurement technique. The research tools used in this study include tables, figures, and models.

Chapter 4: Findings and recommendations

The conclusions the researcher can draw from the results will be discussed in detail in this part, with the main focus being the research challenge. Debates and interpretations will follow the presentation of the study's data analysis. This chapter includes the tables, figures, and models created using the research tools. The conclusions the researcher can make from the results will be covered in detail in this part, with the earlier-stated research challenge as the main focus.

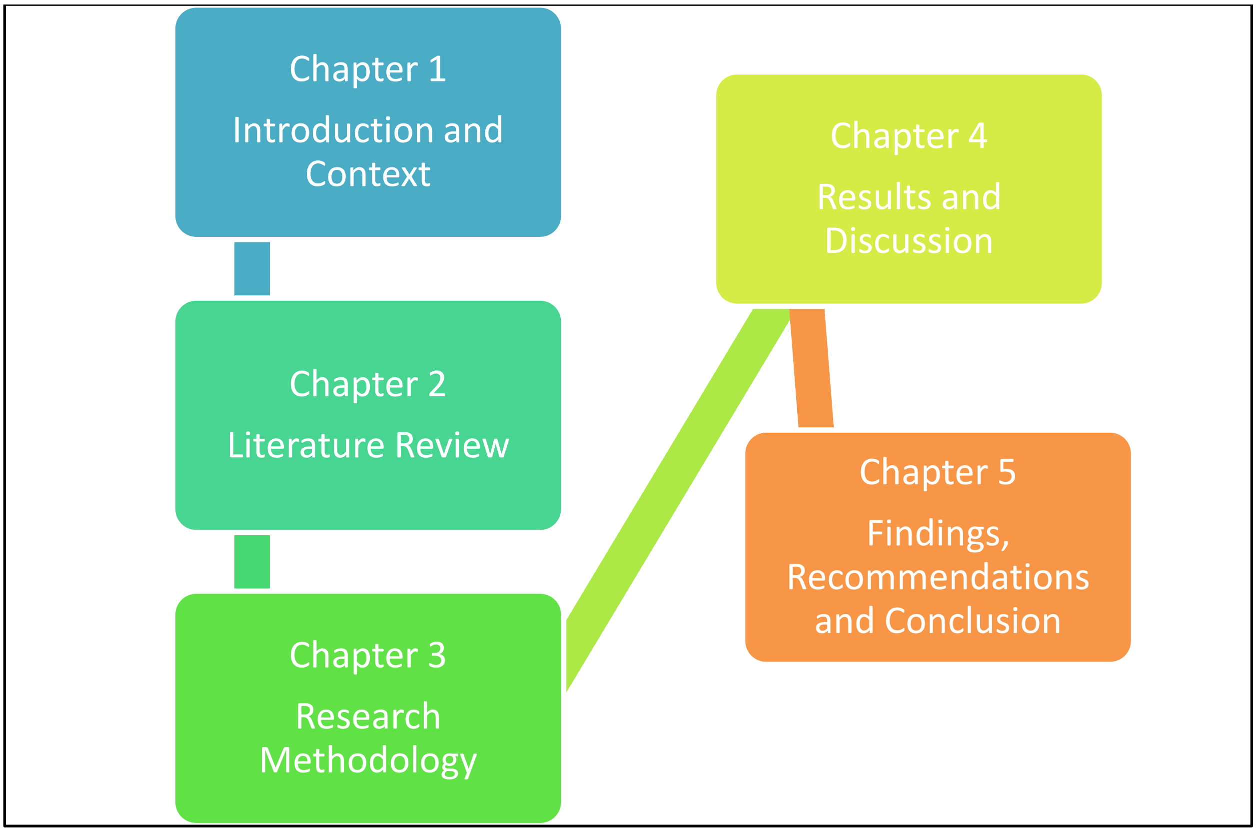


Figure 1-1: Mini-dissertation chapter layout

Source: (Author, 2023)

1.12 Definition of terms

The clarification section discusses the terms and concepts essential to the study. This section aims to introduce and explain the fundamental terms that serve as the basis of this study.

1.12.1 Transport costs

Transport costs refer to the costs a business incurs when transferring products and commodities between locations (Strandhagen *et al.*, 2017:359). These expenses might include gasoline prices, driver salaries, vehicle upkeep, insurance, and other related charges.

The predicted transportation expenses determined by a theoretical model based on several factors, including distance, fuel costs, and vehicle type, are known as planned transport costs. Planned transportation costs offer a forecast of anticipated costs and serve as a comparison point for actual transportation costs (Ambrosino *et al.*, 2018:803).

The actual transportation costs a business incurs when moving goods and commodities are known as actual transport costs. Due to variables, including changes in fuel prices, route adjustments, and unforeseen delays, actual transportation costs may vary from those anticipated (Kurth *et al.*, 2020:2).

1.12.2 Inbound transportation

Inbound transportation refers to the transportation of raw materials or finished products from suppliers to production facilities (Meyer, 2017:2). Inbound transportation is a critical component of a company's supply chain expenses as it directly impacts the efficiency and productivity of production processes.

1.12.3 Cement Industry

The cement industry combines cement manufacturers, suppliers and companies selling cement products. The cement production industry is one of the world's most important and largest industries. The cement industry in South Africa is a major source of employment and makes a considerable contribution to the economy (WorldCement, 2020).

1.12.4 Supply chain management

According to Essilfie-Baiden (2020:81), supply chain management refers to the management of the flow of goods and services, including the movement and storage of raw materials, work-in-progress inventory, and finished goods, from the point of origin to the point of consumption. Effective supply chain management is critical for companies to ensure the efficient and cost-effective movement of goods and materials throughout the supply chain.

1.12.5 Risks

Risk is a sensitivity to loss or danger. Risk in this study refers to the monetary risk and the risk of damage and loss of products. These risks can include delays in delivery, damage or loss of goods during transportation, unexpected costs or charges, and disruptions in the supply chain. Inbound transport risks can significantly impact a company's operations, leading to production delays, decreased efficiency, and increased costs (KT *et al.*, 2020:1262). Outside variables notably affect certain dangers, such as climate, traffic, and road conditions (Riskpulse, 2018).

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction to literature review

This chapter provides a literature review that supports the study by evaluating various topics and reviewing relevant research. This chapter reviews the cement industry, offering light on its dynamics. Additionally, the chapter reviews transportation, with a specific emphasis on areas vital to the cement industry, such as inbound transportation and cost analysis

2.2 Introduction

The nation's economy and infrastructure are heavily reliant on the cement production industry in South Africa. The dynamics of operational logistics, especially inbound transport costs, stand out as a crucial topic of investigation within this sector. Although theoretical frameworks offer organised forecasts for these expenses, actual circumstances frequently diverge from these scholarly hypotheses. South Africa now produces 12 million tonnes of cement, compared to a 20 million tonne production potential, as seen in Figure 2-1. Currently, South Africa produces 12 million tons of cement, compared to the 20 million tons production capacity (Infrastructurenews, 2022).

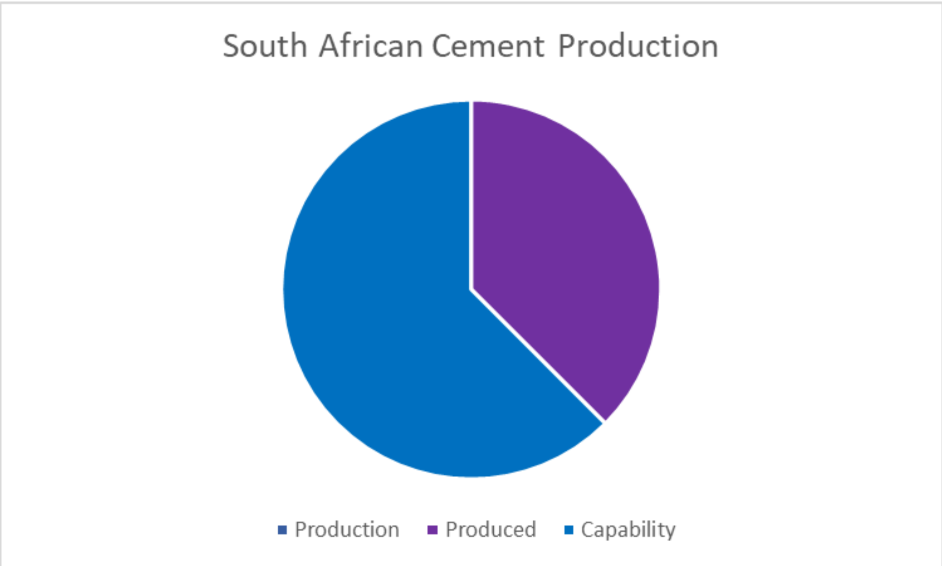


Figure 2-1: South African cement production 2022

Source: (Infrastructurenews, 2022)

The dominant theoretical models, such as the Total Cost of Ownership (TCO), will be discussed in the literature together with previous case studies on transport and the cement industry. This literature review aims to provide a background on the cement industry, transport and the variables that can influence the cost of transport, especially within the cement industry.

To close the knowledge gap between academic theories and practical business realities, this study of the literature will compare prevalent theoretical frameworks with actual data from the South African cement industry.

2.2.1 Brief overview of the research topic

The logistical challenges involved in the inbound transportation of raw materials frequently have substantial financial repercussions in the industrial sector, particularly in the cement business (Camisón-Haba & Clemente, 2020:2075). Some of these challenges could include fuel, labour, maintenance, and downtime costs. When handled properly, these costs offer significant opportunities for realizing cost savings (Izadi *et al.*, 2020:1). However, a difference between the anticipated and actual inbound transport costs may indicate systemic inefficiencies, practical difficulties, or problems with the planning procedure.

In particular, South Africa, where transportation expenses make up 53.2% of logistics costs compared to 39% internationally, is one country where transportation efficiency is a key factor in national competitiveness (Havenga *et al.*, 2014:1). According to (Havenga, 2010:460), transport expenses represent the bulk of South Africa's logistics costs, which are higher than the global average. The most significant cost driver is gasoline, which is driven by shifting oil prices.

This study could be relevant for cement manufacturing companies and the larger manufacturing industry. The study's findings can offer insights into the dynamics of transportation costs, shedding light on the factors causing cost variations and suggesting practical solutions to match theoretical planning more closely with practical execution. Such information would considerably improve operational efficiency, financial performance, supply chain sustainability, and overall competitiveness of manufacturing companies (Izadi *et al.*, 2020:1).

2.2.2 Purpose of the literature review

The primary objective of this literature review is to introduce a theoretical framework for analysing transport costs. Additionally, the review aims to summarise various objectives, simplifying understanding of the research topic within the South African cement industry context. Lastly, the review identifies potential areas that can contribute to industry practices and academic research. The literature review aims to review and synthesise pertinent literature, utilise a theoretical framework, and comprehend the South African cement industry. It also seeks to understand the role of transportation in the cement industry, review cost evaluation methods for inbound transport, assess previous empirical studies on transport costs in the cement industry and identify gaps and contradictions in the literature.

2.3 Transportation

Transport refers to the movement of people, products, and information between locations (Ogden, 2017). Transportation, which includes several modes, including road, train, air, and sea, is a fundamental component of daily living and international trade (Kubanova & Schmidt, 2016:104). Because adequate transportation reduces travel down times and improves the effectiveness of supply networks, developments in transportation have historically been strongly connected with economic growth.

The researcher will discuss the importance, implications, and variables related to transportation in this section. The cement industry depends heavily on transportation since it links the acquisition of raw materials, manufacturing procedures, and final delivery to the end consumer. Solid and effective transportation networks are required due to the logistical difficulties involved in moving heavy resources like gypsum, clay, and limestone to manufacturing plants and then delivering the completed product to different regions of the nation. Given the urgency of building projects, cement companies have historically invested in streamlining their transportation networks to cut costs and guarantee timely delivery.

2.3.1 Definition and importance of inbound transport in the cement manufacturing process

Inbound transport refers to the logistical activities in the transfer of goods from the point of origin to the production or processing plant (Vieira Takita & Cabral Leite, 2017:15). In the cement industry inbound transport is the process of transporting raw materials from their origins to the manufacturing facilities (Rassey, 2016:8). This entails moving a variety of raw materials, including gypsum, clay, limestone, and silica, all of which are necessary for the manufacturing of cement. Inbound transport is done in two parts: the freight transportation of raw materials and the loader part, where materials are moved to and from the transport vehicle (Straka *et al.*, 2018:164).

The importance of efficient inbound transport in the cement manufacturing process cannot be overstated (Odunjo, 2020). It serves as the backbone of the entire production chain, ensuring the timely delivery of raw materials to meet production schedules. Any disruptions or inefficiencies in inbound transport can result in production delays, increase inventory holding costs, and ultimately impact the overall operational efficiency of the cement plant. Efficient inbound transport also contributes to cost control, as transport costs constitute a significant portion of the total production costs (Bergqvist & Monios, 2016:75).

The preservation and quality control of materials during transportation add another difficulty level. Some products require particular transportation circumstances because they are vulnerable to contamination, dampness, or other environmental variables (Fourie, 2023).

2.3.2 Definition of outbound transport in the cement manufacturing process

The conveyance of the final product from the cement factories to various markets, including wholesalers, retailers, and direct customers, is known as outbound transport in the cement production process (Sharma & Khanna, 2020:211). Outbound transport also includes cement delivery to building sites for significant infrastructure projects.

Outbound transport is an essential element in the value chain for the manufactured cement to reach the end user in a timely and economical manner (Alumbugu *et al.*, 2020:19). Outbound transport has a direct impact on consumer happiness, market size, and the cement manufacturer's ability to compete (Odunjo, 2020). Cement producers may decrease lead times, enhance customer service, and minimise transport costs with the aid of effective outbound transport management, all of which can significantly affect profitability.

2.4 Overview of the cement industry

This section will discuss an overview of South Africa's cement industry. The cement industry has significantly influenced the country's infrastructure and economic growth, a key component of the country's building industry.

2.4.1 Cement industry in South Africa

The South African cement industry is a key player in the country's construction sector and substantially contributes to economic and infrastructure development. The cement industry, rooted in the nation's abundant natural resources, has developed over time in response to the country's building demands, urbanisation patterns, and economic ups and downs.

The industry, which includes prominent businesses including PPC, AfriSam, Lafarge, and NPC Cimpor, has been characterised by both cooperative endeavours and competitive dynamics, including earlier charges of price-fixing that prompted essential industry changes. The business also faces difficulties, including the inflow of less expensive imports and environmental concerns. Nevertheless, given that it helps to support the country's urban and rural development programmes, its strategic relevance is still undeniable. The cement industry is key to South Africa's ongoing transformation as it moves towards economic growth and infrastructure modernization.

2.4.2 Definition and significance of the cement industry in South Africa

The socioeconomic fabric of South Africa is intricately woven with the country's cement industry, which is a sizeable sector. Cement production and supply are involved, which is necessary for constructing everything from large-scale infrastructure projects to houses (Devi *et al.*, 2017:156). Consequently, the sector promotes economic expansion, creates jobs, and impacts the sustainability and quality of the built environment (Infrastructurenews, 2022). Indirect effects, such as the energization of upstream and downstream businesses, including quarrying, transportation, and building, are included in its scope in addition to direct economic contributions (Snyman, 2010).

The cement industry comprises a sizable portion of South Africa's larger construction sector. Cement greatly influences the construction industry's success, a key component of building operations ranging from roads, railways, schools, and private dwellings. It's significant to note that 4.8% of all construction sector expenditures in South Africa are allocated to cement (Africa, 2020). This statistic illustrates cement's critical role in the construction industry. Table 2-1 shows the spending in the construction industry and the % spent for each type of expenditure. In addition to being essential for carrying out various construction tasks, from building infrastructure to building homes, the purchase of cement accounts for a sizeable amount of project expenditures. Because of this, changes in the price of cement, which are influenced mainly by costs related to cement manufacturing, such as inbound transportation, can greatly impact the overall economics of building projects.

Table 2-1 Details of purchases in the construction industry, 2017 and 2020

Type of purchase	2017[1]	2020[2]	2017[1]	2020[2]	Annualised % change
	R million		% contribution		
Cement	9 242	8 809	4,8	4,2	-1,6
Sand, aggregate, gravel, pebbles, crushed stone	12 658	12 487	6,5	5,9	-0,5
Ready-mixed concrete	16 849	15 051	8,7	7,2	-3,7
Walling, roofing and flooring material (including bricks and blocks)	43 098	53 985	22,2	25,7	7,8
Reinforcing steel products (gabions, re-bars, wire reinforcing mesh and strips)	33 228	28 640	17,2	13,6	-4,8

Type of purchase	2017[1]	2020[2]	2017[1]	2020[2]	Annualised % change
Electrical fittings, equipment and supplies	31 209	33 581	16,1	16,0	2,5
Paint and lime washes (including pigments, binders and thinners)	4 992	4 025	2,6	1,9	-6,9
Asphalt and bitumen products	9 596	11 841	5,0	5,6	7,3
Fuel for off-road vehicles, machinery and trucks used in construction	10 248	9 552	5,3	4,5	-2,3
Other construction purchases	13 845	19 072	7,2	9,1	11,3
Other purchases	8 416	13 181	4,4	6,3	16,1
Total purchases and transfers-in of materials	**193 381**	**210 224**	**100,0**	**100,0**	**2,8**

Source: (Africa, 2020)

Although the South African cement sector has been hesitant to embrace the green supply chain management revolution, it continues to play a vital role in the economy of the country (Nteta & Mushonga, 2021:1). The cost of construction materials and the effects of the carbon tax are two factors that have an impact on the transportation of materials, particularly in the cement industry. (Kabundu *et al.*, 2022:158). Additionally, the means of transportation utilised to connect South Africa's major industrial centres with seaports have a significant impact on the economic effectiveness, operational costs, and fuel consumption rates (Pienaar, 2013:16). Cement is a low-value, high-volume commodity where the transportation constitutes 20-25% of the selling expense (Cementequipment.org, 2020). Figure 2-2 shows the cost breakdown of variables affecting the selling price of the cement product.

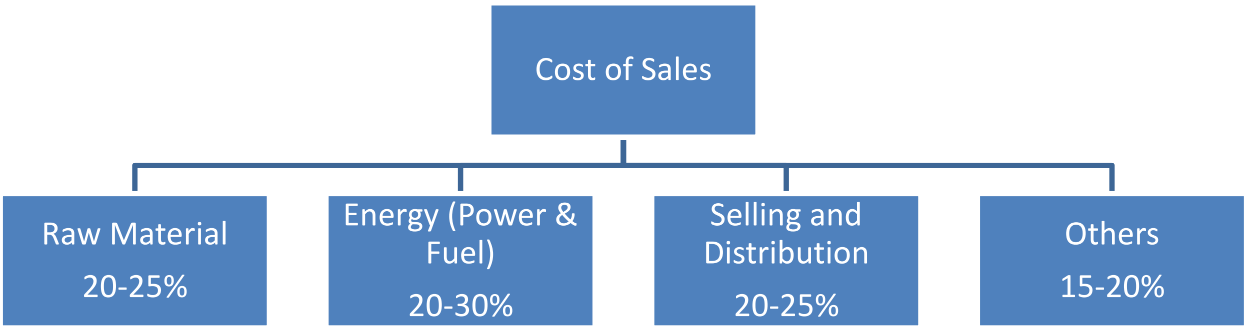


Figure 2-2 Cement selling price cost breakdown

Source: (Cementequipment.org, 2020)

2.4.3 Historical background and development of the cement industry

Since its inception in the late 19th century, the South African cement industry has developed in tandem with the nation's socioeconomic development. The sector, which was once known for its small-scale manufacturing, had a significant development in the middle of the 20th century, coinciding with the country's urbanisation and industrialisation stages (Meyer & Pretorius, 2021:12). Since 1994, six main businesses have dominated the South African cement industry: PPC Cement, AfriSam, Lafarge-Holcim, NPC, Sephaku, and Mamba cement (ACMP, 2011).

This concealed arrangement, prevalent in many nations but particularly exposed in places like Europe and South Africa, frequently involved multinational corporations (Bejger, 2012:88). Doubts surfaced in South Africa in the late 2000s when market pricing remained oddly constant among big brands. Early in the 2010s, South African Competition Commission investigations showed evidence of price fixing and market segmentation among major businesses, including PPC, AfriSam, Lafarge, and NPC Cimpor (Theron & Van Niekerk, 2017). The disclosure of this cartel upended the status quo in the cement sector, leading to penalties, legal action, and a stronger need for openness and regulatory control. Such cartels also have socio-political ramifications, given that they frequently maintain power imbalances in already concentrated businesses. They increase consumer prices and restrict entry to the market for fresh rivals.

Technological developments, changes in consumer demand, the removal of the cement cartel and regulatory adjustments have all impacted the industry's growth (Govinda *et al.*, 2016:309). Furthermore, it significantly contributed to important infrastructure projects and urban development, which helped construct the nation.

2.4.4 Current state of the cement industry in terms of production, consumption, and market trends

The South African cement industry is now dynamic and resilient as it navigates various difficulties, like rising energy costs and regulatory requirements connected to environmental sustainability (Lowitt, 2020). Despite these challenges, the sector maintains constant output to meet local demand and serve select regional market segments. Consumption patterns reflect the economic pulsations of the country, with public infrastructure investments and rising housing demand having a significant impact (Lehne & Preston, 2018).

When it comes to market developments, there is a clear rise in consolidation operations, driven by foreign corporations' desire to take advantage of the potential South African market (Morris *et al.*, 2021:3). This development highlights the industry's potential and the worldwide community's faith in its chances for continued expansion. The nation's continuous infrastructure development is one of the main trends in the South African cement industry (EMR, 2022). To promote economic growth and alleviate historical injustices, the government has given infrastructure development projects, such as roads, bridges, ports, and housing, a top priority. These infrastructure projects drive the demand for cement since cement is a crucial element in construction projects (EMR, 2022).

Cement demand is predicted to rise significantly by 2050, from 4.6 Gt/yr in 2015 to between 6 and 13.5 Gt/yr (Meyer & Pretorius, 2021:10). Cement has become a must-have for infrastructure construction, as well as a catalyst for global connectivity and a lifeline for local growth. Cement is a low-value commodity with a large weight, and transporting it by land can cost up to 30% of the product price (Meyer & Pretorius, 2021:12).

2.5 Transportation in the cement industry

The cement industry depends heavily on transportation since it links the acquisition of raw materials, manufacturing procedures, and final delivery to the end consumer. Strong and effective transportation networks are required due to the logistical difficulties involved in moving heavy resources like gypsum, clay, and limestone to manufacturing plants and then delivering the completed product to different regions of the nation.

2.5.1 Challenges and considerations specific to inbound transport in the cement industry

The cement industry has several challenges with inbound transport (Meyer *et al.*, 2018:26). Managing raw material supply fluctuation caused by weather, seasonal changes, and supplier dependability is one of the main issues (Fourie, 2023). These might cause delays in the transit timetable, resulting in production inefficiencies.

