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BCOM PURCHASING AND SUPPLY

**EFFECT OF TELEMATICS ON FLEET MANAGEMENT: A CASE STUDY OF
DALLAGLIO GROUP OF MINES.**

BY

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Dedication

This project is dedicated to my family, whose unwavering support and encouragement have been my driving force throughout this amazing journey. To my parents, thank you for your endless love and belief in my abilities. Your sacrifices and guidance have been instrumental in my academic and personal growth. To my friends and colleagues, your encouragement and understanding during the challenging times of my academic times have been invaluable. Finally, I dedicate this study to my mentor and advisor, whose insights and expertise have greatly contributed to the completion of this project. Thank you all for being my pillars of strength and inspiration.

ABSTRACT

This research study investigates the effect of telematics on maintenance costs and the challenges faced in maximizing its potential, with a focus on a mining company as a case study for the research. This research study used a mixed-methods approach of collecting data. It analyzed quantitative financial records from 2015 to 2023 and qualitative data from a semi-structured questionnaire. It carried out a pre- and post-telematics and the findings reveal that the adoption of telematics in fleet management led to a significant reduction in maintenance costs. Key factors contributing to the reduction in costs include predictive maintenance, enhanced vehicle monitoring, efficient routing and scheduling, driver behavior monitoring and optimized vehicle utilization. However, the study also explores several challenges that hinder the full potential of telematics. These challenges include resistance to change among several employees, privacy and security concerns regarding how data is used, technical and operational challenges amid operation of the system, financial barriers related to ongoing costs of maintaining and updating the telematics system and lastly lack of adequate training for the workers. Furthermore, the research highlighted several factors that lead to the adoption of telematics. These include the need for costs reduction, advancements in terms of technology, the need for future expansion, regulatory compliance and risk management. The study concludes that while telematics offer huge benefits organizations must address the challenges that hinder them to maximize its full potential and that traditional methods increases costs while telematics reduces them. Recommendation for future research includes the need to explore impact of telematics across different industries and a deeper research into human factors affecting telematics adoption. This comprehensive analysis provides valuable insights for organizations who are considering adopting telematics or are currently utilizing the system in their fleet operations.

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CHAPTER ONE

INTRODUCTION

1.0 Introduction

The main objective of this study is to explore and analyze the effect of telematics on fleet management in logistics in the supply chain of a gold mining company in Zimbabwe. Telematics is now a critical aspect of operations for companies that rely on transportation and logistics. With the advent of telematics there have been significant transformations in how fleets are managed. Fleet managers have changed from manual procedures to electronic processes, they have shifted from the traditional ways. Traditionally fleet managers used manual data entry sheets to track and manage mileage, manual log books for drivers to track vehicle usage throughout the day, companies now favor the adaptation of telematics as it proves various significance and changes in their company's logistical activities. Telematics in transport offers the ability to analyze and monitor every detail of the logistics process. It helps to make proactive decisions that help reduce operational costs, increase service levels and maximize cargo and driver safety(Sharpe,2019). Therefore, it shall examine how Dallaglio Group of Mines is adapting to the use of technology in their fleet management. This chapter will also provide the background of the research relevant to the study, indicating the statement of the problem, objectives of the research study, research questions, significance of the study, limitations and delimitations and lastly the definition of terms.

1.1Background of the study

Dallaglio Group of Mines is a gold mining company which was founded in 2015 where it refurbished and started operating Pickstone Mine in Chegutu and Eureka Mine in Guruve. The head office and warehouse being both located in Harare. This set-up was the main reason that the company invested in fleet telematics as it was the main cause of the encountered problems. Since most of the mining materials were procured in Harare, they had to be transferred to the warehouse