Another significant obstacle is the cost of transportation (Odunjo, 2020). The total cost of transportation can change dramatically depending on changes in fuel prices, vehicle maintenance expenses, and labour costs (Izadi *et al.*, 2020:2). To retain cost effectiveness, cement manufacturers must constantly review and improve their transport processes.

The environmental effects, such as emissions, must be considered during the incoming shipping operation (Ige *et al.*, 2022:2708). Transportation-related emissions add to the cement industry's overall carbon footprint. Examining cleaner and more sustainable transportation methods is necessary since cement firms are under growing pressure to minimise these emissions.

Another critical factor is safety (Bruno *et al.*, 2023). Raw material transportation frequently entails using large trucks and might be unsafe. As a result, it is crucial to follow strict safety guidelines to avoid accidents and guarantee the welfare of the transport industry employees. Various safety regulations control how transport can be utilised; the government controls their regulations. Industry and company policies refine these regulations for the company's specific needs.

Labour constraints impeded inbound transportation, particularly in industries like cement that demand continuous operations or specialised expertise. Companies must manage the complexity of labour regulations, worker unions, and salary negotiations and ensure they have a dependable staff capable of handling and delivering raw materials (Fourie, 2023). Strikes or labour disputes could interrupt production in many areas by disrupting the regular supply of resources (Nel *et al.*, 2018:6). The difficulties of managing labour in incoming transportation are compounded by the ongoing need to train new employees or to ensure that existing employees are skilled on safety and operational regulations.

2.6 Theoretical analysis of inbound transport cost

This section discusses several theoretical stances that the researcher may use to analyse incoming transportation costs. Additionally, the researcher will look at models and cost components that the researcher can use to analyse inbound transport costs. This section discusses the theoretical framework for analysing the costs of inbound transportation. The numerous elements that go into these expenditures, such as vehicle maintenance, fuel, and labour costs, are discussed.

2.6.1 Comparing theoretical planned inbound transport costs with actual transport costs

According to Profillidis & Botzoris (2018:5), the researcher can use a multi-step technique to compare theoretically predicted incoming transport costs with actual expenses. In the first stage, key cost elements must be identified, including fuel costs, vehicle maintenance and depreciation, labour costs, administrative overheads, and the cost of taxes and insurance.

The second step is the creation of a theoretical cost model that incorporates the variables and provides a theoretically computed estimate of incoming transportation costs (Avenali *et al.*, 2018:50). Several predetermined assumptions, including average fuel efficiency, standardised labour expenses, and fixed costs for vehicle maintenance, serve as the foundation of most models (Profillidis & Botzoris, 2018:6).

The third step entails tracking and documenting actual transportation costs in real-time, considering any unanticipated charges that could occur in the real world, such as changes in fuel prices, additional maintenance costs, fluctuating labour costs, and any unforeseen administrative costs.

2.6.2 Key factors and variables influencing inbound transport costs

Several variables and circumstances can influence inbound transportation costs (Fourie, 2023). These consist of:

- Distance and time: The travel distance and time may considerably affect the amount of fuel used, the cost of labour, and the amount of wear and strain on the vehicle.
- Fuel economy: A vehicle's fuel economy is one of the main factors affecting transportation expenses. Fuel economy is the rate at which a vehicle consumes fuel. Fuel economy is measured in litres per kilometre used.
- Prices associated with labour: Labor-related expenses, such as driver salary, overtime pay, and benefits, have a major influence on total costs.
- Depreciation rates: A tangible asset's depreciation rate is the rate in percentage at which it loses value over time. Throughout the asset's useful life, it shows the fraction of the asset's cost that is spent annually.
- Maintenance requirements: Refers to the number of downtime hours the vehicle requires to keep it in productive working condition and its associated cost.
- Vehicle condition: The physical condition of the vehicle.
- Regulation compliance: There may be expenses associated with following safety and environmental rules.
- Market turbulence: Variations in fuel prices and insurance premiums might change anticipated transportation expenses.

Several interconnected variables influence the cement industry’s inbound transport costs. The route's complexity, the vehicle's characteristics, labour concerns, external market and regulatory influences, and other factors all work together to determine the final cost incurred by the makers. Cost-effective transport logistics may be created by comprehending and strategically controlling these components, resulting in seamless and effective operations. Businesses are better positioned to improve their competitive edge and maximise profit margins when they are skilled at managing these variables and reducing possible cost inflators.

2.6.3 Previous studies and theoretical models related to inbound transport cost analysis

Diverse approaches and strategies have been developed in the field of transport cost analysis to offer insights into the factors influencing total inbound transport costs (Profillidis & Botzoris, 2018:5). These approaches include a wide range of variables thought to be crucial for efficient cost control and optimisation. The TCO model is a highly pertinent method in analysing transport costs. The TCO model's comprehensive approach to cost analysis has led to its extensive adoption (Saccani, 2017:1). The TCO model takes into account all costs associated with a vehicle's entire life cycle, providing a comprehensive picture of car ownership as opposed to concentrating on certain factors like the cost of the original purchase or ongoing fuel expenditures (Roda, 2020b:66).

The key components of the TCO model are:

- Acquisition costs: The vehicle's original purchase price makes up a significant portion of the whole cost of ownership.
- Operational costs: These consist of ongoing costs, including fuel, routine maintenance, and repairs. Notably, these expenses frequently rely on elements like the vehicle's fuel economy, required maintenance, and use patterns.
- Insurance costs: Given the inherent dangers of operating a vehicle, insurance rates account for a sizeable portion of TCO.
- Depreciation costs: Depreciation, often known as value loss through time, is an important but sometimes disregarded economic factor. When replacing or upgrading vehicles, it might depend on this cost aspect.
- End-of-life costs: These costs are those related to selling or disposing of the vehicle after it has served its purpose (Roda, 2020b:66).

The TCO model's strength is in its ability to offer a long-term perspective on vehicle costs, considering both up-front and hidden expenses that may have a big influence on the finances of vehicle ownership (Roda, 2020b:67). This complete TCO strategy makes it easier to make well-informed, strategic decisions about the purchase, use, upkeep, and replacement of vehicles.

Additionally, it facilitates accurate comparison and analysis between various vehicle kinds or modes of transportation, assisting incoming transport cost analysis. The TCO model may be a powerful tool for creating realistic, practical, and efficient cost estimates and transport plans when comparing theoretical planned transport costs with actual transport costs (Roda, 2020a:20).

To better understand the intricacies of inbound transport cost analysis, previous empirical research has looked at the variables affecting transport costs in different sectors and regions (Azarnert, 2016:217). These studies frequently include an analysis of various factors, including operational effectiveness, fuel costs, labour costs, vehicle type and condition, and route and scheduling decisions to provide a more complete picture of incoming transport costs.

2.7 Cost analysis of inbound transport cost

2.7.1 Theoretical perspectives

In transport studies, researchers use a variety of cost analysis techniques, each one catering to different business requirements and levels of complexity (Izadi *et al.*, 2020:1). Basic direct operating expenses related to transportation, such as fuel, labour, and periodic maintenance, are the only costs considered under direct costing. It offers a simple analysis but might not account for all associated expenses.

By accounting for both direct and indirect expenses, full-cost accounting offers a more comprehensive perspective (D'Onza *et al.*, 2016:60). These might include expenses related to administration, depreciation, or the cost of capital—important factors that could have a big influence on the cost analysis.

TCO and activity-based costing (ABC), on the more complex end of the spectrum, offer thorough and in-depth perspectives. The TCO technique accounts for all expenses incurred throughout the life of a vehicle or transport system, from procurement to operation to disposal (Roda, 2020b:66).

ABC, in contrast, distributes expenses to certain transport-related activities (Izadi *et al.*, 2020:19). This approach can assist companies in identifying key cost drivers and potential cost-cutting opportunities.

2.7.2 Methods of cost analysis

Several theoretical models are useful tools to estimate and forecast the costs of incoming transportation. Each model offers distinctive viewpoints and methods for cost analysis, giving thorough insights into many elements of transportation expenses.

For instance, the transport costing model (TCM) calculates overall costs by considering several factors, such as the weight carried, the distance travelled, and the mode of transportation (Fauziah Che Leh & Ismail, 2018:1381). By considering these many variables, TCM makes it possible to estimate transportation costs more precisely, promoting effective resource allocation and easing strategic planning (Blaine, 2015:8).

The economic order quantity (EOQ) model has a slightly different underlying theory. Battini *et al.* (2014:147) state that the EOQ model, which is mostly used for inventory management, optimises the frequency and amount of material delivery. The ultimate goal is to find a balance that reduces the total cost of inventory and transportation, thereby increasing the cost-effectiveness of the transportation process (Liu & Nishi, 2020:1).

The ABC model explains the cost structure in more detail. ABC divides the transport process into separate activities and assigns expenses to each distinct activity involved instead of seeing the process as a single, aggregate entity (Wegmann, 2008:8) (Schulze, 2012:717). This detailed cost analysis enables focused cost control and reduction strategies by identifying high-cost locations.

The TCO model provides a comprehensive analysis of transportation expenses (Saccani, 2017:1). It accounts for a vehicle's original purchase price, continuing maintenance expenses, insurance, and potential disposal or resale value in addition to its operating costs (Visani, 2016:145). TCO assists in strategic decision-making regarding vehicle selection and lifecycle management by offering a long-term view of the expenses (Bhutta & Huq, 2002:127).

In conclusion, these theoretical frameworks and models are more than just abstract ideas. They simplify the decision-making processes connected to transport strategies, vehicle selection, route optimisation, and inventory management within the cement sector by providing powerful cost-management tools and actionable analytics.

2.7.3 Cost components

A comprehensive understanding of variable and fixed costs is integral in the theoretical estimation of inbound transport costs. The two types of costs consist of variable costs and fixed costs (Potkány & Krajčírová, 2017:732).

Variable costs are those that change in proportion to the volume of transportation (Potkány & Krajčírová, 2017:732). Notably, they include:

- Fuel costs: The cost of fuel is directly related to the distance travelled and the kind of vehicle used, considering things like fuel economy and the type of fuel (such as diesel, petrol, or electricity).

- Maintenance costs: These expenses are related to the regular maintenance and repairs needed to keep vehicles in working order. The kind and age of the vehicle, the distance travelled, and the road conditions, among other factors, can all affect how frequently and how much maintenance is required.

- Labour costs: This refers to the costs of hiring drivers and other necessary transport personnel. The number of hours worked will determine the labour cost, which is affected by the travel distance and time.

- Tyre costs: Tyre wear and tear, which is influenced by mileage, road conditions, and weight carried, calls for routine replacement and adds to continuous operating costs.

- Oil costs: The number of oil changes that will be necessary at regular intervals depends on how often each vehicle is used. Fluctuating oil prices are also a major cost factor.

Fixed costs, in contrast, are incurred regardless of the volume of transport (Potkány & Krajčírová, 2017:732). They consist of:

- Vehicle acquisition and depreciation costs: A substantial fixed cost is the initial cost of purchasing transport vehicles and the following depreciation over time. The kind of vehicle, its lifespan, use, and maintenance levels may all affect how quickly a vehicle depreciates.

- Insurance costs: These are the expenses incurred to protect the transport vehicles against possible harm, theft, or mishaps. Typically, factors, including the kind of vehicle, its value, and the perceived risk levels, affect insurance premiums.

- Regulatory compliance costs: All transportation-related operations must follow several laws and requirements, including labour rules, environmental laws, and safety standards. One of the constant expenses is the price of guaranteeing this compliance, which includes any licenses, certificates, or fines.

Numerous variables might have a big impact on the previously mentioned prices (Izadi *et al.*, 2020:4). These factors include the overall distance travelled, the method of transportation used (such as road, rail, sea, or air), the fuel economy of the vehicles utilised, the payload capacity (i.e., the most weight a vehicle can carry), the current road conditions, and any relevant regulatory restrictions. Knowing these factors is essential for precise cost prediction and for spotting possible areas for cost-cutting.

2.8 Theoretical foundation for variance analysis

The theoretical basis of variance analysis is firmly anchored in management accounting and financial analysis (Luft & Shields, 2003:203). This analytical method is guided by a number of theoretical concepts and frameworks, each contributing to improved comprehension and use of variance analysis in financial management (Dandago & Adah, 2013:62). These theoretical foundations not only direct the actual use of variance analysis, but they also improve its efficacy in discovering and understanding financial differences.

The theoretical foundations of variance analysis make it an essential management tool for monitoring, analysing, and improving financial performance (Dandago & Adah, 2013:61). Variance analysis enables organisations to make data-driven choices by allowing them to thoroughly compare actual results to preset budgets (Osei & Eum). This strategy greatly enhances resource allocation efficiency and effectiveness, helping organisations towards meeting their financial goals by ensuring that operational outcomes align with their strategic financial plans.

2.8.1 Budgeting and control

The theoretical basis of variance analysis are based on budgeting concepts, which are critical tools for planning, coordination, and control in organisations (Choge, 2016:15). This analytical technique is a systematic comparison of actual financial results to specified budgeted amounts. Such comparisons allow managers to completely evaluate organisational performance and apply corrective actions as needed, so better aligning operational operations with strategic objectives and increasing overall organisational effectiveness (Choge, 2016:14).

2.8.2 Standard costing

Variance analysis typically integrates the concept of standard costs, which is a strategy for establishing predetermined costs for products or services based on projected resource utilisation levels (Hung & Shanmugam, 2023:525). This technique provides a standard for evaluating actual expenses, allowing managers to identify and investigate variations from planned estimates. The theoretical framework of standard costing is useful in determining the core reasons of variations, allowing for more precise cost control and ongoing improvement in financial management techniques.

2.8.3 Management by expectations

According to the theory of management by exception, managers should focus on significant variations rather than consistently handling all budgeted items (Pallavi, 2023:1). This technique relies heavily on variance analysis to identify and prioritise major deviations that require further research and action. This strategy allows for more strategic resource allocation, directing managerial efforts and attention to areas that require the most essential corrective action, hence improving both effectiveness and efficiency in organisational resource management.

2.8.4 Control theory

Variance analysis that is based on control theory concepts, which state that organisations need strong ways to monitor and correct deviations from desired results (Dahal, 2022:34). Variance analysis serves as a vital control tool, comparing actual performance to budgeted forecasts, allowing for a thorough investigation into the causes of substantial disparities. This technique not only helps to discover the root causes of deviations, but it also allows organisations to improve their control systems (Dahal, 2022:35). As a result, performance management improves because organisations can respond proactively and make educated decisions to better align their operations with strategic objectives.

2.9 Previous empirical studies on transport cost

This section looks at studies that have been carried out based on actual data and observations on the cost of transportation in the cement industry. The researcher will address key conclusions, trends, and patterns from this research.

2.9.1 Case studies

A thorough examination of empirical research and case studies is particularly instructive for better understanding the practical application and potential difficulties related to the incoming transport costs in the cement industry.

For instance, a key journal article by (Storeygard, 2016:1263) addresses the problem of fuel price volatility and its associated influence on transportation costs. The researchers looked at a cement firm in Sub-Saharan Africa and gave a breakdown of how fluctuating fuel prices greatly impacted the company's transportation costs. In addition to reiterating the crucial role gasoline prices play in determining transportation costs, it highlights the need for strategic planning and risk mitigation techniques to deal with such swings (Gwilliam & Bofinger, 2011).

In another intriguing research paper, Oberhofer & Dieplinger (2014:237) examined the adverse effects of inefficient route design on transportation costs. The study centred on operations in Austria showed how poor or ineffective route design might significantly increase transport costs. Routes that don't account for traffic, distance, and road conditions can increase travel times, fuel consumption, and, thus, transportation costs. A study done by Tseng (2005:1661) emphasized the significance of careful route design and optimization for attaining transportation cost-effectiveness.

These case studies offer insightful information that is both practical and major indications of the complex dynamics and factors that determine actual transport costs in the cement industry. These research's key takeaways work as a vital link between theory and real-world industrial operations, opening the door for more effective cost- and logistical-saving methods.

2.9.2 Variables in transport cost

For efficient cost management, it is essential to have a thorough grasp of the variables that might affect differences in actual transportation costs (Izadi *et al.*, 2020:2). These variables, which are frequently complex and interconnected, can have a big impact on the cement industry's inbound logistics cost structure.

The distance travelled throughout the transportation procedure is one of the primary considerations (Potkány & Krajčírová, 2017:733). The greater the distance between the starting point and the destination, the more diesel will be consumed, the longer it will take, and the more money it will cost. The kind of transportation used significantly influences transport expenses. Trucks, trains, ships, etc., all have different operational costs, efficiency, and carrying capacities (Engebrethsen & Dauzère-Pérès, 2019:1). The decision between them can have a big impact on the cost of cement transportation per unit.

Another big cost component is the cost of fuel. Because of how unstable the world's oil markets are, changes in fuel prices can have a big impact on how much it costs to move goods. Road conditions can significantly impact transport expenses. Poor road conditions can raise the cost of transportation by causing delays, increasing fuel consumption owing to slow-moving traffic, and increasing wear and tear on vehicles.

Another crucial element is the transport vehicle's cargo capacity (Milan, 2006:34). The amount of cement that can be transported by a given vehicle can be increased, potentially lowering the cost per unit of cement transported (SteadieSeifi, 2014:13). Transport expenses are also significantly influenced by labour costs and vehicle upkeep. While labour expenses rely on driver salaries, which vary depending on skill level, geography, and market conditions, routine maintenance is essential for effective vehicle operation and can prevent expensive failures (Macharis & Bontekoning, 2004:401).

Environmental factors like the weather and traffic congestion can also unpredictably influence transportation timetables and fuel efficiency, which might change costs. Transport costs can also be impacted by shifting market factors, such as variations in supply and demand or legislative changes.

2.9.3 Comparison of previous literature

The researcher may gain a more comprehensive understanding of the variables and dynamics that affect inbound transport costs in the cement industry by comparing the results of several empirical investigations. By comparing the two, the researcher may find patterns, identify trends, and recognise outliers in the data.

Route design, for instance, was identified as a key factor of transportation cost-effectiveness in a large research by (Oberhofer & Dieplinger, 2014). The researchers emphasised the necessity of strategically and optimally choosing routes to save travel times, avoid traffic, and use less gasoline.

On the other hand, Chen *et al.* (2019) assert that the type of vehicle used and its accompanying fuel economy have a more significant impact on regulating transportation expenses. His analysis showed how choosing a fuel-efficient vehicle may significantly reduce fuel usage, leading to considerable long-term cost savings.

This comparison of data sheds light on the complex nature of transportation expenses. It underlines that although certain aspects could be more significant in each situation, the researcher cannot ignore others since they also affect the overall cost structure.

In conclusion, a comprehensive understanding of transport costs in the cement sector requires comparison and interpretation of various empirical investigations. They provide cement manufacturers with a theoretical framework and practical case studies that may help them negotiate the difficulties of their logistical operations and develop efficient cost-saving tactics. These studies also highlight areas where the research may require more study to fill in knowledge gaps or reconcile conflicting results.

2.10 Observations from the literature review

In this literature study, the researcher has covered various topics relating to incoming transport costs for the cement industry. In the specific socio-economic context of South Africa, it synthesises several theoretical frameworks, highlights the findings of empirical research, and investigates the plethora of factors impacting these costs.

Notable models have become fundamental instruments in the field of cost analysis within the area of theoretical frameworks. The TCO, ABC, EOQ and TCM are a few examples of these. The effective use of these models can optimise logistics operations and give sound cost forecasts (Storeygard, 2016) (Battini *et al.*, 2014; Roda, 2020b).

Transportation's significant influence on total operational costs in the context of the South African cement industry has emphasised the importance of an effective incoming transport system. The incoming and outward transportation phases are important in cement production, each with its own set of difficulties and factors to consider.

Concerning empirical investigations, the review offers perceptions of actual transportation expenses. These studies highlight essential variables that influence these costs, such as the volatility of fuel prices, inefficiencies in route planning, the choice of vehicle type, and cargo capacity (Storeygard, 2016) (Oberhofer & Dieplinger, 2014).

2.10.1 Identification of common trends, gaps, and discrepancies in the literature

The emphasis on strategic route planning and using fuel-efficient vehicles as the main cost mitigation techniques may be seen as a pattern across the literature. Moreover, the literature acknowledges the influence of changing fuel prices on transportation costs.

However, there are discernible gaps in the literature, particularly when examining less obvious but no less essential elements like traffic jams, bad weather, and changes in the regulatory environment. Additionally, there are not many thorough, in-depth case studies exclusively focused on the South African setting that might provide a deeper understanding of the distinctive regional factors.

The literature's discrepancies mainly occurred in how various cost-influencing criteria were prioritised. Some studies considered route planning and payload capacity, while others gave more weight to vehicle type and fuel economy. These variations emphasise the complex and multifaceted transport cost analysis, emphasizing the need for a context-specific, nuanced approach to comprehending and controlling transport costs in the cement sector.

2.11 Summary of the literature

The primary theoretical frameworks for assessing and forecasting transportation costs, including TCO, ABC, EOQ and TCM, were analysed at the beginning of the review. These models are useful tools for industrial decision-making processes, each with specific strengths and focus.

Very little scholarly literature concentrates on this topic despite the crucial role of inbound transport in manufacturing and the cement sector. Even though there have been many studies on various areas of logistics and supply chain management, there haven't been many that look at inbound transport costs in the industrial environment, especially in the cement business. There is a huge vacuum in academic knowledge of the complexity, difficulties, and tactics involved in managing incoming transport costs due to the lack of extensive, focused study. Furthermore, traditional transport cost models may fall short of accurately capturing the specifics of the cement industry due to its unique characteristics and requirements. Therefore, there is an obvious need for additional in-depth, industry-specific research to advance academic understanding and real-world applications for efficient transport cost management.

The review also sheds light on the significance of both incoming and outbound transportation in cement manufacture and the various difficulties connected with these phases. This realisation emphasises how important effective transportation planning and execution are for cost control and operational efficiency.

The empirical studies the researcher looked at provided a valuable understanding of the actual transport costs in the cement sector. The main factors that have been recognised as having a substantial impact on actual transport costs are variations in fuel prices, the efficiency and inefficiency of route planning, the significance of vehicle type, and cargo capacity.

The literature review provides a fundamental understanding of the intricacies of incoming transport costs in the cement industry. By providing background, highlighting important points, and laying the groundwork for the following case study of a cement production firm in South Africa, it builds a foundation upon which the primary research may be built. Additionally, it contributes to the more extensive scholarly discussion on transport expenses in the cement industry, advancing knowledge and guiding practice in this crucial activity area.

CHAPTER 3 RESEARCH METHODOLOGY

3.1 Introduction

The researcher used a case study approach to meet the objectives and the research questions in section 1.4. This chapter outlines the research design, data measurement tool, sample, and data analysis procedures to achieve the objectives outlined in section 1.4. The research is a financial analysis.

Saunders (2019) provides a clear framework for the different paradigms of research and created a research onion to visualise the paradigms. The researcher used the research onion to develop the study's research framework. Figure 3-1 showed that a research onion is a six-layered framework, with each layer covering a specific study area.

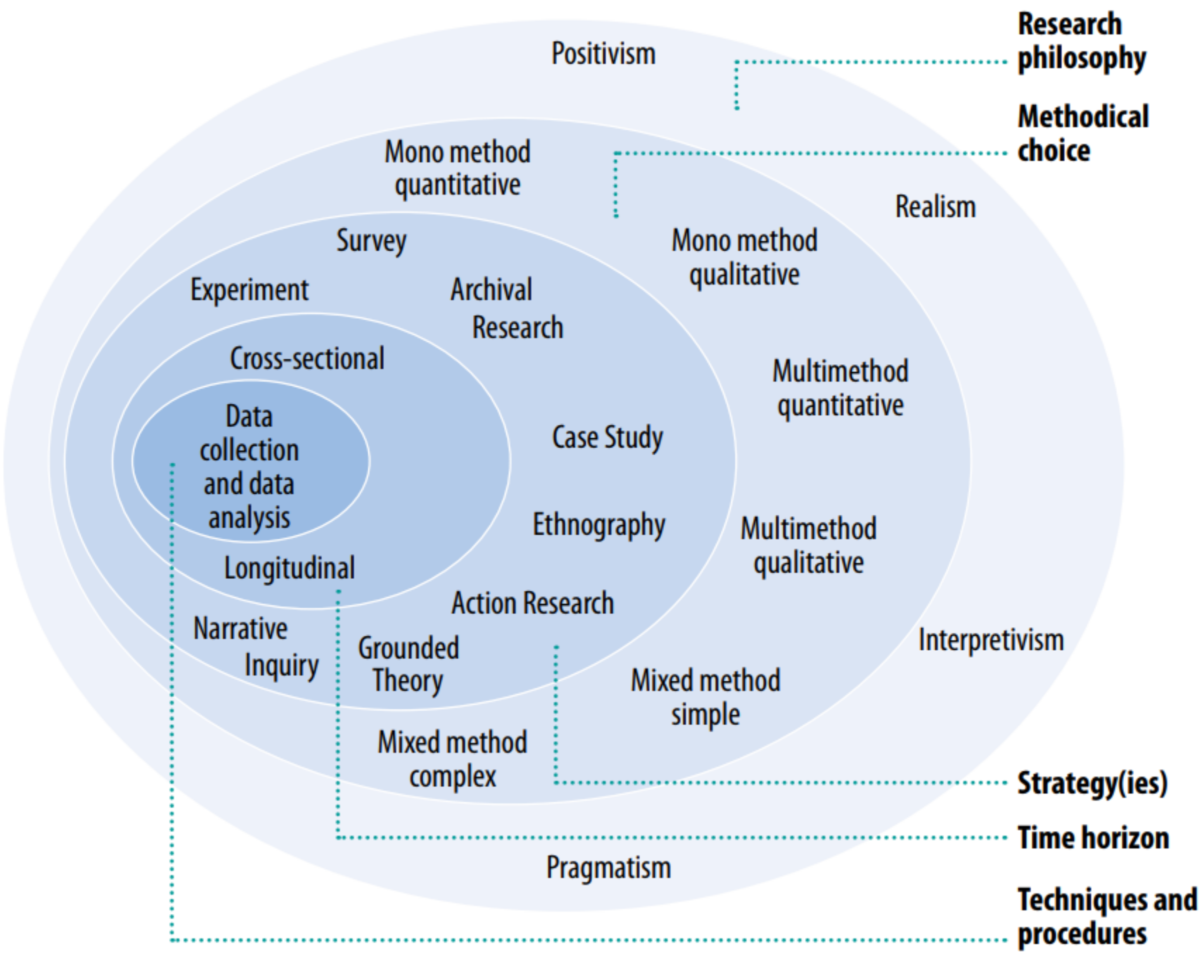


Figure 3-1: Saunders research onion

Source: (Saunders, 2019)

In approaching this research, the study began with a thorough literature review to understand the existing knowledge on the topic. This foundational step allowed the researcher to identify gaps in the current understanding and frame the research questions accordingly. With clear objectives in mind, the researcher then selected an appropriate research methodology, ensuring that it aligned with the nature of the study and the type of data required. The researcher carried out data collection, adhering to ethical guidelines and ensuring the reliability and validity of the information gathered. The researcher maintained a reflective stance throughout the process, constantly revisiting the objectives. The researcher approached the data analysis phase using a financial analysis technique that suited the data. The data analysis is the baseline for the findings and results in Chapter 5.

Figure 3-2 illustrates a summative view of the research onion paradigms utilised for the specific study. This study utilised positivism, deduction, a case study with financial analysis, and a cross-sectional approach. The researcher did the data analysis on numerical secondary data sets.

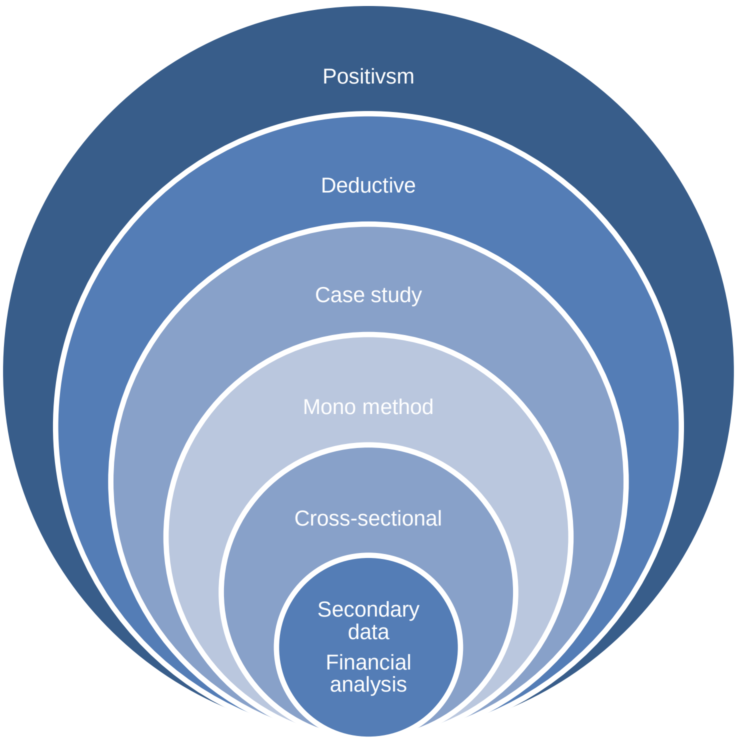


Figure 3-2: Research onion for this study

Source: (Author, 2023)

3.2 Research methodology

The researcher described the procedure and method in the next section. The researcher also described the data collection, analysis, and evaluation sample.

3.2.1 Research design

The researcher employed a case study approach, focusing exclusively on Sephaku Cement. A case study comprehensively analyses individuals, subjects, or initiatives (Hays, 2004). Given adequate diligence, investigating case study research in real-life scenarios may produce new findings (Voss *et al.*, 2002:195). The problem statement for this study supports using a theory to guide cost management rather than identifying previously unidentified components. More research might be needed by doing this study with sufficient accuracy, increasing the body of knowledge on this subject.

For this case study, the researcher chose a descriptive research design as the primary methodological strategy. By its definition, descriptive research offers a thorough and complete description of a specific topic or phenomenon (Saunders, 2009:140). It goes deeply into the complexities of the subject at issue, frequently by methodically gathering and carefully examining empirical facts to present a complete picture. Sephaku Cement is brought into perspective within the framework of this study, providing a comparison lens between the anticipated (or theoretical) and the actual inbound transportation costs related to its manufacturing. The primary objective of the descriptive research is to provide an accurate analysis of the inbound transportation expenses connected to the manufacturing process. The study compared the theoretical costs, as budgeted or estimated by the manufacturer before the financial year, with the actual costs incurred.

To achieve the study's objectives, chapter 2 is dedicated to a thorough literature review, which examines previous research and perspectives on the topic. Chapter 4 a comprehensive variance analysis, comparing the expected and actual costs related with Sephaku Cement's inbound transportation.

Using a positivist methodology, the researcher has carefully examined the empirical data gathered from the cement manufacturer to draw informed conclusions. The researcher used a deductive technique for analysing the numerical data collected from the cement manufacturer.

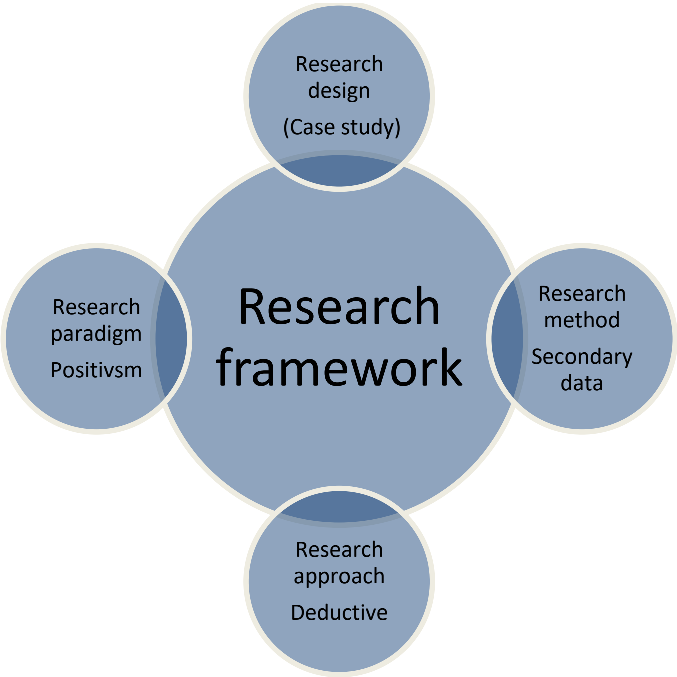


Figure 3-3: Research framework for the study

Source: (Author, 2023)

3.2.2 Research method

The researcher studied the data using a variance analytical approach to ensure accuracy and depth in the results.

A TCO model was used in this study to examine the costs of inbound transportation. The TCO model, as described in section 2.7.2, which is well known for its thorough method of collecting both direct and indirect costs, provides a full view of the financial implications of transportation operations. The TCO model, while valuable in providing an accurate insight into expenses has limitations. The model can be intricate and time-intensive, may not comprehensively account for fluctuating market conditions, and is often subjective, hinging on the assumptions made. Additionally, its accuracy is heavily reliant on the quality of data fed into the model.

- Complexity and Time-Consumption: Calculating TCO can be complex and time-consuming, requiring detailed data collection and analysis. This complexity might lead to inaccuracies if all factors are not adequately considered.

- Estimation Errors: TCO relies heavily on estimates for future costs, which can be inaccurate. Predicting expenses like maintenance, operational costs, and life expectancy of a product or asset over time can be challenging and subject to change due to market dynamics or unforeseen events.

- Changing Market Conditions: TCO analysis might not fully account for dynamic market conditions, such as fluctuating prices, technological advancements, or economic changes, which can significantly affect the total cost over time.
- Subjectivity and Bias: The process can be subjective, depending on the assumptions and values assigned by the analyst. This subjectivity can lead to biases in the TCO calculation.
- Overemphasis on Cost: While TCO provides a thorough cost analysis, it might overlook other important factors such as quality, supplier reliability, and brand reputation. This overemphasis on cost can lead to decisions that compromise other critical aspects.
- Difficulty in Quantifying Intangible Factors: Intangible factors like customer satisfaction, employee well-being, or brand value are challenging to quantify and often not adequately reflected in TCO analysis.
- Inadequate for Short-Term Decisions: TCO is more suited for long-term analysis. For short-term decisions, the model might not provide relevant insights as it emphasizes long-term cost implications.
- Risk of Oversimplification: Simplifying complex cost structures into a single TCO figure can sometimes lead to overlooking specific vital cost elements, especially in cases of highly complex products or services.
- Dependency on Quality Data: The accuracy of TCO analysis is highly dependent on the quality of the data used. Poor or incomplete data can lead to misleading conclusions.

The researcher utilised the TCO model because it accurately analyses all related expenses, providing an overall picture of the costs associated with inbound transportation. The researcher has built an Excel model to calculate the actual costs spent throughout the fiscal year. This model was populated with the initial budget and the actual cost to compare and analyse the data. A key variable is the distance travelled by the vehicles due to production requirements, the model recalculated the initial budget cost in accordance with the actual distances travelled to create a revised flexible budget to accurately compare costs. The key variables together with the total inbound transport cost was compared and analysed with the revised flexible budget and the actual cost incurred.

For Sephaku Cement, this model is beneficial for collecting and analysing all direct and indirect expenses related to the inbound transportation of cement manufacture. The researcher deconstructed costs into specific variables before using the TCO model in Excel. The TCO model identifies costs incurred. The data utilised by the TCO model was acquired through financial statements, budget statements and management reports provided by Sephaku Cement.

Using the Excel TCO model enabled a comprehensive and in-depth study of the data, resulting in data-driven and informative research results. The utilisation of the TCO model enabled the researcher to analyse the actual cost incurred by Sephaku Cement against the estimated cost. The model also provided insight into the factors contributing to differences between the estimated cost and the actual cost. By utilising the TCO model the researcher was able to give accurate recommendations to Sephaku Cement regarding inbound transport costs.

3.2.3 Population and sample

A study population represents the complete group of individuals or elements about which the researcher intends to draw conclusions, encompassing the entire set of relevant variables (Blumberg *et al.*, 2014). It is impractical to research the whole population of cement manufacturers because of the industry's size and variety. As a result, the researcher chose one company, which is a subset of the population. The subject of the case study is an organisation in South Africa, Sephaku Cement, one of the top 10 cement manufacturers in South Africa (Topcementcompanies, 2023). Sephaku Cement producers roughly 26% of all cement in South Africa (SephakuCement, 2023; Statista, 2018). The researcher examined the transportation cost in-depth to conclude the wider group.

In South Africa, Sephaku Cement is recognised as a dominant force in the cement industry. Sephaku Cement has substantial production facilities that are strategically located in key cities around the nation (Topcementcompanies, 2023). The company's success is founded on its commitment to quality and innovation. Its primary manufacturing plants are in Gauteng, North West, and Mpumalanga. These locations exhibit the company's extensive operational reach and assistance in supplying South Africa's rapidly growing urban and rural communities with the necessary infrastructure. The main manufacturing plant for Sephaku Cement is based in Lichtenburg, as illustrated in Figure 3-4.

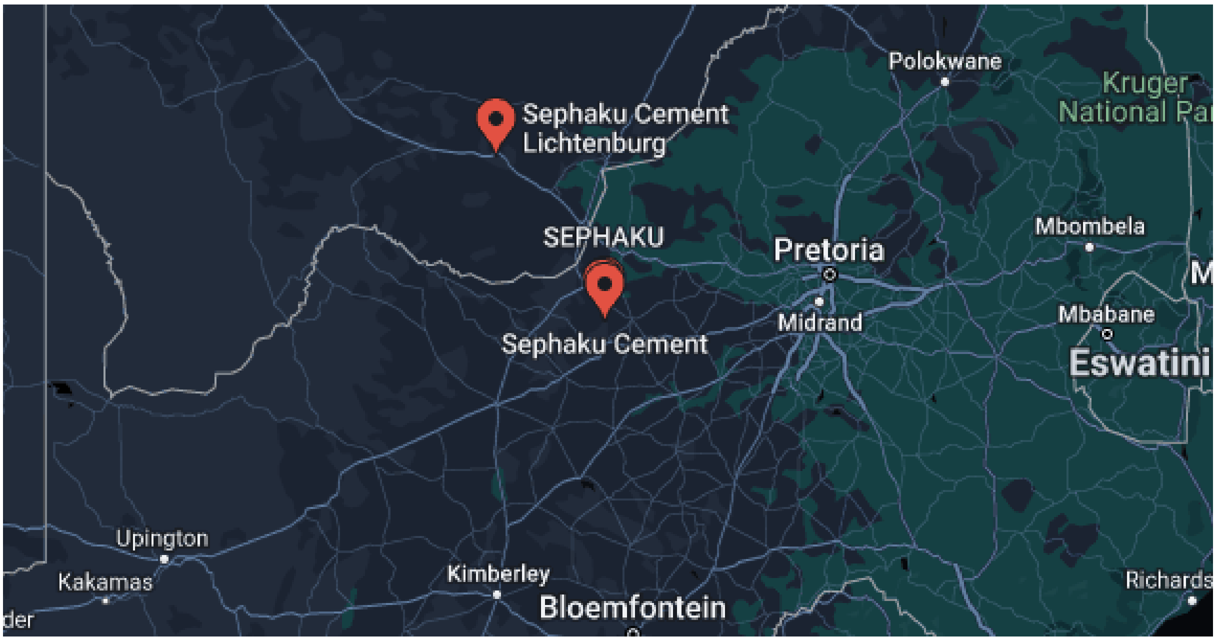


Figure 3-4: Sephaku cement manufacturing sites

Source: (Google, 2023)

Sephaku Cement transports the raw material with trucks to the Lichtenburg site, where cement manufacturing occurs and the final product is distributed. The manufacturing of cement involves several essential phases. Initially, raw materials are obtained and transported directly to the manufacturing site from the suppliers. When on-site, these materials are prepared and divided into various silos, each of which is reserved for specific types of cement. The finished cement product is effectively conveyed to clients after production, making it accessible for purchase and consumption. The site's location was selected to be central to all inbound raw material locations (Fourie, 2023). Figure 3-5 visually illustrates the process of cement manufacturing.

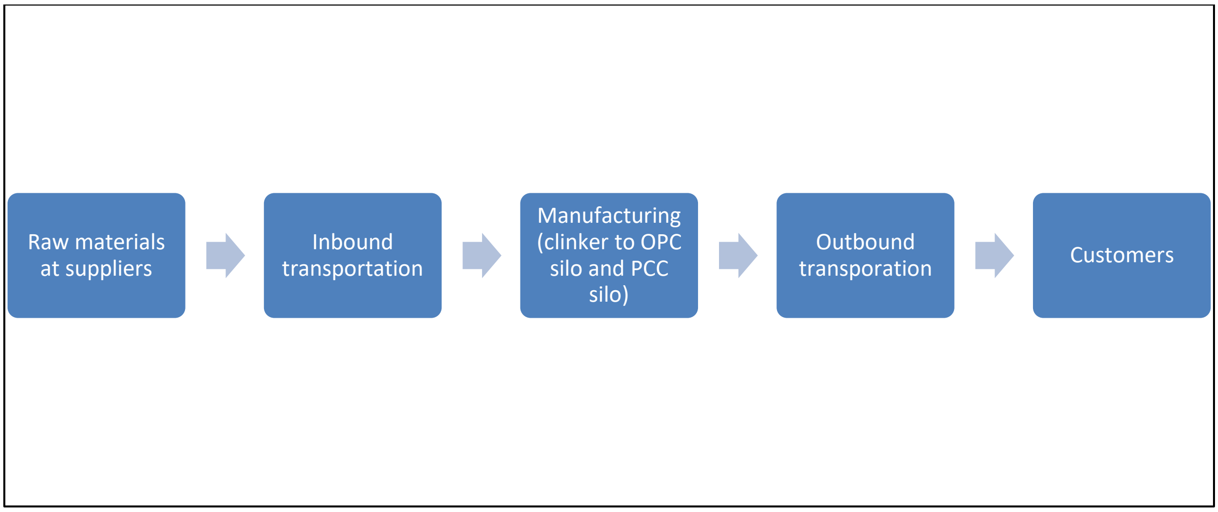


Figure 3-5: Cement manufacturing process flow

Source: (Author, 2023)

The sample is the process of choosing particular data sources for collecting data that are pertinent to achieving the research objectives (Gentles *et al.*, 2015:1781). This study focuses on the second phase in the process, namely all the costs associated with transporting the raw materials from the suppliers to the manufacturing plant. The data collection consists of budgeted and actual data relating to inbound transportation collected from the company under investigation to compare costs.

3.2.4 Data collection

The procedure of gathering data is an essential part of any research project since the validity and dependability of the conclusions directly depend on the quality and correctness of the data (Downing, 2003:831). The researcher chose a digital strategy to guarantee easy access to and organisation of the data required for this research. The researcher, in collaboration with Sephaku Cement, identified the relevant general ledger accounts that should be utilised for the study. These identified general ledger account information was collected from the financial statements and budget statements from Sephaku Cement. By utilising identified general ledger accounts, the data collected was reliable and accurate throughout the analysis. The actual distance travelled was obtained from monthly management reports for Sephaku Cement. The following general ledger accounts were utilised from the profit and loss statement and the budget statement.

- Transport Fuel
- Maintenance operational

- Maintenance washing
- Maintenance excess
- Depreciation
- Maintenance tyres
- Unsurance vehicles
- Driver wages and salaries
- Interest
- Insurance – Workman's compensation
- Transport – Toll fees
- Admin fee – Equestra
- Tracking fee – Equestra
- Personal protective equipment

The budget for the financial year 2021 and the monthly financial statements for 2021 for Sephaku Cement were uploaded to a Google Drive folder on 28 July 2023 by Mr D Fourie, Transport Manager Sephaku Cement. Mr Fourie only shared this Google Drive folder for access by the researcher, supervisor, and manufacturer to maintain privacy and restrict access. The researcher obtained the following information from the cement manufacturer using Google Drive as a platform for sharing.

- Financial year 2021 budget.
- Transport KPIs for 2021
- Fuel consumed per driver and truck for 2021
- Tyre expenditure for each truck in 2021
- Audit and risk reports for 2021
- Maintenance cost per truck for 2021

- Truck utilisation for 2021
- Monthly financial reports from January 2021 to December 2021

Sephaku Cement provided data for each month of the financial year 2021. Mr Fourie also supplied additional data like fuel prices and toll gate fees to track the actual spending.

3.2.4.1 Utilising Google Drive as a hosting platform

The researcher retained and organised all relevant financial reports using Google Drive, a cloud-based storage service. This platform not only made sure the data remained safe and available, but it also made sharing and collaboration simple, enabling as-needed real-time changes and modifications.

3.2.4.2 Financial reports

The financial reports served as the foundation of this research, and the researcher downloaded the reports from the manufacturer's financial system (SAP). This system offered an accurate and complete dataset since it served as the principal repository for Sephaku Cement's financial transactions and records. The reports provided a detailed look at the organisation's operations and performance and a wide range of financial data, statistics, and comprehensions.

Only costs directly related to inbound transportation were analysed to compare the study's budget and actual transport cost. Sephaku Cement allocated these actual costs to specific general ledger accounts in the enterprise resource planner (ERP) systems applications and products in data processing (SAP) software. This study did not analyse transport costs unrelated to inbound transportation and unforeseen expenses. The study started with the annual budget to perform the comparisons.