and then to the mine be it Pickstone or Eureka. The problem arised during those years due to unmonitored driver routes, they were not able to locate the drivers in real time, delivery delays which interrupted production at the mines, increases in operating costs be it fuel or maintenance and alleged theft due to mismatch in quantities received over quantities purchased. Due to unmonitored driver behavior and routes, drivers used cars for their own personal needs without management knowing, hence this increased maintenance costs of the vehicles. For years' managers have relied on conventional manual systems using driver log sheets, laborious data entry and other paper record-keeping systems so as to keep track of business fleet operations. Fleet managers used mileage and fuel records so as to compare that data to other vehicles. These manual systems often lead to inefficiencies, inefficient routes, lack of real time information of the driver and the state of the vehicle. All these problems disrupted the gold production hence in an attempt to solve the problems they adopted and implemented telematics in their fleet management in 2021. They moved from traditional ways to technological processes .According to Jay Palter (2022), since the turn of the century from the 20th to the 21st business fleet management technologies have exploded and it is now even common for managers of even small fleets to have one or more technological solutions to help manage their vehicles. They introduced electronic log sheets in replacement of manual log books, installed GPS trackers on all of their trucks and small cars, put maintenance and mileage trackers on vehicles and dashboard cameras for monitoring driver behaviors and safety. Telematics can significantly enhance operational efficiency by enabling better route planning, fuel management, preventive maintenance and improve driver safety. However, it does not mean that all companies with technology in their transportation segments are having it all easy, there is a possibility that when new systems and equipment are installed most companies fail to exploit the technology to its full potential. Installing telematics does not mean that all the problems in fleet management are solved. Failure to maximize the technology installed may pose great threats to the logistics activities and gold production rate despite all the benefits it brings.

1.2 Statement of the problem

Despite the adoption of telematics, many fleet managers and organizations are still grappling with understanding the full scope of its impact. Questions still remain regarding the extent to which telematics contributes to maintenance cost reduction. The mining sector relies heavily on transportation hence incurs high costs in the movement of materials, equipment and

personnel(Ghebrihiwet,2019), thus it is vital to analyze if telematics reduces maintenance costs. According to the Financial Model Template (2024) on average a large mining truck can cost around \$50,000 per maintenance while a small truck will cost around \$10,000. The Chamber of Mines Zimbabwe CEO, Isaac Kwesu (2023) states that most mining companies are finding it difficult to break even because operating costs are higher than they have been the year before. By not maximizing technology companies are facing problems due to delivery delays of supplies, high maintenance costs, alleged theft, unmonitored driver routes, lack of real time visibility of the driver and unmonitored fuel consumption. As such these are the factors that led the researcher to explore the effects of technology on fleet management in the mining sector.

1.3 Objectives

- To determine the effect of telematics on fleet management in the supply chain.
- To explore the challenges that organizations face in maximizing the potential of telematics.
- To establish the factors leading to telematics adoption in fleet management.

1.4 Research questions

- To what extent is telematics contributing to fleet management?
- What are the challenges that organizations face in maximizing the potential of telematics?
- What are the factors that lead to telematics adoption in fleet management?

1.5 Significance of the study

This research study is significant to the corporate world. It aims to explore and quantify the effects of telematics on maintenance costs. It seeks to analyze if telematics reduces or increases maintenance costs. This study offers insights that are crucial for both academic research and practical application in businesses. These findings will be very important to businesses who want to improve their bottom line and achieve a competitive advantage in the mining sector. By exploring benefits that telematics conveys, it might persuade other businesses to invest and implement telematics into their logistical activities. This study takes into account the fact that while telematics offers numerous advantages, its implementation is not without challenges, hence the

challenges are clearly identified and explained. Identifying these challenges and proposing potential solutions to overcome them will assist companies in overcoming any obstacles that they face and fully realize and maximize the benefits that telematics systems brings. Also the findings of this research will go a long way as it will provide valuable guidance for fleet managers hence contributing to more effective and efficient logistics management practices. Finally, this study contributes heavily to the academic literature on telematics and fleet management as it intends to fill in the existing research gaps and provide new insights. It will serve as a valuable resource for other researchers who are interested in undertaking a research study under telematics and logistics and would want to imitate this research topic.

1.6 Assumptions

The validity and trustworthiness of this study's conclusions and findings are guaranteed by the below assumptions:

- i. It assumed that fleet managers will provide accurate reports regarding maintenance costs. This includes cost data before and after telematics implementation.
- ii. It also assumes that pre-telematics costs and post-telematics costs are comparable for easy assessment of changes.
- iii. The study assumes that all financial statements collected and used complies with relevant data privacy and ethical standards.

1.7 Delimitations of the study

Several specific delimitations were set onto this study to ensure a focused and controllable scope. These are:

- i. The research study is limited to the logistical practices and fleet management within Dallaglio Group of Mines and this allows an in-depth analysis of telematics implementation and its impact within a specific company.
- ii. The research only analyses maintenance cost data over a specific period of time, from 2015 to 2023.