CHAPTER 4 RESULTS AND DISCUSSION

4.1 Annual budget

Budgeting is one of the most essential components of efficient financial planning and management. This prepared budget is a detailed financial plan created to project the anticipated expenses for the 2021 financial year. The budget assists in guiding Sephaku Cement to match resources with organisational goals by acting as a strategic tool and a financial guideline. The total budget provides a clear picture of the financial trajectory by comparing expected expenses and revenues, which makes proactive decision-making, resource allocation, and performance review possible.

In compiling the 2021 inbound transport budget, Sephaku Cement forecasted the total quantity of raw materials transported for production. Using this total quantity, Sephaku Cement created a monthly average and used this as the basis for the monthly budget amounts. The expected quantity of raw material transported per month amounted to 50 750 tons, consisting of 25 375 tons of clinker and 25 375 tons of additional raw materials (SephakuCement, 2020). All tonnage is expressed in 000' tons.

4.1.1 Assumptions

Sephaku Cement made the following assumptions while drawing up the budget for 2021.

- The number of working days a month is 25, totalling 300 days for the year.
- The estimated quantity of raw material required to be transported was 609 000 tons per annum (tonnage expressed in 000' tons).
- The fuel price in January 2021 was R 14.67, and from February to December, it was R15.06.
- Driver salaries will increase by 7.5% in March 2021.
- The number of drivers will be 71.
- The fuel consumption of the vehicles will be 2 km/l.
- Sundry and maintenance costs to increase by 4.6% to correlate with the current Consumer Price Index (CPI).

Sephaku Cement compiled the budget using the assumptions mentioned above. Sephaku Cement did not employ a standard costing system for budgeting. Sephaku Cement used the budget to compare and analyse the actual spending for the year against the budgeted amounts. Table 4-1 below illustrates the different variable costs as budgeted for in the 2021 budget. The variable costs budgeted for were operational expenses, washing, excess, fuel, tyres, tollgate fees, driver's salaries, interest on lease agreements, Equestra administrative cost and tracking, workman’s compensation (WCC) insurance, personal protective equipment (PPE) and other insurance expenditures. With reference to Table 4-1, it was evident that the company did not work on a flexible budgeting system where the activity per month was recognised. The company budgeted for the financial year and then divided the total into a per month fixed amount. To analyse the budgeted cost accurately against the actual cost, the researcher recalculated the budget by utilising the actual distance travelled for the year, Table 4-2 illustrates this.

Table 4-1: Initial budgeted variable costs for 2021

Month	Operational	Washing	Excess	Fuel	Depreciation	Tyres	Tollgate fees	Driver Salaries	Interest on lease agreement	Equestra Admin	Equestra tracking	WCC insurance	PPE	Insurance
Jan	R905 707	R24 058	R294 820	R4 795 247	R720 000	R570 874	R195 220	R1 975 630	R176 100	R116 400	R71 437	R35 404	R0	R131 772
Feb	R905 707	R24 058	R294 820	R4 922 728	R720 000	R570 874	R195 220	R1 975 630	R176 100	R116 400	R71 437	R35 404	R65 000	R131 772
Mar	R905 707	R24 058	R294 820	R4 922 728	R720 000	R570 874	R200 053	R2 196 514	R176 100	R116 400	R71 437	R35 404	R55 000	R131 772
Apr	R905 707	R24 058	R294 820	R4 922 728	R720 000	R570 874	R200 053	R2 196 514	R176 100	R116 400	R71 437	R35 404	R0	R131 772
May	R905 707	R24 058	R294 820	R4 922 728	R720 000	R570 874	R200 053	R2 196 514	R176 100	R116 400	R71 437	R35 404	R50 000	R137 114
Jun	R905 707	R24 058	R294 820	R4 922 728	R720 000	R570 874	R200 053	R2 196 514	R176 100	R116 400	R71 437	R35 404	R0	R137 114
Jul	R905 707	R24 058	R294 820	R4 922 728	R720 000	R570 874	R200 053	R2 196 514	R176 100	R116 400	R71 437	R35 404	R0	R137 114
Aug	R905 707	R24 058	R294 820	R4 922 728	R720 000	R570 874	R200 053	R2 196 514	R176 100	R116 400	R71 437	R35 404	R0	R137 114
Sep	R905 707	R24 058	R294 820	R4 922 728	R720 000	R570 874	R200 053	R2 196 514	R176 100	R116 400	R71 437	R35 404	R0	R137 819
Oct	R905 707	R24 058	R294 820	R4 922 728	R720 000	R570 874	R200 053	R2 196 514	R176 100	R116 400	R71 437	R35 404	R0	R137 819
Nov	R905 707	R24 058	R294 820	R4 922 728	R720 000	R570 874	R200 053	R2 196 514	R176 100	R116 400	R71 437	R35 404	R0	R137 819
Dec	R905 707	R24 058	R294 820	R4 922 728	R720 000	R570 874	R200 053	R2 196 514	R176 100	R116 400	R71 437	R35 404	R0	R137 819
Total	R10 868 484	R288 696	R3 537 840	R58 945 259	R8 640 000	R6 850 488	R2 390 966	R25 916 400	R2 113 200	R1 396 800	R857 244	R424 848	R170 000	R1 626 818

Source: (SephakuCement, 2021)

Table 4-2: Recalculated flexible budget amounts using the actual distance travelled

Variable cost	Initial total budget at 7 812 924 km	Cost per km	Total flexible budget at 6 933 316 km	Difference
Operational maintenance	R 10 868 484	R1.39	R 9 644 870	R 1 223 614
Washing maintenance	R 288 696	R0.04	R 256 194	R 32 502
Excess maintenance	R 3 537 840	R0.45	R 3 139 537	R 398 303
Fuel	R 58 945 259	R7.54	R 52 308 983	R 6 636 276
Depreciation	R 8 640 000	R1.11	R 7 667 277	R 972 723
Tyre	R 6 850 488	R0.88	R 6 079 235	R 771 253
Tollgate fees	R 2 390 966	R0.31	R 2 121 782	R 269 184
Driver salaries	R 25 916 400	R3.32	R 22 998 635	R 2 917 765
Interest on lease agreement	R 2 113 200	R0.27	R 1 875 288	R 237 912
Equestra administration	R 1 396 800	R0.18	R 1 239 543	R 157 257
Equestra tracking	R 857 244	R0.11	R 760 732	R 96 512
WCC insurance	R 424 848	R0.05	R 377 017	R 47 831
PPE	R 170 000	R0.02	R 150 861	R 19 139
Insurance	R 1 626 818	R0.21	R 1 443 665	R 183 153
Total	R 124 027 044	R15.87	R 110 063 619	R 13 963 424

Source: (Author, 2023)

4.2 Possible variables affecting costing

In this section, the researcher analysed the different variables. The researcher broke down the total cost into variable costs and presented them separately to promise accuracy. The actual spent data from the fiscal year 2021 serves as the foundation for this investigation. By analysing the amounts paid for each variable cost, the researcher could compare the actual and budgeted costs of inbound transport in this chapter. In the following sections, the different variable expenses were explored and analysed.

4.2.1 Fuel cost

For cement producers, fuel costs make up a sizable portion of operating expenses, and Sephaku Cement is no different. Like many other sectors, internationally and inside South Africa, the shifting fuel costs in 2021 influenced Sephaku Cement. These costs impacted immediate operations, logistics, and supply chain, particularly inbound transportation.

One of the drivers of fuel costs is the price of fuel per litre. The fuel price significantly fluctuated in South Africa in 2021, primarily because of changes in currency rates, oil prices globally, and other economic issues. Fuel costs in the country significantly rose, which had an accumulated impact on the cost of travel and the overall economy. Historically, these price increases have been affected by municipal taxes and levies, the Rand-Dollar exchange rate, and global crude oil prices (DMRE, 2021). The rise in fuel costs presented difficulties for both consumers and companies, highlighting the nation's need for adequate transport infrastructure and sustainable energy solutions (Meyer, 2018:66). Figure 4-1 illustrates the budgeted vs actual fuel price for diesel 50ppm for 2021.

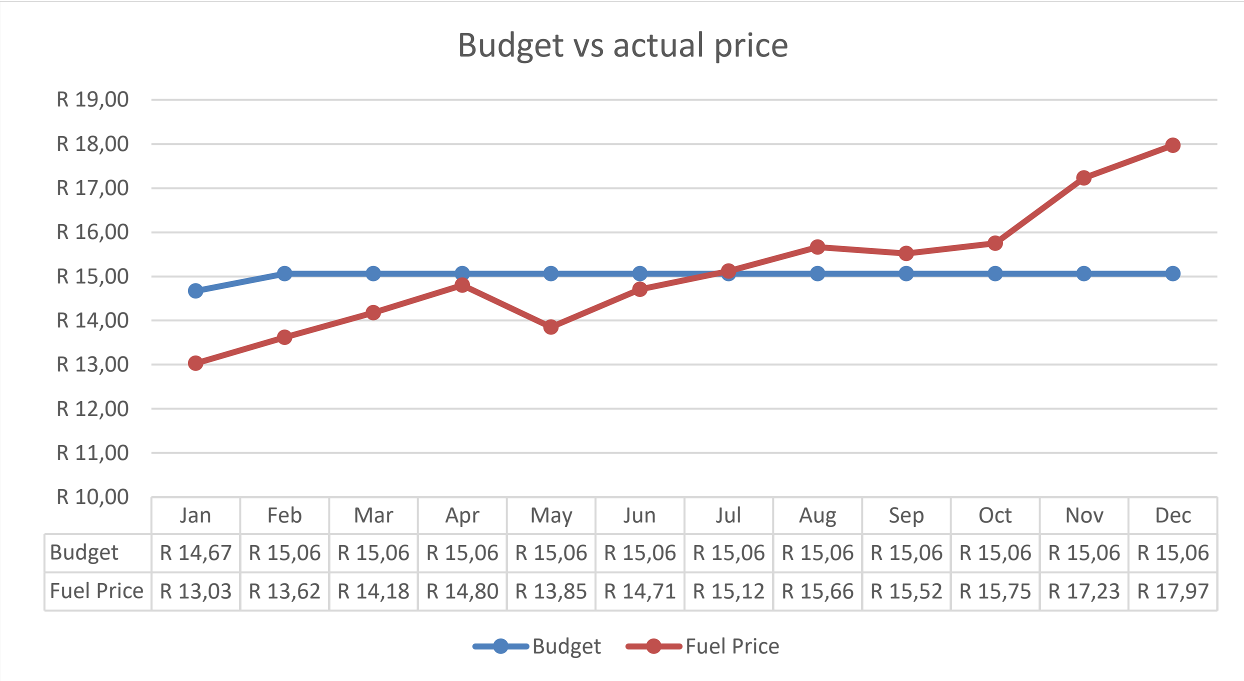
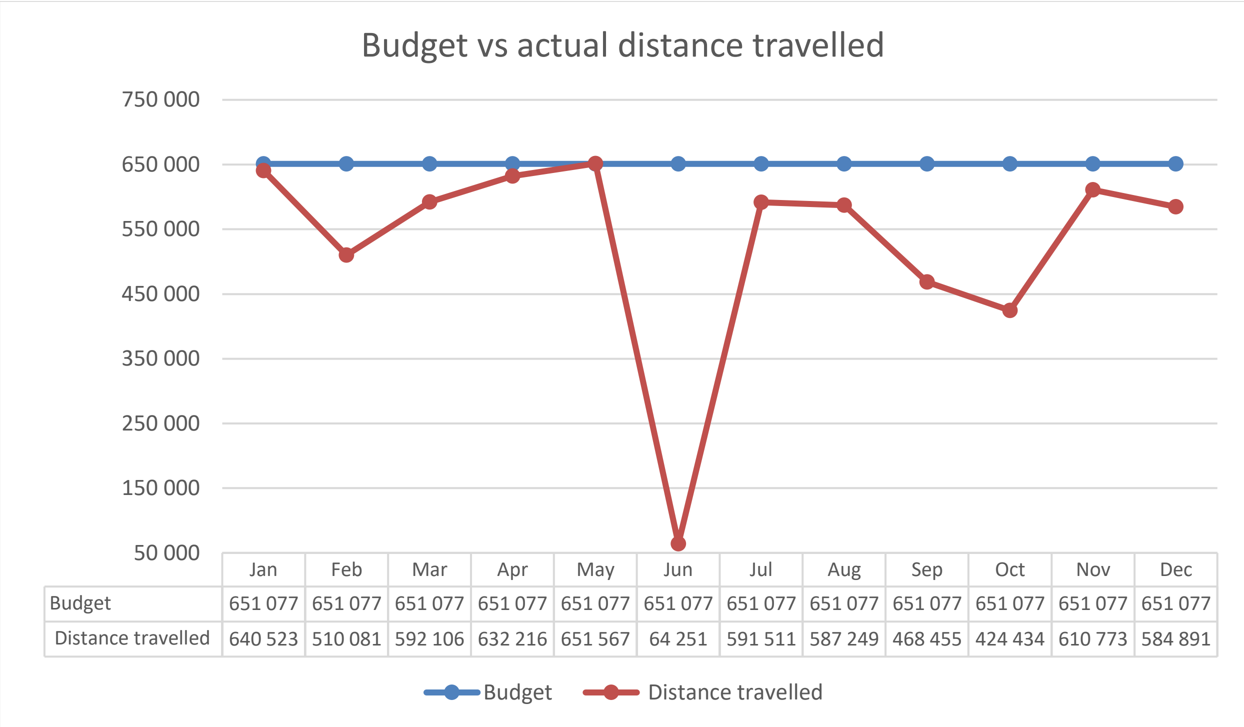


Figure 4-1: Budget vs actual fuel prices 2021

Source: (AA, 2021)

The price for diesel 50ppm grew from R13.03 to R17.97 in 2021. The fuel price increase constitutes 37.91%. The increase in fuel prices influences the actual and total cost of inbound transport to the manufacturing site. The fuel price is a government-controlled price that the market cannot control. The importance of the fuel price is seen in the manufacturer's actual monthly cost. Sephaku Cement assumed during compiling the 2021 budget that the January 2021 fuel price would be R14.67 per litre and that the average from February to December would be R15.06 per litre. From January to June, the budget amount per litre was lower than the actual fuel price per litre. From July to December, the difference in actual fuel price per litre increased against the budget fuel price per litre.

Inbound transport is critical to ensure the timely and effective product flow in logistics and supply chain management. The distance travelled is one of the drivers affecting the fuel cost of inbound transportation. The number of kilometres travelled determines fuel consumption and additional expenditures, including wear and tear on vehicles, driver compensation, and toll gate fees. Additionally, the time that transport assets, such as vehicles, are roadworthy and how frequently vehicles need repair depend on the distance travelled. Although the distance travelled impacts more than one type of cost variable, it is directly linked and seen in the fuel costs spent. The figure below shows the actual kilometres travelled in 2021. Figure 4-2 illustrates the budgeted vs actual distances travelled per month for 2021. The distances are per 000'km.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Budget	651 077	651 077	651 077	651 077	651 077	651 077	651 077	651 077	651 077	651 077	651 077	651 077
Distance travelled	640 523	510 081	592 106	632 216	651 567	64 251	591 511	587 249	468 455	424 434	610 773	584 891

Figure 4-2: Budget vs actual distance travelled for 2021

Source: (SephakuCement, 2020)

When compiling the budget, Sephaku Cement took the estimated tonnage of raw materials required for the year, calculated the total distance to travel for the year and divided it into 12 months. Throughout 2021, the budget for distance travelled, expressed in kilometres (km), was estimated to be an average amount of 651 077 km per month, resulting in 7 812 924 km for the year. The fleet's monthly distance directly correlates to the quantity of raw materials needed for manufacturing. This connection emphasises transportation's essential role in creating a stable supply chain since the demand for raw materials determines the frequency and scale of transport operations. The vehicles travel an average of 578 026 km (expressed as 000' km) every month. This average emphasises the dynamic interaction between manufacturing and the supply chain since it can change depending on the individual production demands of any given month, even if it represents the overall transportation trend. While production requirements are not the focus of this study, it is essential to acknowledge that they directly impact the distances vehicles need to transport materials. The total distance travelled was 6 936 316 km, 876 608 km less than the budget.

Manufacturing cement and raw materials transportation from the suppliers to the manufacturing site influenced the actual distance travelled. Weather, infrastructure projects and customer demand directly affect cement manufacturing. Taking the fuel spent, the fuel price and the distance travelled, the budgeted fuel cost per kilometre is R7.00/l for January and R7.53/l for the rest of 2021.

Throughout 2021, the fuel price per kilometre varied and corresponded with the monthly distance travelled. Along with the type and condition of the route travelled fuel consumption is an additional factor influencing the fuel cost per kilometre. January and October were the only months when fuel costs were close to the budget. During the first six months of the year, the actual fuel cost per kilometre was lower than the budget fuel cost per kilometre, while the actual fuel cost per kilometre from July to December was constantly higher than the budget fuel cost per kilometre.

Sephaku Cement calculated the fuel cost budget by considering the average monthly distance expected to be travelled and the projected fuel prices, both of which were key cost drivers averaged over the year. Figure 4-3 illustrates the budget for fuel spent and the actual monthly expenditure.

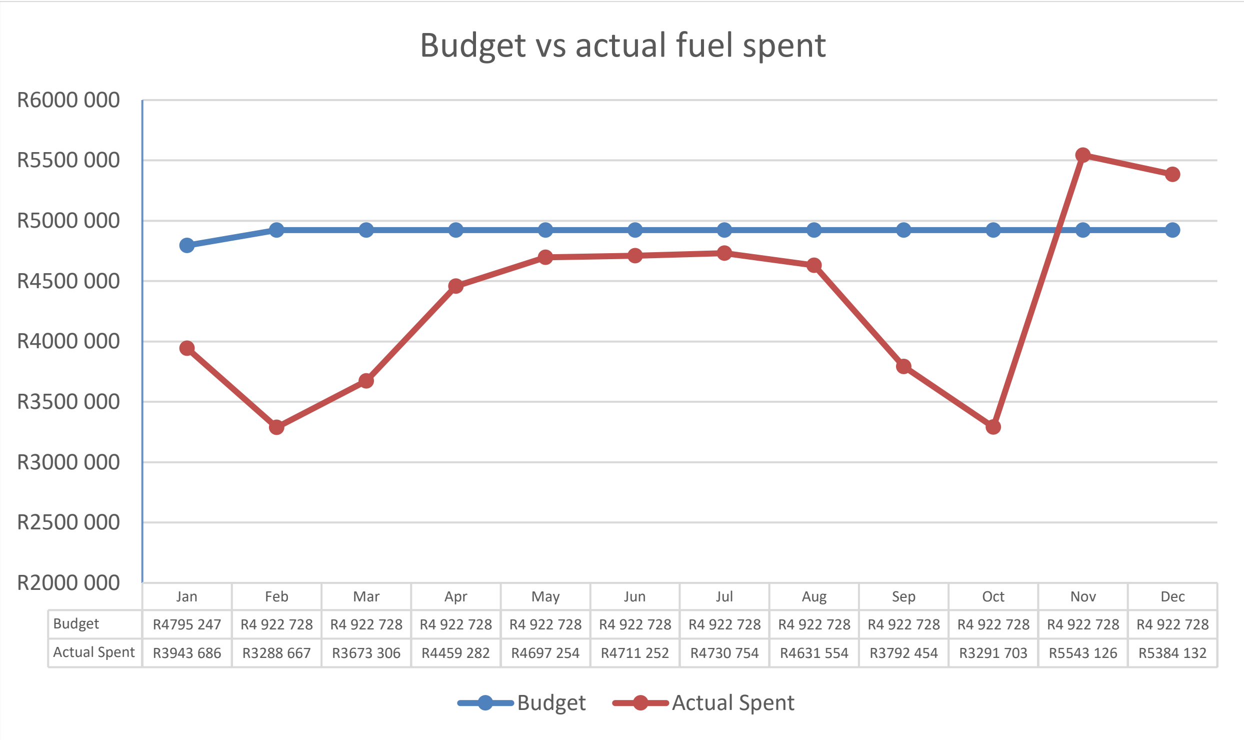


Figure 4-3: Budget vs actual fuel spent for 2021

Source: (SephakuCement, 2021, 2022a)

For January, Sephaku Cement budgeted the fuel spent to be at R 4 795 247. For the rest of the year, Sephaku Cement took the estimated fuel spent for the year and divided it equally into the remaining 11 months, resulting in a monthly budget of R 4 922 728. The total budget for 2021 amounted to R 58 945 259. The actual fuel costs fluctuate monthly and are fundamentally unpredictable. The recalculated flexible budget amounted to R 52 308 983 at R1.39 per kilometre. When the actual fuel costs are compared to the flexible budget, Sephaku Cement overspends by R 161 815 for the year. The variance is an over-expenditure of 0.31%. Table 4-3 illustrates the recalculated flexible budget for fuel costs.

Table 4-3: Fuel cost comparison

Total budgeted amount at 7 812 924 km	Variable cost per km	Flexible budget at 6 936 316 x R7.54	Actual cost	Variance	Finding
R 58 945 259	R7.54	R 52 308 983	R 52 147 168	-R 161 815	Overspend

Source: (Author, 2023)

The average actual monthly cost for 2021 resulted in R 4 345 597. The cost for the year started at R 3 943 686 in January 2021, decreased in February, and then increased in March. There was a noticeable increase in spending from April through August, which peaked in May and June. However, there was a noticeable increase in actual spending in November, which resulted in the highest fuel expenditure per month for the year, R 5 543 126. The total actual spending on fuel for 2021 amounted to R 52 147 168 for the year, an overspending of R 161 815.

4.2.2 Maintenance cost

In the context of inbound transportation, maintenance costs include various costs necessary to ensure vehicles' optimum efficiency and lifetime. The variable consists of regular maintenance like oil changes, tyre rotations, brake inspections to maintain vehicles in good condition, labour costs, and vehicle downtime. The replacement or repair of damaged parts is also covered, ranging from small items such as brake pads and tyres to larger, more expensive items such as engines and gearboxes. In South African geography, where there are a variety of road conditions, maintenance also accounts for the expenses of resolving wear and tear from rugged terrains or lengthy travel lengths.

A cost driver for operational maintenance cost is the vehicle's distance travelled. Figure 4-2 the budgeted and actual distances travelled throughout 2021, directly influencing the cost. Maintenance comprises routine running maintenance, washing of the vehicles and excess costs related to maintenance. The study included a separate analysis for tyre maintenance. The researcher consolidated the actual maintenance costs in Table 4-5.

Table 4-4: Maintenance variable cost comparison

Variable cost	Total budgeted amount at 7 812 924 km	Variable cost per km	Flexible budget at 6 936 316	Actual cost	Variance	Finding
Operational maintenance	R 10 868 484	R1.39	R 9 644 870	R 10 700 123	-R 1 055 253	Overspend
Washing maintenance	R 288 696	R0.04	R 256 194	R 309 003	-R 52 810	Overspend
Excess maintenance	R 3 537 840	R0.45	R 3 139 537	R 3 082 283	R 57 254	Underspend
Total	R 14 695 020	R1.88	R 13 040 600	R 14 091 409	-R 1 050 809	Overspend

Source: (Author, 2023)

Table 4-4 illustrates the total maintenance analysis for 2021 according to the flexible budget. Figure 4-4 shows a breakdown between the initial maintenance cost, flexible budget and the actual cost incurred during the year.

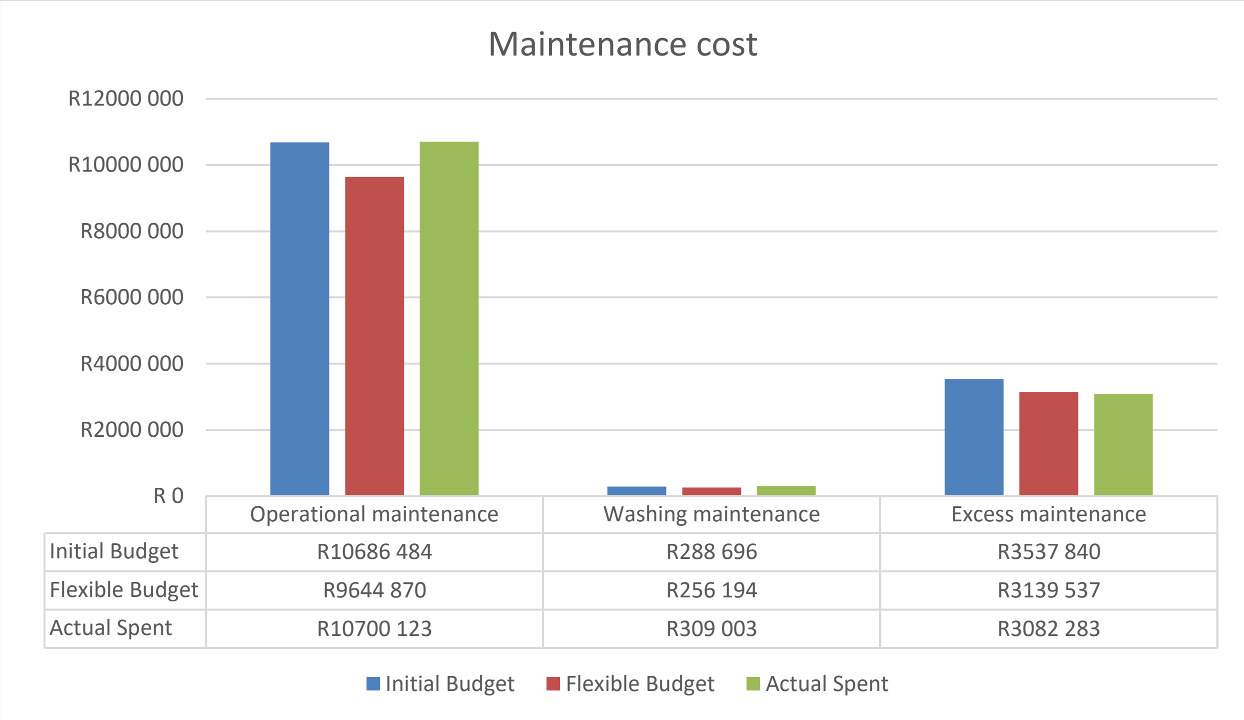


Figure 4-4: Maintenance cost chart

Source: (Author, 2023)

Figure 4-6 shows the budgeted and actual expenses for routine operational maintenance during 2021.

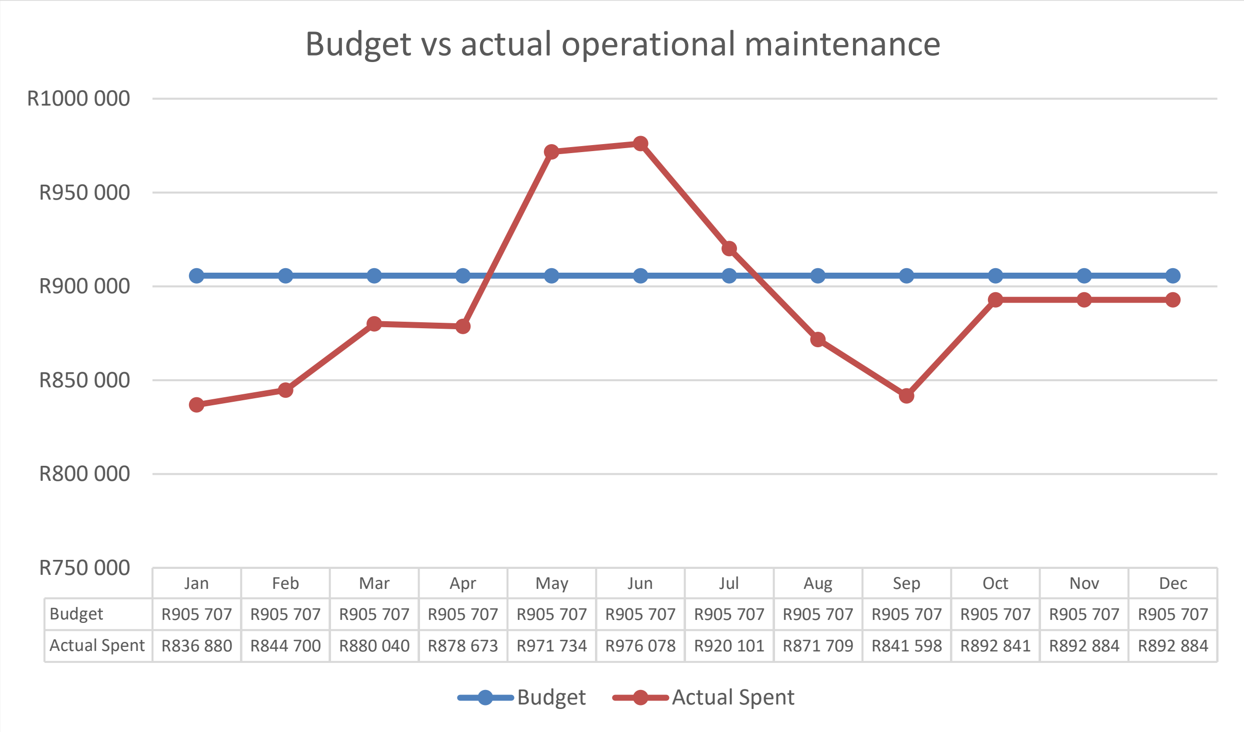


Figure 4-5: Budget vs actual operational maintenance spent in 2021

Source: (SephakuCement, 2021, 2022a)

For the 2021 budget, Sephaku Cement took the annual estimated expenditure and divided it equally into 12 months for a monthly budget of R 90 5 707. The estimated budget for 2021 was R 10 868 484. Over the financial year 2021, the fleet's maintenance costs have seen considerable fluctuations. The actual maintenance cost for 2021 averaged R 891 677, which is R 14 030 lower than the initial budget average cost. Table 4-5 illustrates the recalculated flexible budget for operational maintenance costs.

Table 4-5: Operational maintenance comparison

Total budgeted amount at 7 812 924 km	Variable cost per km	Flexible budget at 6 936 316 x R1.39	Actual Cost	Variance	Finding
R 10 868 484	R1.39	R 9 644 870	R 10 700 123	-R 1 055 253	Overspend

Source: (Author, 2023)

The flexibility budget amounted to R 9 644 870, which is R 1 223 614 lower than the initial budget at 7 812 924km. When the researcher compared the flexible budget to the actual costs, the actual costs were R 1 055 253 higher than the flexible budget. This is a loss of 10.94% for the year.

The monthly distance or trips a vehicle drives determines how much washing maintenance is required. The kind of road surface and weather conditions might also affect the price. The longer trip distance results in longer journey times, affecting the washing and maintenance needed. The kind of road surface mainly determines the quantity of dirt and dust that develops on a vehicle. For instance, vehicles on gravel or unpaved roads are likely to become dirtier more quickly than vehicles on well-kept asphalt roads. These surfaces' roughness and loose particles can increase the amount of dust and mud splashes, particularly in damp weather.

The weather has an essential effect on washing upkeep. Rain can create muddy conditions that require more regular washing, especially on unpaved roads. On the other hand, vehicles are more prone to dust collection in windy and dry circumstances. A vehicle will frequently spend more time on the road as it travels further. A vehicle is exposed to the weather and other environmental pollutants the longer it is in operation. This prolonged exposure makes washing more necessary and may also call for more thorough cleaning techniques to maintain the vehicle in good condition.

Washing maintenance is one of the lower expense variables, and the cost per kilometre illustrates this. The cost per kilometre fluctuates as the distance travelled changes during the year. The monthly cost per kilometre is higher during the dry months, which illustrates that the environment plays a role in the amount of cleaning needed.

Figure 4-6 illustrates the budgeted vs actual monthly costs of washing the vehicles in use.

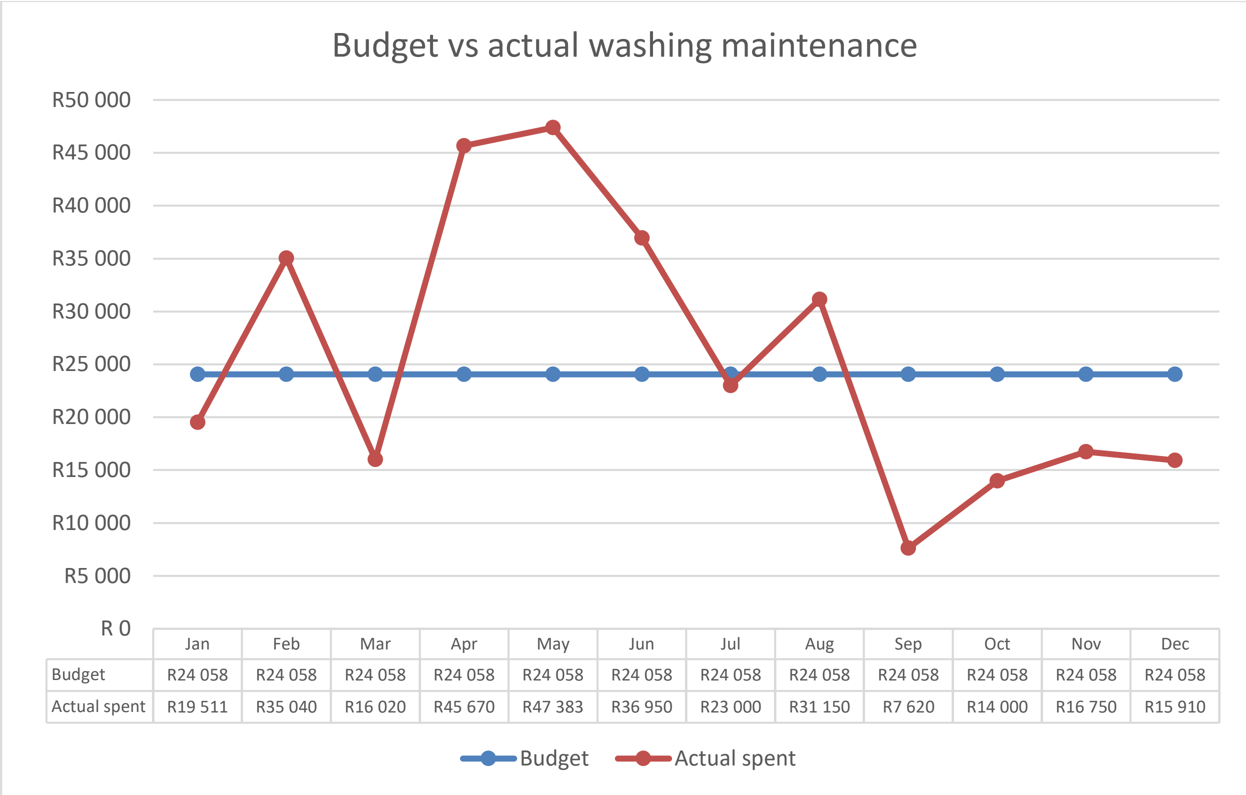


Figure 4-6: Budget vs actual washing maintenance spent in 2021

Source: (SephakuCement, 2021, 2022a)

Like the operational maintenance budget, Sephaku Cement took the estimated year spent on washing and divided it equally over the 12 months, resulting in a budget of R 24 058 per month for washing maintenance. The total budget for 2021 was R 288 696. The cost of keeping inbound transport vehicles clean and maintained throughout 2021 fluctuated throughout 2021. The actual average monthly expense for vehicle cleaning was R 25 750, R 1 692 higher than the monthly initial budget. This ongoing investment is crucial to keep the vehicles in good condition from a functional standpoint and in terms of presentation and impression made on clients and partners. Regular washing can also extend the life of those vehicles by minimising the buildup of dirt and impurities that might eventually cause corrosion or other problems to the vehicles. The total yearly expenditure on washing maintenance came to R 309 003. Then, the researcher compared the flexible budget to the actual costs for the year, and Sephaku Cement incurred a loss of R 52 810. This is a variance of 20.61% higher than the flexible budget. Table 4-6 illustrates the analysis of washing maintenance.

Table 4-6: Washing maintenance comparison

Total budgeted amount at 7 812 924 km	Variable cost per km	Flexible budget at 6 936 316 x R0.04	Actual cost	Variance	Finding
R 288 696	R0.04	R 256 194	R 309 003	-R 52 810	Overspend

Source: (Author, 2023)

Excess maintenance is the cost related to insurance claims for damages and repairs done through the vehicle's insurance. On concluding the budget, Sephaku Cement took the actual spending for 2020 and adjusted it for 2021. The total amount was distributed evenly through the 12 months. Several elements can drive this cost, and the distance travelled, as per Figure 4-2, directly influences the excess maintenance cost. The more the vehicle travels, the higher the risk of breakdowns and repairs. These vehicles transport heavy loads of raw materials over long distances in various road conditions. The more kilometres a vehicle travels, the more physical wear and tear it sustains.

Due to the shorter distances driven than anticipated, the actual cost per kilometre is less than the projected cost per kilometre. February, March, and May saw a higher actual cost per kilometre. Sephaku Cement can charge excess maintenance after the actual damage happened. The average initial budgeted cost per kilometre comes to R0.45, and the actual spent average comes to R0.44. The slight difference still influences the total cost over a total distance of 7 193 047 travelled in 2021.

Figure 4-7 illustrates the budget and total monthly expenses for excess maintenance in 2021.

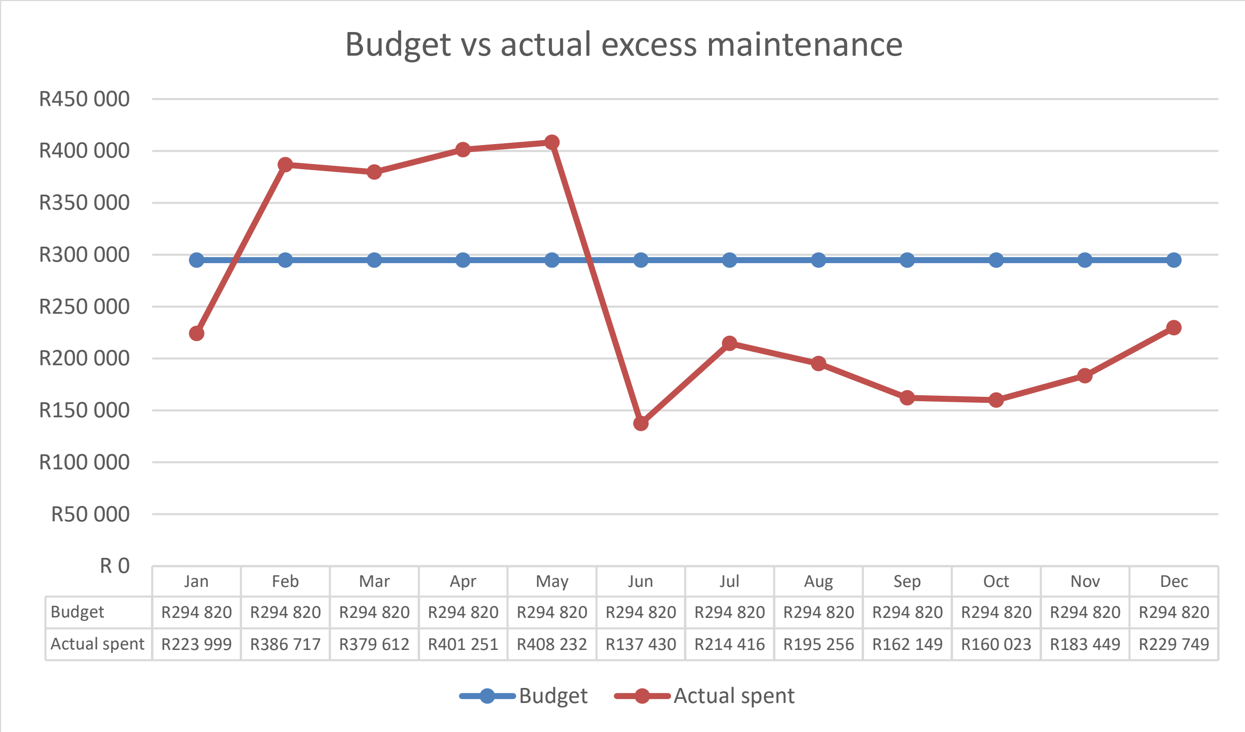


Figure 4-7: Budget vs actual excess maintenance spent for 2021

Source: (SephakuCement, 2021, 2022a)

Throughout 2021, the monthly budget was R 294 820, with a total budget of R 3 537 840 for 2021. The average actual spent amounted to R 256 857. Excess costs result from repairs done through the insurer and are a result of unanticipated maintenance. These repairs include replacing parts that wear out faster than intended or upgrading to improve vehicle performance. It also emphasises the necessity of strict vehicle monitoring and prompt actions to reduce future excesses. The actual total spent for 2021 amounted to R 3 082 283. Table 4-7 illustrates the analysis done on excess maintenance. The flexible budget of R 3 139 537 is R 57 254 lower than the actual cost, resulting in a savings of 1.82% for the year.

Table 4-7: Excess maintenance comparison

Total budgeted amount at 7 812 924 km	Variable cost per km	Flexible budget at 6 936 316 x R0.45	Actual cost	Variance	Finding
R3 537 840	R0.45	R 3 139 537	R 3 082 283	R 57 254	Underspend

Source: (Author, 2023)

4.2.2.1 Operational maintenance cost

The highest operational maintenance actual cost was recorded in May 2021 at R 971 734, while the lowest actual cost was in September 2021 at R 841 598. The total operational maintenance actual cost for the year amounted to R 10 700 123, R 1 055 253 higher than the flexible budget.

4.2.2.2 Washing maintenance cost

The month with the highest actual expenditure on washing maintenance was April 2021, with a cost of R 45 670. In contrast, September 2021 saw the lowest washing maintenance actual cost at R 7 620. The cumulative actual cost for washing maintenance for the year was R 309 003, which is R 52 810 higher than the flexible budget.

4.2.2.3 Excess maintenance cost

February 2021 witnessed the highest actual cost of excess maintenance at R 386 717, while June 2021 had the lowest actual cost at R 137 430. The total actual excess maintenance cost for 2021 was R 3 082 283, which was R 57 254 lower than the flexible budget.

4.2.2.4 Total maintenance cost

The total actual maintenance cost for 2021 was R 14 091 409 compared to the flexible budget of R 13 040 600. The total maintenance resulted in a loss of R 1 050 809, with the actual spent 29.73% higher than the flexible.

The actual cost spend on maintenance demonstrates the extensive efforts made to maintain the fleet's operating effectiveness and cleanliness and take care of any unexpected repair needs. Total actual maintenance expenditures peaked in May 2021 at R 1 427 349. Meanwhile, September 2021 saw the lowest total actual maintenance costs at R 1 011 365. Such fluctuations across months highlight the dynamic nature of maintenance requirements and the significance of early planning and budget allocation to manage these expenses successfully.

4.2.3 Tyres

Tyres are a substantial and ongoing expense in transportation, including inbound transportation. The wear and tear on tyres are unavoidable given South Africa's expansive terrain, and the distances transport vehicles frequently travel. The tyres' quality and durability directly impact the vehicles' safety, effectiveness, and fuel efficiency. To guarantee optimum performance and avoid potential vehicle failures or accidents, routine replacements and maintenance are crucial. The type of tyre the organization selects, whether an all-terrain, highway, or speciality tyre, can also affect how much it costs, with some luxury brands or varieties fetching greater rates. Additionally, shifting market pricing, import taxes, and the availability of brands or sizes can impact the total cost of tyres.

In formulating the tyre budget for 2021, Sephaku Cement considered the total projected kilometres required during the year. The average lifespan of a tyre in terms of distance was the base for the estimate. The resultant figure was then adjusted upwards by 4.6% to account for inflation and other economic factors, in line with the CPI. This annual budgeted amount was subsequently distributed evenly across the months. It's essential to note that as the distance travelled by a vehicle increases, the frequency of tyre replacements also rises, primarily due to the safety considerations associated with the tyre's effective lifespan. As per Figure 4-2, the distance travelled directly drove the spent-on tyres for 2021.

On average, the actual cost of tyres per kilometre is less than the anticipated cost. Several variables contribute to this difference, most notably the reduced actual distances travelled than initially anticipated and the decreased number of tyre changes needed throughout the time due to the reduced wear and tear on the tyres. Proper maintenance and inspections can also reduce the cost per kilometre by increasing the tyre's lifespan.

Figure 4-8 illustrates the budget vs. the actual monthly amount spent on tyres in 2021. It also indicates how the spending per month can fluctuate.