1.8 Limitations of the study

- i. The study is limited to a single mining company hence the results may not be directly transferable to other companies in other industries.
- ii. The research study heavily relies on the accuracy of the data provided by the company hence any inaccuracies or inconsistencies in the data may affect the findings and results.

1.9 Definition of terms

Fleet

A fleet is a number of vehicles operating together under the same ownership. According to studies a minimum of five vehicles constitutes a fleet and those with 50 or less are considered as small business fleet.

Fleet management

It is the process of managing a fleet of commercial vehicles to keep the business running efficiently. Management of commercial motor vehicles such as cars, vans and trucks. It includes a range of functions such as vehicle maintenance, vehicle tracking, driver management, fuel management and health and safety of drivers.

Telematics

Telematics is an interdisciplinary field that combines telecommunications and informatics to enable long distance real-time data between management and the driver. It denotes the application of technology to track and regulate vehicles by gathering and evaluating information on the location, speed, fuel, maintenance and driving patterns of the vehicle.

Global Positioning System(GPS)

A technology used in transport that uses signals and data from multiple satellites to determine a location anywhere on earth. It is a US owned utility that provides users with positioning, navigation and timing(PNT)services. This system consists of three segments the space segment, control segment and the user segment. GPS allows fleet managers to track down the location and delivery times of their vehicles.

Vehicle tracking system

Is a combination of the installation of an electronic device in a vehicle or fleet of vehicles with purpose designed computer software to enable the owner or a third party to track the location of the vehicles.

Logistics

Logistics is part of the supply chain which deals with the efficient forward and reverse flow of goods and services. It is the process of planning, implementing and controlling procedures for the efficient and effective transportation and storage of goods and services from the point of origin to their respective destinations. It includes inbound, operations and outbound.

1.10Summary

The thrust of this chapter was to highlight the research problem being investigated, background of the study, research objectives that guided the research questions and the assumptions that were made by the researcher. The chapter also highlighted the significance of the study, delimitations and limitations of the study, definition of terms used in the chapter. The following chapter will look at the literature review of the study and it will provide a detailed review of the subject under study.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This research is about the effect of telematics on fleet management. The previous chapter was the introduction into the research, it looked at the problem statement and the objectives which guide the study. This chapter is divided into theoretical and empirical review. It also looks at relevant existing knowledge on the research objectives which are to determine the effect of information technology on fleet management, to explore the challenges that organizations face in maximizing the potential of telematics and to suggest measures as a way of mitigation on the challenges. Also included is the conceptual framework, research gap and finally the conclusion of the chapter.

2.1 Theoretical Review

2.1.1 The Theory of Replacement

Replacement theory is not an individual theory, it has evolved and developed through collective contributions. It considers factors such as the lifespan of vehicles, maintenance costs, downtime costs and the cost of acquiring new vehicles. It can be applied to determine the optimal timing for replacing fleet vehicles to minimize overall maintenance costs. By using telematics, fleet managers can make decisions about when to repair, maintain or replace vehicles. The theory states that as a vehicle ages and experiences breakdowns, maintenance costs increase as well that is when the cost of maintenance becomes greater than the cost of replacement. It takes up maintenance costs as the factor that leads to vehicle replacement. According to Victor Omoke et.al (2018) in fleet management an organization should determine the expected optimal workload a fleet can handle

depending on its usage before it can be taken for repair and maintenance. According to Grant (1963) in this theory, if a fleet manager replaces his vehicles too soon it will cost his company money, conversely if he waits too long it will again cost his company money. So it is very effective to use this theory in this study as the author would like to assess if implementation of technology make fleet managers reduce maintenance costs instead of incurring more costs by opting for replacement.

2.1.2 Theory of Constraints (TOC)

Theory of constraints began in the 80's with the study of an Israeli Physicist Dr. Eliyahu Goldratt when he became interested in problems regarding identifying bottlenecks in production in 1986. TOC is one of the simplest, most powerful supply chain concepts (Stanton, 2018). It can be applied in several areas of knowledge and that can help evaluate and solve different types of bottlenecks in simple as well as complex systems. It states that constraints determine the performance of a system and it can be applied to supply chain management (Blackstone, 2010). A constraint is anything that hinder performance, in logistics technology has been applied to monitor fleet and a constraint can be that the fleet would be too old. No matter the kind of technology they install they will not reap any profits of a successful implementation because maintenance costs will continue to rise. Another example can be inefficient technological systems in fleet management, this can be a constraint as it also hinders technology to work at its fullest capacity. TOC can then be employed to assess problems, define causality relationships between these problems and pose solutions to bottlenecks by means of identifying the weakest link in a system and help reduce maintenance costs hence it is critical to use in this study as we explore the effects of technology on fleet management.