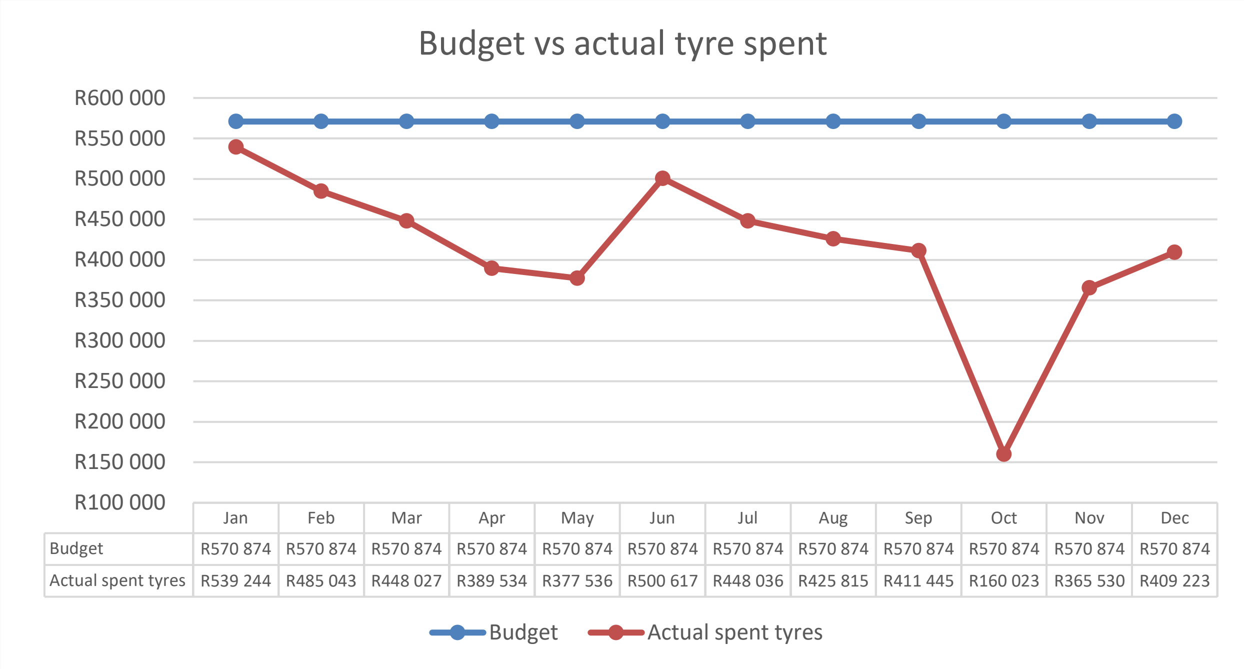


Figure 4-8: Budget vs actual tyre spent in 2021

Source: (SephakuCement, 2021, 2022a)

The actual tyre cost fluctuates monthly as the vehicle travels different distances each month. The actual spent is also affected by purchasing a new tyre or a re-treaded tyre. The total actual cost for 2021 was R 4 960 071, which is R 1 119 163 lower than the flexible budget, as illustrated in Table 4-8. This concludes with a yearly savings of 18.41%. Table 4-8 shows the recalculated flexible budget for tyre cost.

Table 4-8 Tyre cost comparison

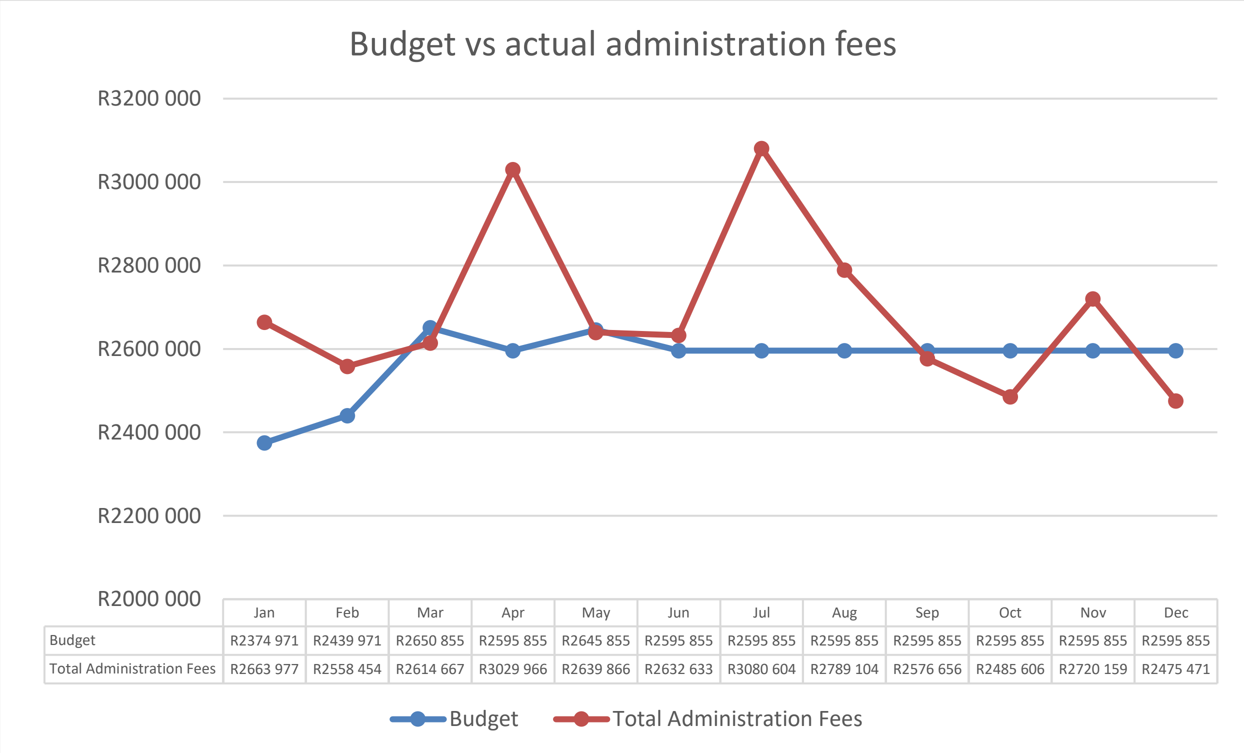
Total budgeted amount at 7 812 924 km	Variable cost per km	Flexible budget at 6 936 316 x R0.88	Actual cost	Variance	Finding
R 6 850 488	R0.88	R 6 079 235	R 4 960 071	R 1 119 163	Underspend

Source: (Author, 2023)

The flexible budget is R 771 253 lower than the initial fixed budget of 2021. During 2021, the number of new tyres purchased was 633, and 516 were retread tyres. The total actual purchases amounted to 1 179 tyres against a budget of 1 733. The reduced usage of 554 tyres during the year is accounted for by the combined usage of new and retread tyres, yielding an overall yearly savings of R 1 119 163.

4.2.4 Administration cost

In the field of inbound transportation, administrative spending accounts for variable costs due to staff fluctuation. The administration costs include driver salaries, interest on lease agreements of vehicles, Equestra administration fees, Equestra tracking fees, WCC and PPE for the drivers. Additional costs like software licences, deport costs, and depot salaries are fixed costs and not a variable in the scope of inbound transportation. Figure 4-9 illustrates the initial fixed budget vs. actual monthly expenditures on the total administration fees.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Budget	R2374 971	R2439 971	R2650 855	R2595 855	R2645 855	R2595 855	R2595 855	R2595 855	R2595 855	R2595 855	R2595 855	R2595 855
Total Administration Fees	R2663 977	R2558 454	R2614 667	R3029 966	R2639 866	R2632 633	R3080 604	R2789 104	R2576 656	R2485 606	R2720 159	R2475 471

Figure 4-9: Budget vs actual administration fees spent for 2021

Source: (SephakuCement, 2021, 2022a)

Several factors affect administrative costs in transportation, particularly fleet management. The number of drivers hired is one of the main determinants of this fluctuation. The number of drivers employed and the cost of salaries are closely related. The total wage payout rises as additional drivers are employed. This expense covers not just their base pay but also any overtime, bonuses, and other benefits that may be available by the pay plan of the organisation. The cost of workers' compensation insurance goes up in direct proportion to the number of drivers. Employees need this insurance to safeguard themselves against diseases or injuries connected to their jobs. The potential liability rises with the number of drivers on the payroll, increasing WCC expenses. As the number of drivers grows, there's a need to equip each one of them with the necessary PPE.

Different variables can break down the total administration spent. Figure 4-10 illustrates the breakdown of the total actual administration costs expenditures between the variables.

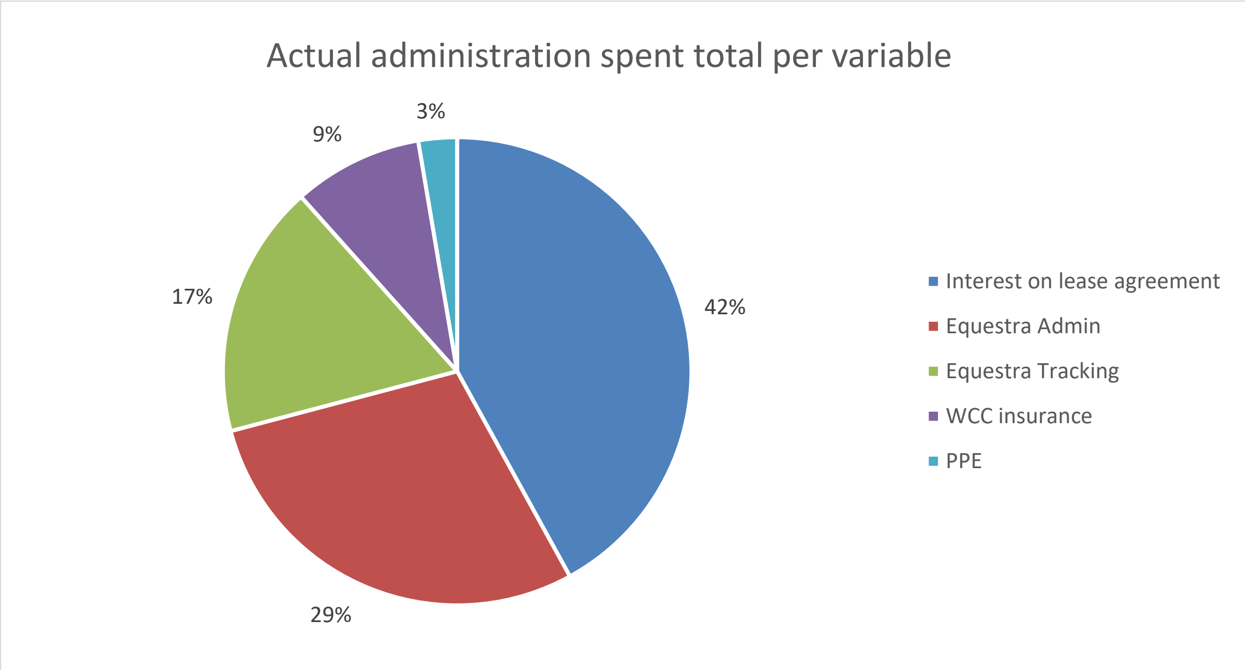


Figure 4-10 Actual administration spent per variable 2021

Source: (SephakuCement, 2021, 2022a)

Most of the total actual administration costs come from driver salaries and Equestra administration fees of 42% and 29%, respectively.

The total initial budget for administration fees was R 27 402 077 for 2021. The actual average monthly expenditure on administration fees is R 2 688 930. Table 4-9 illustrates the analysis of the different variable elements for 2021, with the recalculated budget and the actual expense incurred.

Table 4-9: Administration variable cost comparison

Variable cost element	Total budgeted amount at 7 812 924 km	Variable cost per km	Flexible budget at 6 936 316	Actual cost	Variance	Finding
Driver salaries	R25 916 400	R3.32	R22 998 635	R27 354 269	-R4 355 634	Overspend
Interest on loan agreement	R2 113 200	R0.27	R1 875 288	R2 063 754	-R188 466	Overspend

Variable cost element	Total budgeted amount at 7 812 924 km	Variable cost per km	Flexible budget at 6 936 316	Actual cost	Variance	Finding
Equestra admin	R1 396 800	R0.18	R1 239 543	R1 418 872	-R179 329	Overspend
Equestra tracking	R857 244	R0.11	R760 732	R860 024	-R99 291	Overspend
WCC insurance	R424 848	R0.05	R377 017	R439 469	-R62 452	Overspend
PPE	R170 000	R0.05	R150 861	R130 773	R20 088	Underspend
Total	R 30 878 492	R3.95	R 27 402 077	R 32 267 162	-R 4 865 085	Overspend

Source: (Author, 2023)

4.2.4.1 Driver salaries

The flexible budget for driver salaries was R 22 998 635. The highest actual cost for driver's salaries was R 2 591 626 in April, and the lowest actual cost was R 2 070 985 in October. The drivers' salaries expenditure indicates probable differences in the number of drivers employed and employee turnover. The actual driver salaries exceeded the flexible budget by R 4 355 634 for 2021.

4.2.4.2 Interest on the lease agreement

The flexible budget for 2021 was R 1 875 288. March 2021 and May 201 saw notably lower actual interest costs at R 94 624 and R 81 678, respectively. Sephaku Cement made corrections after consultations with the Risk Department. Sephaku Cement was to correct these adjustments at the year-to-date as per actual owned. The interest on the lease agreements is vulnerable to interest rate changes set out by the South African Reserve Bank. The total actual spent for 2021 was R 2 063 754, R 118 466 higher than the flexible budget for the year.

4.2.4.3 Equestra administration

Equestra administration cost is related to the contract for procuring and managing the fleet. These costs include the fuel cards used, service planning and general maintenance like battery replacements. The flexible budget for 2021 was R 1 239 543. The actual spent remained relatively stable through the year with an average of R 118 293, with the highest actual cost in December 2021 of R 120 549 and the lowest actual cost in January 2021 of R 113 878. The actual cost during 2021 changed five times. The total actual spent on Equestra administration was R 1 418 872, R 179 329 higher than the flexible budget.

4.2.4.4 Equestra tracking

Equestra tracking refers to the costs of the tracking services provided by Equestra. The flexible budget for 2021 came to R 760 732. The actual average monthly spent for tracking resulted in R 71 669. The spent fluctuates monthly depending on the number of vehicles in operation and monthly trips. In addition to the standard contract, in June 2021, Sephaku Cement acquired a fatigue management system. The actual total spent for 2021 amounted to R 860 024, R 99 291 higher than the flexible budget.

4.2.4.5 WCC insurance

WCC insurance is an insurance programme offering medical benefits and income replacement to workers who suffer illnesses or injuries sustained at work. The Compensation for Occupational Injuries and Diseases Act 130 of 1993 regulates the system in South Africa. The flexible budget for 2021 was R 377 017. The actual insurance cost was most significant in June 2021 at R 57 913 and the lowest in February at R 2 466. These variations occur due to changes in coverage, claims, or premium modifications. The total of drivers employed also plays a role in the cost per month. The actual average spent for 2021 is R 36 622. The actual total spent for 2021 was R 439 469, R 62 452 higher than the flexible budget.

4.2.4.6 PPE

PPE refers to the protective wear that drivers must wear during working hours. The flexible budget for 2021 amounted to R 150 861. PPE actual costs were high in July 2021 at R 103 431. The actual spent indicates a bulk purchase or increased safety precautions. In contrast, a few months without any PPE expenses were recorded, including April, June, and September. The actual total spent for 2021 amounted to R 130 773, which is R 20 088 lower than the flexible budget.

The following aspects can also influence the actual administrative cost spent during the year.

- Wage negotiations:

The negotiations with the union regarding wage negotiations impact the total amount actually spent on salaries. Sephaku Cement used the CPI to budget for driver salaries, which is usually lower than standard.

- Employment turnover:

The transportation industry can experience fluctuations in driver availability. Layoffs may temporarily reduce salary costs from operational changes, seasonal needs, or economic downturns. Conversely, periods of new employment, especially if there's a need for rapid hiring to meet surging demands, can increase the administrative costs associated with recruitment, training, and onboarding. These fluctuations in workforce numbers can lead to variable costs per kilometre over time.

- Efficiency considerations:

It's also worth noting that the efficiency of drivers can influence the cost per kilometre. Experienced drivers familiar with routes, traffic patterns, and vehicle handling might complete trips faster and more efficiently than newer hires. This efficiency can reduce costs per kilometre, even if their salaries might be higher due to their experience.

4.2.5 Toll gate fees

Tollgate charges are an essential component in the pricing structure of inbound transportation in South Africa. Our nation's major roadways are kept up, maintained, and improved with the help of the tolls collected at various toll plazas. These toll expenses may build up rapidly for enterprises in charge of incoming logistics, particularly when moving products across great distances between provinces. Fleet managers must include these toll costs in their planning to ensure correct transport estimates and costs.

For the 2021 budget, Sephaku Cement estimated the number of trips travelled with the anticipated tollgate fees to calculate the yearly spent. The more kilometres travelled and the more journeys a vehicle undertakes, the more frequently the vehicle passes through a tollgate. The estimated annual spent was accordingly averaged equally into the 12 months. Due to regulations changing, tollgate fees in March, January and February were kept at a lower budget. If all the vehicles are fully operational during a month, the number of possible trips amounts to 725 trips if each vehicle yields one trip a day. Sephaku Cement calculates the potential number of trips with 29 vehicles and 25 working days each month. The tonnage that Sephaku Cement can transport if each vehicle makes one trip per day is 25 375. The budgeted tonnage required is 50 750 000 tons per month, which requires vehicles to make more than one trip a day. Figure 4-11 illustrates the number of trips budgeted and the actual number of trips during 2021.

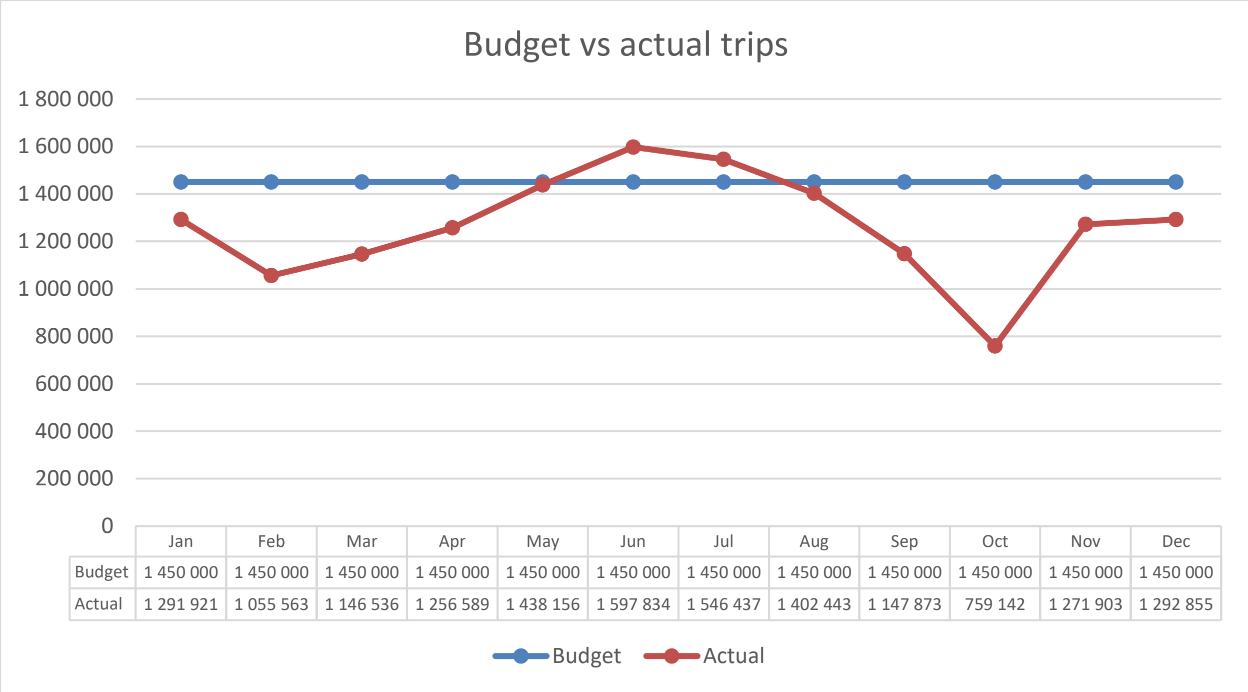


Figure 4-11: Budget vs actual trips for 2021

Source: (SephakuCement, 2021, 2022a)

The number of trips made by Sephaku Cement was lower than the budget except for June and July. The lower quantity of raw material needed for manufacturing directly links to the actual spent. This can be correlated to the distance travelled for 2021.

The cost per kilometre links to the reduced distance travelled and number of trips throughout 2021. Although monthly fluctuations cannot be only attributed to the number of trips travelled, the route taken also plays a role. Different routes have different tollgate fees associated with them.

Knowing the most recent toll rates and potential frequent user discounts might help budget and plan trips. Figure 4-12 illustrates the budget vs actual tollgate fees for the year per month.

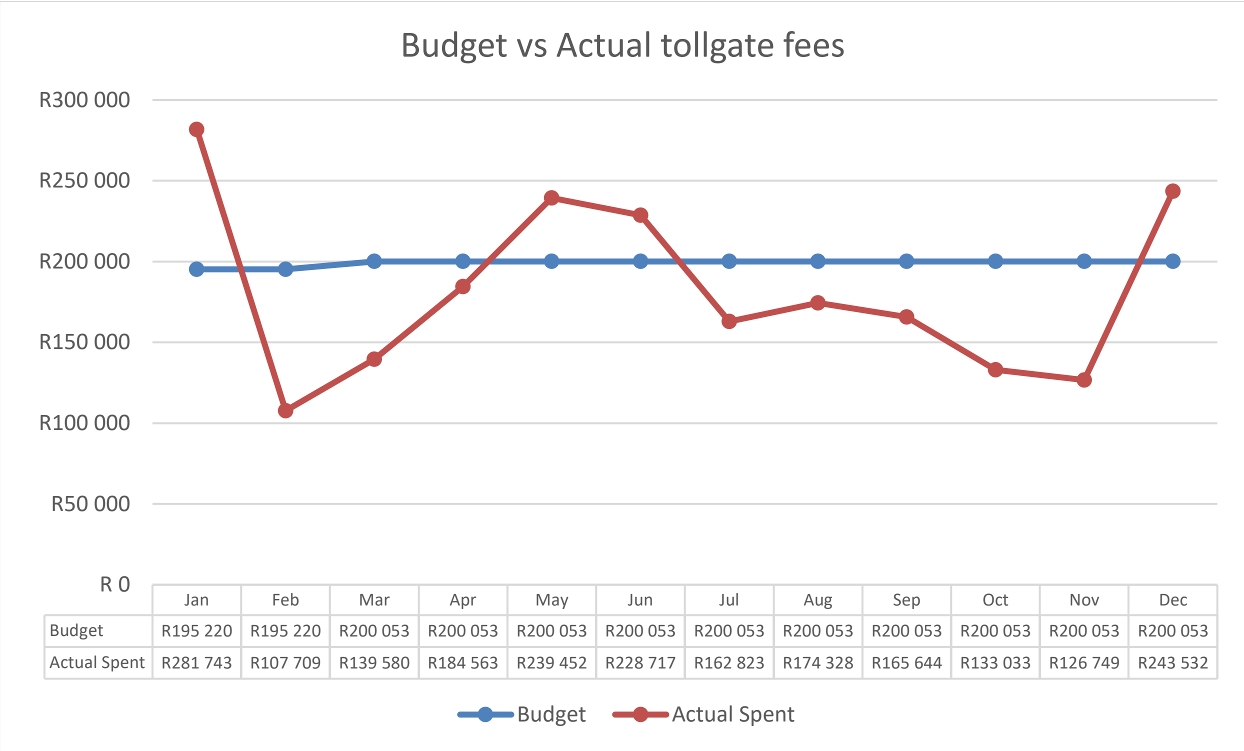


Figure 4-12: Budget vs actual toll fees spent in 2021

Source: (SephakuCement, 2021, 2022a)

The total budget for 2021 came to R 2 390 966. Toll fees are an unavoidable expenditure in the world of transportation. Certain roads and infrastructures levy fees as traffic crosses them to pay for the upkeep and expansion of these important road networks. The amount spent on tollgate fees links with the number of trips made and the vehicles' routes. Therefore, frequent trips or routes with several toll stops can greatly increase this cost. Although there may occasionally be other options, they frequently present difficulties, such as longer travel durations or worsening road conditions. The actual average monthly spend is R 182 323 during 2021. The higher actual expenditures during December 2021 correlate to the increase in kilometres travelled during the month. Correlating to the higher month, the lowest actual spent month of February 2021, R 107 709, can be directly linked to the amount kilometres travelled during the month. The actual total spent amounted to R 2 390 966 for the year, as illustrated in Table 4-10. This actual spent is R66 090, higher than the flexible budget, resulting in a loss of 3.11% for the year.

Table 4-10: Tollgate fees cost comparison

Total budgeted amount at 7 812 924 km	Variable cost per km	Flexible budget at 6 936 316 x R0.31	Actual cost	Variance	Finding
R 2 390 966	R0.31	R 2 121 782	R 2 187 872	-R 66 090	Overspend

Source: (Author, 2023)

4.2.6 Depreciation

Depreciation cost is essential when analysing the costs related to inbound transportation. Depreciation is the term used to describe the gradual decline in the value of transportation assets, most notably vehicles, brought on by normal wear and tear, ageing, and technical obsolescence. The market value of vehicles experiences a decrease correlated with the extent of their travel and exposure to diverse terrains across the country. This entails assigning a part of the vehicle's original purchase price as a cost throughout the vehicle's useful life for enterprises. In addition to impacting the financial statements, this also has consequences for capital budgeting and tax deductions. Companies must record depreciation to maintain efficient, cost-effective transportation operations and plan for upcoming fleet replacements.

Depreciation is an inherent aspect of any asset, and when it comes to vehicles, age stands as the most significant determinant. As a vehicle ages, it naturally undergoes wear and tear, both cosmetically and mechanically. This wear and tear, coupled with the inevitable obsolescence due to technological advancements and changing safety or efficiency standards, leads to a decline in its market value. A vehicle's operational lifespan is undoubtedly affected by the distance it travels, resulting in mechanical wear, possible damages, and the need for replacements or repairs. However, the vehicle's chronological age has a more significant impact on the vehicle's economic depreciation. Even a lightly used vehicle loses value over time because newer models with greater safety features, more sophisticated amenities, and improved fuel economy hit the market. Sephaku Cement uses the depreciation amounts to budget, and Sephaku Cement's head office directly provides the actual. Figure 4-13 illustrates the budget and actual depreciation spent for the year.

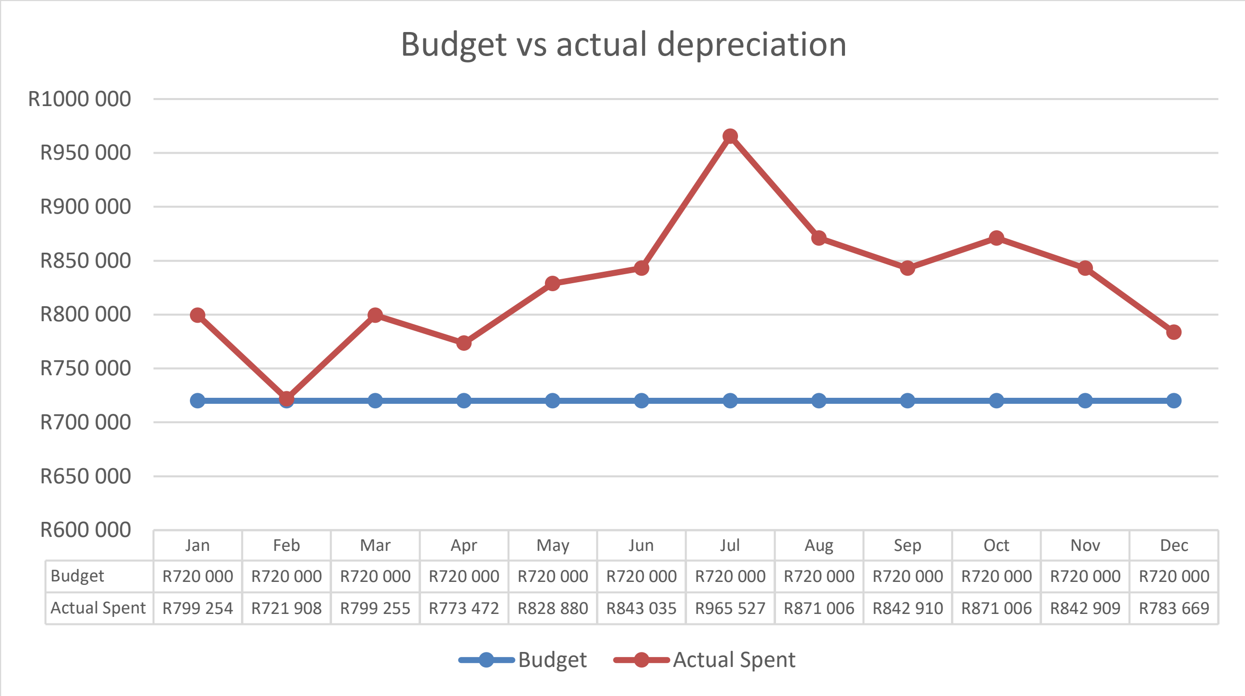


Figure 4-13: Budget vs actual depreciation spent 2021

Source: (SephakuCement, 2021, 2022a)

Sephaku Cement estimated the yearly depreciation and divided it equally over 12 months, which resulted in a monthly budget of R 720 000, and the total budget for 2021 came to R 8 640 000. Sephaku Cement calculated the depreciation budget cost per kilometre by dividing the annual budget by 7 812 294 km, averaging R1.11 for the year. Depreciation is the term used to describe the gradual decline in asset value over time. In the context of this data, it pertains to the vehicles utilised for inbound transport. The highest actual depreciation spent was recorded in July at R 965 527, indicating the most significant reduction in asset value for that month. The depreciation adjustment was due during the month. Table 4-11 illustrates the analysis of depreciation costs for the year. Compared to the flexible budget, Sephaku Cement incurred a loss of R 2 275 554 or 29.68% during the year.

Table 4-11: Depreciation cost comparison

Total budgeted amount at 7 812 924 km	Variable cost per km	Flexible budget at 6 936 316 x R1.11	Actual cost	Variance	Finding
R 8 640 000	R1.11	R7 667 277	R 9 942 831	-R 2 275 554	Overspend

Source: (Author, 2023)

While depreciation fluctuates throughout the year, it usually does so less dramatically than other expenditures. Implementing the diminishing balance technique of depreciation is the leading cause of these changes. An asset's declining value decrease is entered into the ERP system upon acquisition and automatically calculated. The system additionally offers a feature allowing manual overwrites to guarantee accuracy and flexibility in financial reporting. The finance department estimates any revisions to the depreciation levels while considering the asset's current worth. The actual depreciation is not an expense that changed through the action of the transport department.

4.2.7 Variable costs breakdown

The actual variable costs for inbound transport, as analysed in the above sections, are illustrated in Figure 4-14 below.

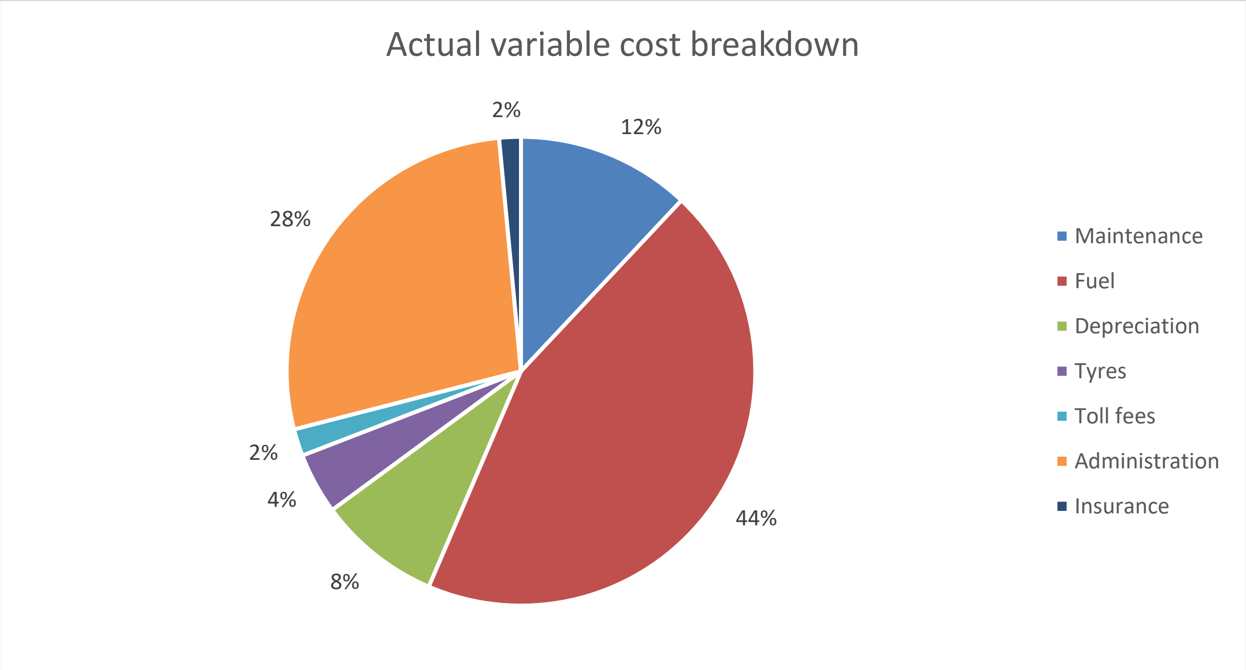


Figure 4-14: Actual inbound transport variable cost breakdown 2021

Source: (SephakuCement, 2021, 2022a)

Most actual inbound transportation costs consist of fuel costs at 44% for 2021. Administration and maintenance costs are also high-cost variables at 28% and 12%, respectively. However, the fuel cost towards the final product selling price is 20-30%. Figure 4-14 above shows that the contribution towards inbound transportation is much higher. Drivers' salaries attributed to the high actual administration cost, which amounted to R 27 354 269 for 2021.

Figure 4-15 illustrates the percentage breakdown of the variable cost per the flexible budget the researcher recalculated. The main contributors are fuel and administrative costs, similar to the actual expenses. The percentage of the flexible budget contribution differs from the actual expense percentage contribution, as illustrated in Table 4-12.

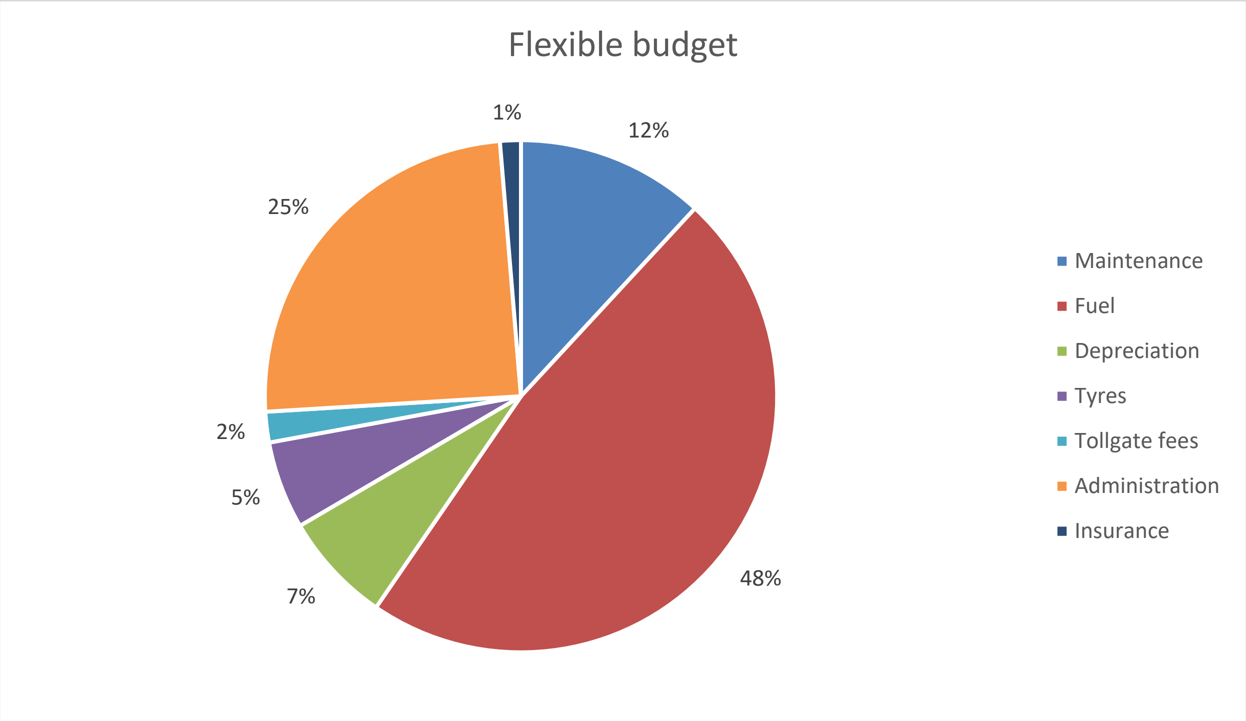


Figure 4-15: Flexible budget variable cost breakdown 2021

Source: (Author, 2023)

Table 4-12: Variable cost flexible budget vs actual cost percentage contributions

Variable cost	Flexible budget	Actual cost
Maintenance	12%	12%
Fuel	48%	44%
Depreciation	7%	8%
Tyres	5%	4%
Tollgate fees	2%	2%
Administration	25%	28%
Insurance	1%	2%

Source: (Author, 2023)

The main difference was in the two main contributors, namely fuel and administration costs.

4.2.8 Total inbound transportation cost

Table 4-13 below relates to the actual total inbound transportation cost compared to the flexible budget. The total actual amount spent for inbound transportation amounted to R 117 352 481 for the year. Consistent with the variables measured in section 4.2, the cost of fuel and driver salaries remain the highest expense for inbound transportation, with the cost amounting to R 52 147 168 and R 27 354 269, respectively. The highest overspend during the year was depreciation, R 2 275 554, and driver salaries, R 4 355 634. The highest underspend for the year was tyre costs at R 1 119 163. The only variable costs that showed an underspend for the year were excess maintenance, fuel, tyres and PPE.

Table 4-13: Inbound transport budget vs actual cost 2021

Variable cost	Total budgeted amount at 7 812 924 km	Variable cost per km	Flexible budget at 6 936 316	Actual cost	Variance	Finding
Operational maintenance	R 10 868 484	R1.39	R 9 644 870	R 10 700 123	-R 1 055 253	Overspend
Washing maintenance	R 288 696	R0.04	R 256 194	R 309 003	-R 52 810	Overspend
Excess maintenance	R 3 537 840	R0.45	R 3 139 537	R 3 082 283	R 57 254	Underspend
Fuel	R 58 945 259	R7.54	R 52 308 983	R 52 147 168	R 161 815	Underspend
Depreciation	R 8 640 000	R1.11	R 7 667 277	R 9 942 831	-R 2 275 554	Overspend
Tyres	R 6 850 488	R0.88	R 6 079 235	R 4 960 071	R 1 119 163	Underspend
Tollgate fees	R 2 390 966	R0.31	R 2 121 782	R 2 187 872	-R 66 090	Overspend
Driver salaries	R 25 916 400	R3.32	R 22 998 635	R 27 354 269	-R 4 355 634	Overspend
Interest on lease agreement	R 2 113 200	R0.27	R 1 875 288	R 2 063 754	-R 188 466	Overspend
Equestra administration	R 1 396 800	R0.18	R 1 239 543	R 1 418 872	-R 179 329	Overspend
Equestra tracking	R 857 244	R0.11	R 760 732	R 860 024	-R 99 291	Overspend
WCC insurance	R 424 848	R0.05	R 377 017	R 439 469	-R 62 452	Overspend
PPE	R 170 000	R0.02	R 150 861	R 130 773	R 20 088	Underspend
Insurance	R 1 626 818	R0.21	R 1 443 665	R 1 755 967	-R 312 302	Overspend
Total	R 124 027 043	R15.87	R 110 063 619	R 117 352 481	R 7 288 862	Overspend

Source: (SephakuCement, 2022b)

A cornerstone of modern financial management is the concept of flexible budgeting, especially in industries where operational variables are prone to significant variations. Flexible budgets adjust to reflect the actual output, revenue, or activity level, in contrast to static budgets, which are predetermined and stay the same until the fiscal period begins (Shim *et al.*, 2011). This dynamic budgeting method is particularly relevant when discussing transportation logistics, as initial forecasts might differ significantly based on parameters like distance travelled. Sephaku Cement implements a fixed annual budget, which remains unchanged throughout the fiscal year. However, the formulation of this budget is not uniformly standardised; it is tailored according to the variable nature of each cost element, employing flexible principles where necessary to accommodate the dynamic aspects of certain expenditures.

The end of the fiscal period reveals actual operational activity and financial results. If the planned activity does not match the actual activity, the original planning budget is no longer a valuable instrument for assessing performance. To provide an appropriate performance assessment in such cases, it becomes necessary to develop a flexible budget corresponding to the actual activity level (Matějka *et al.*, 2021:168).

Sephaku Cement sets its budget structure in stone; it is not flexible in nature. To improve the accuracy of comparing the budget and actual expenses, the researcher recalculated the budget by incorporating the actual distance travelled, as shown in Table 4-13.

The researcher recalculated the budget to a flexible budget to facilitate a more accurate comparison between the year's budget and actual transportation costs. Table 4-13 illustrates this recalculation. This recalculation involved dividing the total budgeted per variable by the actual kilometres travelled of 6 933 316, rendering a flexible budget for the year. As depicted in Table 4-13, the flexible budget was analysed against the actual cost for each variable, indicating either an overspend or underspend on the variable cost element. Sephaku Cement incurred a total overspending of R 7 288 862 for the year when comparing the flexible budget and the actual costs. The overspend constitutes a loss of 6.62% on the flexible budget.

4.3 Summary

This chapter analyses the cost variables of the year's inbound transportation expenses. The assumption utilised and confirmed that the primary factor affecting all associated transportation costs was the distance travelled during the year. In this analysis of the actual kilometres driven by the transportation fleet, a direct and proportionate correlation was found with the overall expenses paid, impacting several cost components like fuel, maintenance, and administrative costs. The analysis reaffirmed the necessity for a budgeting method that can adjust to the dynamic nature of such factors. It emphasised the need to take operational metrics, like distance, into account in the financial planning and control of transportation logistics. The researcher suggests that not only one cost driver, distance, can be used, but more suitable cost drivers for some variable costs can be identified.

To understand the differences between budgeted and actual expenses, the researcher recalculated the budgeted costs against the actual distances travelled. When comparing the revised estimated cost per kilometre to the actual kilometres, the total annual expenditure came to R 117 352 481. The fact that this amount was R 7 288 862 higher than the flexible budget, a 6.62% increase, highlights how critical distance is in determining costs.

In summary, the chapter has emphasised the relevance of adaptive budgeting techniques that may consider the dynamic character of transportation logistics in addition to the significance of distance as a cost driver. The results provide evidence of the complex relationship between financial performance and operational activities in the context of inbound transportation.

CHAPTER 5 FINDINGS, RECOMMENDATIONS AND CONCLUSION

This last chapter discusses the essential findings and recommendations for the analysis as outlined in Chapter 4. It shows how well the research objectives have been attained by carefully matching these findings with the original objectives stated in section 1.4. Furthermore, this discussion opened the door for suggesting directions for further research based on the conclusions and observations of the current study.

5.1 Findings

This section discusses the findings for variables analysed in Chapter 4 and the budget process utilised.

5.1.1 Operational maintenance cost

The vehicles may have needed more maintenance than first estimated, as seen by the R 1 055 253 operational maintenance expenditure. Perhaps an underestimate of maintenance expenditures during the budgeting stage, unanticipated repairs, or increased wear and tear are to blame. The fixed budget was static and unable to account for the reduced distances travelled, which is a driver to operational maintenance.

5.1.2 Washing maintenance cost

The R 52 810 overspending on washing maintenance compared to the flexible budget suggests that more frequent washing was required or the actual cost of washing services was more significant. Variables like weather, operational intensity, and road conditions could have caused this rise. Seasonal increases in washing maintenance have not been considered in the fixed budget approach, leading to the incorrect amount budgeted.

5.1.3 Excess maintenance cost

The underspending on excess maintenance suggests that Sephaku Cement set aside a more extensive than necessary contingency budget for unplanned and major repairs. This indicates that there will be fewer unanticipated maintenance problems than anticipated, which is a positive sign. However, using the fixed budget could not accurately account for the changes during the year.

5.1.4 Fuel costs

Fuel consumption was either accurately estimated for the year or well-managed as fuel expenses were slightly underabundant. This strict budgetary control demonstrates precise forecasting and handling of a major factor influencing transport expenses. Sephaku Cement should still accurately forecast fuel costs, considering additional drivers, like production forecasts during seasonal shifts. Utilising a fixed budget for the year could be closely accurate, as seen in this study. Still, it does not accurately predict the actual amounts spent during months, making monitoring difficult.

5.1.5 Depreciation cost

The considerable overspending on depreciation suggests that Sephaku Cement may have underestimated asset depreciation rates or that asset valuation may have changed. This may indicate that the vehicle's market worth declines faster than anticipated due to increased usage or other market variables. Depreciation cost is an expense that should be accurately calculated during the budgeting phase, as the company should unify a fixed depreciation strategy on all assets within it. Changes in depreciation during the year should only change on the acquisition and the sale of a vehicle.

5.1.6 Tyres cost

The underspending on tyres points to either better tyre management, resulting in fewer replacements, or a lower-than-expected rate of wear and tear. This might also point to improved supplier negotiations or adjustments in tyre usage habits. The fixed budget does not account for any fluctuations in distance travelled, which directly affect the wear and tear of the tyres. Retreats at a lower cost also decreased the actual expenditure, resulting in underspending during the year.

5.1.7 Tollgate fees

Several drivers might be blamed for the R 66 090 overspending on tollgate costs, such as increased distances, route changes that include additional toll roads, or increased toll prices. This situation emphasises how crucial it is to plan your routes strategically and closely monitor traffic patterns. Furthermore, closely monitoring travel patterns can help anticipate shifts in toll prices and modify budget estimates appropriately, resulting in more precise resource allocation and financial planning.