2.1.3 Diffusion Theory

This theory was done by E.M Rogers first published in 1962 in his book Diffusion of Innovations. According to Everett Rogers (1995), this theory is not a single theory but a Meta theory with several perspectives that relate to the concept of diffusion because according to the theory four

factors influence the adoption of innovation which are the innovation itself, communication channel used, time and lastly nature of the group to which it is introduced to. All these four factors are of paramount importance for a technology to be successfully implemented and to yield great results in business organizations. This theory also explains the passage of a new idea through stages of adoption by different people and the main people in the theory are innovators, early adopters, early majority, late majority and laggards (Halton, 2023).

Innovators-These are the risk takers and pioneers who lead the way. They are the ones who want to be the first to try the innovation, venturesome and are interested in new ideas and very little, if anything needs to be done to appeal to this population (Wayne and LaMorte ,2022).

Early Adopters-They climb aboard the train early and help spread the word about innovation to others.

Early Majority-They are persuaded by the early adopters and may deliberate for some time before completely adopting the new idea and they will not act without solid proof of benefits (Les Robinson 2009).

Late Majority-They approach innovation cautiously and wait to make sure that the adaptation is solely in their best interests and as a result they do not adopt until most others have done so.

Laggards-These are the last people to adopt technology. They are resistance to change and want to keep on doing manual processes as they are used to doing things that way.

Diffusion theory provides a framework that helps to understand innovator characteristics when technology is introduced in an organization. It helps understand why Information Technology is adapted by other companies in their fleet management and why others face difficulties. Thus in this case the diffusion theory will be of paramount importance in showing how technology has been adopted and spread in fleet management in the gold mining sector.

2.1.4 Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) was developed by Fred Davis in 1989. It is a theory that models how users come to accept and use a technology. It states that for a person to accept a

technology it is predicted and determined by the users' behavioral intention. TAM uses a behavioral approach to the technology adoption process (Venkatesh,2000). According to Davis this model is an information system that explains how to encourage users to accept and utilize a technology. It states that a variety of factors, including the following, affect users' decision about how and when to employ new technology when presented with it:

i. Perceived usefulness(PU)

According to Fred Davis it is the degree or extent to which a person believes that using a particular system would enhance their job performance. Malik and Annuar (2021) defined perceived usefulness as the potential users' subjective likelihood, which gives a probability that the technology used will improve the individual or team's performance from an organizational perspective. So in order for the technology to be successfully implemented in organizations employees should believe that the certain innovation will enhance and improve their working performance.

ii. Perceived ease of use(PEOU)

According to Davis perceived ease of use is defined as the level at which a person believes that using a system or a technology would be free from effort. The term is in accordance with the definition of the word 'ease' (to make it easier), which means freedom from great difficulty or effort (Perwitasari,2022). When presented with a system employees do not want to accept it if it involves complicated procedures or if the system is hard to use no one has a positive attitude towards it hence they end up neglecting the innovation and focusing on their manual procedures. They want a system that is effortless.

Many models have been proposed to explain and predict the use of a technology or system but this study is going to use TAM because it is the one that is widely used by some researchers on their studies for example one of them was Aboelmaged and Gebba (2013) on the adaptation of mobile banking usage. Thus this model was seen fit by the researcher to use it and analyze the effect of technology on fleet management.

2.2Empirical Review

2.2.1 Fleet telematics in Zimbabwe

Chipauro, P et al (2022) conducted a study examining vehicle fleet management practices and service delivery in SOE's that are in Zimbabwe. The conclusions of this study are based on a pragmatism research design, calculated descriptive statistics using statistical package for social science and testing of the hypothesis using the structural model equation. It concluded that vehicle fleet management, fuel management, monitoring driver behavior and vehicle replacement or maintenance have negatively influenced service delivery in SOE's in Zimbabwe but further explained that ICT is a moderating factor that strengthens the relationship between fleet management practices and service delivery. During the study they found out that there was lack of transparency in fuel consumption and that there is a reactive rather than preventive maintenance of vehicles who have not implemented technology, but for those who adopted telematics their findings indicated a potential decrease in maintenance costs by up to 12% due to better vehicle monitoring and timely maintenance interventions.