5.1.8 Administration cost

Driver salaries: The overspending on driver salaries could indicate higher wage rates than budgeted or the employment of additional drivers to meet operational demands. This suggests a need to review staffing levels and wage policies.

PPE: The underspend in PPE is a positive sign of cost-saving, possibly due to bulk purchasing, better inventory management, or lower-than-expected usage rates. Expenses on PPE are directly linked to the number of drivers utilised. The budget did not accurately predict the anticipated number of drivers Sephaku Cement will employ using the fixed budget.

WCC insurance: The overspending on WCC insurance might be due to increased insurance premiums or more claims than anticipated, indicating a need for better risk management or insurance negotiation.

Equestra administration and tracking: The overspending in these areas suggests higher operational costs or service fees, possibly due to increased usage or price hikes in administrative and tracking services. The fixed budget could not accurately predict the number of vehicles in use, directly influencing the amount spent on Equestra administration and tracking.

Interest on lease agreement: The overspending in this category could be due to higher interest rates than expected or additional leasing costs, indicating a need for better financial planning or renegotiation of lease terms. A fixed budget cannot predict the total cost accurately, whereas a flexible budget would be more accurate.

5.1.9 Insurance cost

The basis for the excess insurance expenditures could be attributed to a rise in insurance rates, modifications to the coverage specifications, or underestimating the original insurance budget. Reviewing insurance coverage and maybe comparing prices is necessary in this situation. The fixed budget could not account for changes in interest rates, which directly affect insurance premiums.

5.1.10 Total budget

Sephaku Cement predicated the 2021 budget on a multitude of assumptions, including the number of operational days, the volume of raw materials that the company will transport, fuel prices, variations in driver wages, the total number of drivers, fuel consumption rates, and maintenance expenses correlated with the CPI. The company did not employ a standardised budgeting policy across these variables, opting instead for a fixed annual budget compiled differently for each variable. This rigid budgeting approach failed to account for environmental and market fluctuations, resulting in a significant discrepancy where the budgeted cost per kilometre was markedly lower than the actual cost incurred. The absence of a consistent, standardised budgeting technique is evident in the variances observed between the budgeted and actual costs per kilometre for each variable.

The budget also did not consider industry and seasonal trends. For instance, the rainy season impacts industry sales and the availability of raw materials; thus, the distances travelled during certain months should be lower than in the industry consumption months.

The findings highlight how difficult it is to control costs in the transportation industry, especially for cement producers like Sephaku Cement. Numerous interrelated internal and external operational elements and general economic conditions are among the many variables that determine expenses. By identifying and analysing these variables and using the TCO model, the study was able to provide a thorough understanding of the actual costs incurred compared to the budgeted projections. Using a fixed annual budget inherently hampered Sephaku Cement's ability to adjust to environmental changes. A flexible budget with quarterly reviews would have increased accuracy by adapting to external and internal environment fluctuations.

This was even more evident when the researcher recalculated the budget per the distance travelled. The recalculated flexible budget gave a better analysis of the accuracy of the budget. The higher cost for the two highest expensed variables, fuel cost and driver salaries indicates that the budget policy to account for the variables effectively is lacking.

The overall comparison between the budget and actual cost incurred during the year indicated that the cost per kilometre was significantly higher than the forecasted cost. Although the financial year showed savings in cost against budget, the company incurred a considerable loss when the recalculation of a flexible budget was done on the actual distance travelled.

5.2 Summary of findings as per objectives

In the forthcoming section, a summary of findings aligned with the predefined objectives will be presented. The summary will provide a clear and concise overview of the outcomes, highlighting how each objective has been met and the implications of these findings. This structured approach ensures that the results are not only thoroughly analysed but also effectively communicated, offering a coherent understanding of the research's overall achievements.

- To compare theoretical planned inbound transportation costs with actual transport costs for the Sephaku Cement and to identify the factors contributing to any differences between the two.

Chapter 4 of the study provides an analysis of the expected expenses vs the actual expenditures spent for Sephaku Cement's inbound transportation. In this chapter, each variable that influences these expenses is thoroughly examined. A strong emphasis is put on the major driver, distance travelled, which is employed as a crucial parameter for recalculating a flexible budget. This recalibration enables a more precise and relevant comparison of expenditures. The chapter delves deeper into the efficiency and accuracy of Sephaku Cement's incoming transportation budgeting process by studying the differences between estimated and actual cost while taking distance into account.

- To review the existing literature on transportation cost models as part of supply chain management to provide a theoretical framework for the study.

In section 2.7 and section 2.9 the document conducts an extensive review of existing literature focusing on the theoretical analysis and cost analysis of inbound transportation, respectively. The literature review of Chapter 2 reveals a notable gap in the current body of research, particularly concerning the specific nuances of this subject. The conclusion drawn from this literature review underscores the scarcity of in-depth studies in this area, highlighting a clear need for further research. This recommendation for additional investigation is put forth to deepen the understanding and expand the knowledge base surrounding the complexities and financial implications of inbound transportation.

- To analyse Sephaku Cement’s transportation costs and compare the planned and actual transportation costs.

RESULTS AND DISCUSSIONChapter 4 provides a detailed analysis and discussion of the major variables shaping inbound transportation costs. This chapter investigates each variable, providing a detailed comparison of the budgeted and actual expenses associated with each.

- To identify the factors contributing to differences between planned and actual transportation costs for Sephaku Cement.

The main driver influencing the differences between planned and actual transportation costs for Sephaku Cement was revealed to the actual distances travelled against the estimated distances travelled. This difference resulted in affecting the variable expenses for Sephaku Cement. Table

4-13 summarised and concluded which variable expenses were overspend and which variables were underspend. Another factor that contributed was the budget strategy that Sephaku Cement utilises, on which recommendations was provided.

- To provide recommendations for Sephaku Cement and other manufacturing companies in South Africa on how they can optimise their supply chain management strategies to reduce transportation costs.

In section 5.2 the researcher offers strategic recommendations to Sephaku Cement. A key recommendation is the adoption of a forecasting software model, designed to refine the accuracy and efficiency of budget projections. Additionally, the implementation of a rolling budget is recommended, allowing for continuous updates and adjustments in response to changing financial landscapes. Furthermore, the researcher emphasised the importance in conducting regular stress tests on the presented budget. The stress test is essential to assess the resilience of budgetary allocations and to ensure actual expenses are better aligned to estimated expenses.

5.3 Recommendations

Based on the findings, Sephaku Cement should consider the following recommendations to ensure effective cost management and control:

- Transition from a traditional annual budgeting cycle to a rolling forecast model that updates the budget periodically (e.g., quarterly or monthly).
  This approach allows for more frequent adjustments based on the latest operational data and market conditions.
- Implement forecasting software that can integrate real-time data from various business functions, providing a current view of financial performance and enabling proactive adjustments to the budget.
  The method needs a strong technology foundation to be implemented. Integrating and analysing real-time data from several business sectors using the suggested forecasting software should be possible. A comprehensive and current picture of the company's financial situation is only possible with this integration. Using such a system, Sephaku Cement can avoid depending on outdated historical data and learn about trends as they happen.

This approach offers several key advantages:

- Enhanced agility

The company is better equipped to react swiftly to shifts in the market, including variations in the price of raw materials or changes in customer demand. This flexibility is essential in the volatile and fiercely competitive cement sector.

- Proactive decision making

The business may make proactive decisions instead of reactive ones by foreseeing problems before they become a problem by using real-time data. More intelligent resource allocation and cost control may result from this foresight.

- Improved accuracy

Rolling forecasts lessen the dependence on long-term projections, which are frequently predicated on assumptions that might change. This results in financial planning and budgeting that are more precise.

- Strategic alignment

Updating projections regularly guarantees that the business's financial plan stays aligned with its operational objectives and market state. Sustainability and long-term success depend on this connection.

- Better performance tracking

Identifying discrepancies and putting remedial measures in place when financial performance is regularly monitored against revised expectations more quickly is possible.

In conclusion, using a rolling forecast model with cutting-edge forecasting software will provide Sephaku Cement with the resources it needs to manage its finances more skilfully in a changing economic climate.

Sephaku Cement should consider the following recommendations to reduce transport costs in the future:

- Invest in driver training programmes

Provide thorough instruction emphasising effective driving methods, such as braking and accelerating, using gears efficiently, and cutting down on idle time. These methods can result in considerable fuel savings and less vehicle wear and tear.

Incorporate courses on route planning and navigation to reduce needless travel distance and time stuck in traffic. These actions can also help to save fuel and maintenance expenses.

- Performance monitoring and incentives

Monitor driver performance against efficiency metrics and provide incentives for those who meet or exceed targets. This motivates drivers to be more cost-conscious and aligns their goals with the company's financial objectives.

Implement a reward system that recognizes and compensates drivers for behaviours that contribute to cost savings, such as fuel-efficient driving and careful route planning.

- Adaptive workforce planning

Implement a workforce planning strategy that aligns staffing levels closely with operational demand. This could involve combining full-time, part-time, and temporary staff and contractors to provide the agility to scale labour up or down as needed.

Utilize advanced scheduling software that can predict staffing needs based on historical data, seasonality, and upcoming business initiatives. This helps to ensure that staffing levels are optimized for productivity and cost-efficiency.

- Engage scenario planning

Conduct scenario planning sessions to envision various future states based on potential economic conditions, such as significant fuel price hikes, exchange rate volatility, or changes in regulatory environments.

Create detailed financial models for each scenario, including best-case, worst-case, and most likely scenarios, to understand the potential impact on costs and to prepare appropriate responses.

- Stress testing

Regularly perform stress tests on the budget to evaluate the organization's financial robustness under different scenarios. This helps identify vulnerabilities and areas where the company needs to build more flexibility or reserves.

Use the insights from stress testing to adjust financial strategies, such as debt levels, liquidity reserves, and investment plans, to ensure the company can withstand adverse conditions.

For Sephaku Cement, adopting a flexible budget has several benefits, especially in fast-changing company settings where requirements and circumstances might alter often. Its flexibility is one of its main advantages; more precise and pertinent financial planning is made possible by the flexible budget's capacity to be modified in response to changes in circumstances or variations in actual performance (Oyadomari *et al.*, 2018:1641).

Better cost control is an additional benefit of utilising a flexible budget. Flexible budgets offer a more realistic baseline for performance evaluation by accounting for actual activity levels (Arnold & Artz, 2019:51). This makes it easier for organisations to pinpoint areas where they are overspending or underspending. This results in more strategic resource management and more informed decision-making.

Flexible budgets also make proactive management possible. Instead of only responding to changes, Sephaku Cement will be able to foresee and address them (Beck *et al.*, 2020:4). Thanks to its ability to adjust more quickly to market upheavals, economic fluctuations, and unforeseen problems, this forward-looking approach can result in considerable competitive advantages. Furthermore, flexible budgeting improves the organisation's agility (Sirkiä & Laanti, 2015:5033). The capacity to promptly adapt to new knowledge or market trends is essential in today's fast-paced corporate environment.

5.4 Conclusion

The study's research provides insightful information about the financial and operational dynamics of Sephaku Cement's inbound transportation division. The results highlight how important distance travelled is as a significant factor in determining transportation costs, impacting everything from fuel and maintenance to driver compensation. In addition to validating the research methodology, the study's careful alignment of these findings with the original research goals has also identified areas where cost management and budgeting practices need improvement.

Among the most essential recommendations is the implementation of a rolling forecast model. This model promises better precision and agility in financial planning, which is distinguished by its frequent updates and dependence on real-time operational data. The organisation will be able to react to changes in the market and internal operations more skilfully because of this notable departure from the conventional annual planning cycle. This approach, backed by advanced forecasting software, is being used strategically to better align financial planning with the company's overall operational objectives and is a step towards modernising financial management practices. Sephaku Cement could also consider ABC costing methods as they allow a company to budget more accurately and track cost drivers more efficiently (Kitsantas *et al.*, 2020:164).

Sephaku Cement may also achieve significant cost savings and operational improvements by investing in driver training, performance monitoring, scenario planning, adaptive workforce planning, and stress testing. These tactics aim to create a more robust, flexible, and effective transport system and cut costs. They also stress the significance of strategic planning, proactive management, and ongoing operational and financial performance assessment.

This study will form the baseline for future empirical research as a comparison. Further research is required on the key variables and the best-suited budget structure for inbound transportation within the cement manufacturing industry. For Sephaku Cement, further research on the inbound transport cost structure and outsourcing would be beneficial. With increased research on this topic, key industry trends, best practices and cost saving initiatives can be identified and recommended.

Finally, this study opens the door for more research and development in this area and thoroughly analyses Sephaku Cement's present transportation cost structure. The recommendations above provide the organisation with a plan to improve its financial and operational performance, guaranteeing sustainability and competitiveness in an increasingly demanding sector. The study's conclusions may impact general industrial procedures, resulting in more economical and effective transportation management in the cement industry and other sectors.

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APPENDIX 1: PERMISSION TO CONDUCT RESEARCH

NWU BUSINESS SCHOOL

NWU Business School
North-West University
Private Bag x6001
Potchefstroom, 2520
http://commerce.nwu.ac.za/business-school

18 April 2023

PERMISSION TO CONDUCT RESEARCH: A STUDY CONDUCTED AT SEPHAKU CEMENT

Dear Sephaku Cement South Africa,

I am writing to inquire about the possibility of conducting a research study in collaboration with Sephaku Cement. The purpose of the study is to compare the theoretical planned inbound transport costs with the actual transport costs of the company. The study will be conducted as part of a mini dissertation for my Masters in Business Administration (MBA).

As a leading manufacturing company in South Africa, Sephaku Cement's inbound transportation operations are of great interest to the research community. The study will provide valuable insights into the factors that influence inbound transportation costs and help identify areas for improvement in the company's operations.

The study will involve analysing Sephaku Cement's inbound transportation records for the financial year 2022 to compare the planned and actual transportation costs. The study will be conducted in accordance with ethical standards and all data collected will be kept confidential.

I am writing to request permission to conduct the study in collaboration with Sephaku Cement. The collaboration will involve providing access to inbound transportation records and any necessary information related to the inbound transportation operations of the company. The research will be conducted in a professional and non-disruptive manner, with minimal interference to the company's operations.

I believe that the results of this study will be of great benefit to Sephaku Cement. The findings will provide insights into the factors that affect inbound transportation costs and identify areas for improvement in the inbound transportation operations of the company.

Thank you for considering my request. I look forward to hearing from you soon.

Sincerely,

Elzané van der Wath
Student number: 13030124
MBA Candidate

DECLARATION BY THE RELEVANT RESPONSIBLE PERSON:

By signing below, I Derick Fourie **agree to give permission for the** research to take place with the identified participants in the study entitled:

Comparing Theoretical Planned Inbound Transport Costs with Actual Transport Costs: A Case Study of Sephaku Cement in South Africa

RESEARCH OBJECTIVES

Primary objective

- To compare theoretical planned inbound transportation costs with actual transport costs for Sephaku Cement and to identify the factors contributing to any differences between the two.

Secondary objectives

- To review the existing literature on transportation cost models as part of supply chain management, to provide a theoretical framework for the study.
- To analyse the transportation costs of Sephaku Cement and to compare the planned and actual transportation costs.
- To identify the factors that contribute to differences between planned and actual transportation costs for Sephaku Cement.

I declare that:

- I have read this request for a permission form and understand what is expected of the company in the research.
- I have had a chance to ask questions to the researcher and all my questions have been adequately answered.

Signed at (place) Centurion on (date) 25 / 04 /20 23

Signature of Relevant responsible person

Transport Operations Manager

Capacity of signatory

APPENDIX 2: ETHICAL CLEARANCE

Private Bag X1290, Potchefstroom
South Africa 2520

Tel: 018 299-1111/2222
Fax: 018 299-4910
Web: http://www.nwu.ac.za

Senate Committee for Research Ethics
Tel: 018 299-484
Fezlwe.Mseleni@nwu.ac.za

25 June 2023

ETHICS APPROVAL LETTER OF STUDY

Based on approval by the **Economic and Management Sciences Research Ethics Committee (EMS-REC)** on, 23/05/2023 the Economic and Management Sciences Research Ethics Committee hereby **approves** your study as indicated below. This implies that the North-West University Senate Committee for Research Ethics (NWU-REC) grants its permission that, provided the special conditions specified below are met and pending any other authorisation that may be necessary, the study may be initiated, using the ethics number below.

Study title: Comparing theoretical planned inbound transport costs with actual transport costs: A Case study of Sephaku Cement in South Africa

Study Leader/Supervisor (Principal Investigator)/Researcher): Prof A Smit

Student: E Van der Wath (13030124)

N	W	U	-	0	0	6	7	1	-	2	3	-	A	4

Institution Study Number Year Status

Status: S = Submission; R = Re-Submission; P = Provisional Authorisation; A = Authorisation

Application Type:
Commencement date: 25/06/2023 **Risk:** Minimal
Expiry date: 25/06/2024

Approval of the study is initially provided for a year, after which continuation of the study is dependent on receipt and review of the annual (or as otherwise stipulated) monitoring report and the concomitant issuing of a letter of continuation.

Special in process conditions of the research for approval (if applicable):

-

General conditions:

While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, the following general terms and conditions will apply:

- *The study leader/supervisor (principle investigator)/researcher must report in the prescribed format to the EMS-REC:*
  - *annually (or as otherwise requested) on the monitoring of the study, whereby a letter of continuation will be provided, and upon completion of the study; and*
  - *without any delay in case of any adverse event or incident (or any matter that interrupts sound ethical principles) during the course of the study.*
- *The approval applies strictly to the proposal as stipulated in the application form. Should any amendments to the proposal be deemed necessary during the course of the study, the study leader/researcher must apply for approval of these amendments at the EMS-REC, prior to implementation. Should there be any deviations from the study proposal without the necessary approval of such amendments, the ethics approval is immediately and automatically forfeited.*

APPENDIX 3: VARIABLE COST PER KILOMETRE

	Driver salaries		Interest on loan agreement		Equestra administration		Equestra tracking		WCC insurance		PPE		Total per month	
Month	**Budget**	**Actual**	**Budget**	**Actual**	**Budget**	**Actual**	**Budget**	**Actual**	**Budget**	**Actual**	**Budget**	**Actual**	**Budget**	**Actual**
Jan	R3.03	R3.54	R0.27	R0.34	R0.18	R0.18	R0.11	R0.05	R0.05	R0.05	R0.00	R0.01	R3,65	R4,16
Feb	R3.03	R4.24	R0.27	R0.43	R0.18	R0.23	R0.11	R0.06	R0.05	R0.06	R0.10	R0.00	R3,75	R5,02
Mar	R3.37	R3.84	R0.27	R0.16	R0.18	R0.19	R0.11	R0.16	R0.05	R0.05	R0.08	R0.01	R4,07	R4,42
Apr	R3.37	R4.10	R0.27	R0.34	R0.18	R0.18	R0.11	R0.12	R0.05	R0.05	R0.00	R0.00	R3,99	R4,79
Ma	R3.37	R3.57	R0.27	R0.13	R0.18	R0.18	R0.11	R0.11	R0.05	R0.05	R0.08	R0.02	R4,06	R4,05
Jun	R3.37	R3.44	R0.27	R0.27	R0.18	R0.19	R0.11	R0.12	R0.05	R0.09	R0.00	R0.00	R3,99	R4,10
Ju	R3.37	R4.31	R0.27	R0.31	R0.18	R0.20	R0.11	R0.15	R0.05	R0.07	R0.00	R0.17	R3,99	R5,21
Aug	R3.37	R3.99	R0.27	R0.35	R0.18	R0.21	R0.11	R0.13	R0.05	R0.06	R0.00	R0.00	R3,99	R4,75
Sep	R3.37	R4.57	R0.27	R0.43	R0.18	R0.26	R0.11	R0.17	R0.05	R0.08	R0.00	R0.00	R3,99	R5,50
Oct	R3.37	R4.88	R0.27	R0.42	R0.18	R0.28	R0.11	R0.19	R0.05	R0.09	R0.00	R0.00	R3,99	R5,86
Nov	R3.37	R3.79	R0.27	R0.27	R0.18	R0.20	R0.11	R0.13	R0.05	R0.07	R0.00	R0.00	R3,99	R4,45
Dec	R3.37	R3.62	R0.27	R0.22	R0.18	R0.21	R0.11	R0.14	R0.05	R0.06	R0.00	R0.00	R3,99	R4,25
Monthly Average	R3.32	R3.99	R0.27	R0.31	R0.18	R0.21	R0.11	R0.13	R0.05	R0.06	R0.02	R0.02	R3,95	R4,71

APPENDIX 4: EXCEL COST MODEL OUTPUT

Budget Kilometers 7812924 km

Actual Kilometers 6936316 km

Maintenance | Fuel | Depreciation

Tyres | Tollgate fees | Administration

Insurance

Calculate | Calculate

Variables	Budget	Budget Recalculated	Actuals as per GL	Budget Cost per Kilometer	Actual Cost per Kilometer
Operational Maintenance	R 10 868 484,00	R 9 644 870,00	R 10 700 123,00	R 1,39	R 1,54
Washing Maintenance	R 288 696,00	R 256 194,00	R 309 003,00	R 0,04	R 0,04
Excess Maintenance	R 3 537 840,00	R 3 139 537,00	R 3 082 283,00	R 0,45	R 0,32
Fuel	R 58 945 259,00	R 52 308 983,00	R 52 147 168,00	R 7,54	R 7,52
Depreciation	R 8 640 000,00	R 7 667 277,00	R 9 942 831,00	R 1,11	R 1,43
Tyre	R 6 850 488,00	R 6 079 235,00	R 4 960 071,00	R 0,88	R 0,72
Tollgate fees	R 2 390 966,00	R 2 121 782,00	R 2 187 872,00	R 0,31	R 0,32
Driver salaries	R 25 916 400,00	R 22 998 635,00	R 27 354 269,00	R 3,32	R 3,94
Inerest on loan agreement	R 2 113 200,00	R 1 875 288,00	R 2 063 754,00	R 0,27	R 0,30
Equestra administration	R 1 396 800,00	R 1 239 543,00	R 1 418 872,00	R 0,18	R 0,20
Equestra tracking	R 857 244,00	R 760 732,00	R 860 024,00	R 0,11	R 0,12
WCC insurance	R 424 848,00	R 377 017,00	R 439 469,00	R 0,06	R 0,06
PPE	R 170 000,00	R 150 861,00	R 130 773,00	R 0,02	R 0,02
Insurance	R 1 626 818,00	R 1 443 665,00	R 1 755 967,00	R 0,21	R 0,25
Totals	R 124 027 043,00	R 110 063 619,00	R 117 352 479,00	R 15,89	R 16,79