Cynthia Tagwireyi (2019) undertook a study to explore the impact of fleet management on logistics management in the retail sector in Zimbabwe. The author used both qualitative and quantitative approaches to collect data. Main aim of the study was to find the relationship between fleet management and logistics management. Variables of this study were inventory control, material handling and distribution communication. It suggested that fleet management has been adopted by a number of retail outlets in Zimbabwe which includes Choppies, OK, Spar and that they have greatly benefited from fleet technology software like vehicle tracking and route planning. The author's study concluded that there is a positive correlation between fleet management and logistics management and it was recommended that for the retail sector in Zimbabwe to improve on logistics management there is a massive need to also improve on fleet management. Improvement should be mainly focused on changing and upgrading fleet, route optimization and a massive adaptation of innovation and technology in managing their fleet.

2.2.2 Fleet telematics in Africa

Waiyaki and Brits (2015) carried out a study on leveraging telematics for optimal fleet performance. The main aim of the study was to find the effectiveness of modern fleet management system that was implemented in Kenya Power and Lighting Company. The variables of the study were reducing road accidents, increasing fleet availability, fleet operations costs and minimizing theft of vehicles. The study used a mixed method approach. The authors were both in agreement

that many companies are turning to fleet telematics to boost profitability, productivity and operational efficiency. The study focused on determining whether the GPS -enabled solutions improved the effectiveness and efficiency in KPLC and the results of the study in question showed a positive impact of logistics activities at reduced costs after the company had adopted the technology on their fleet management. The study findings were that telematics reduced accident rate, massive improvement in fleet availability, a remarkable reduction in maintenance costs and minimized vehicle theft. Waiyaki and Brits both agreed that fleet telematics is definitely a necessary solution in fleet management. They provided evidence of companies reducing costs, eliminating inefficiencies and made telematics an attractive investment for transport business owners.

Abdillah (2018) carried out a study in intelligent fleet management systems on operational performance of transport companies in Mombasa, Kenya. Ali used a descriptive cross sectional survey design, closed questionnaires for collection of data. To test the relationship between the variables, a regression model was used. From the findings, the study concluded that there is a positive relationship between vehicle financing, maintenance and operational performance of companies in fleet management. It suggested that vehicle financing and regular maintenance of vehicles will increase operational efficiency of companies. The study had two findings firstly it concluded that ICT positively influences the relationship between performance, finance and maintenance and driver –fuel management. The study also states that adaptation of vehicle telematics does not always predict improvement of operational performance in companies and that technology alone is not always reliable.

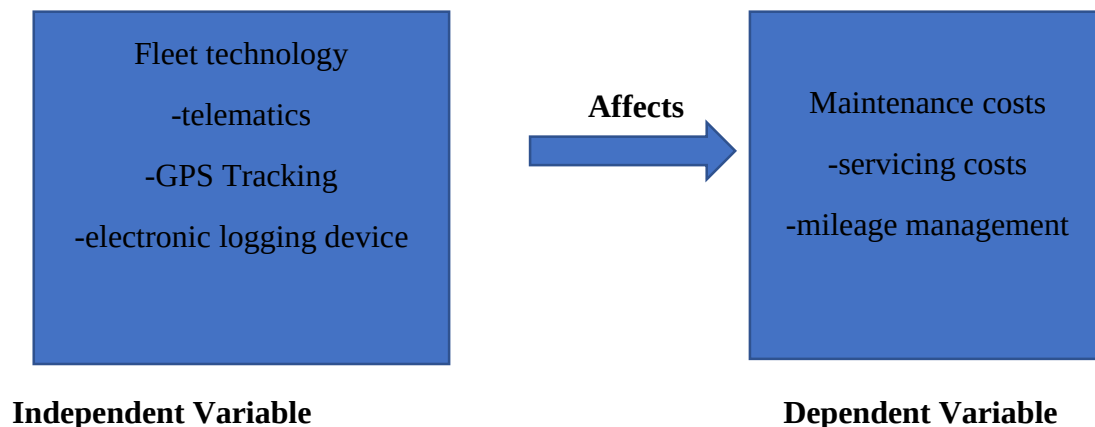
2.2.3 Fleet telematics in Europe

This research was undertaken by Shane Byers in 2013. The main objective of the study was to examine the adaptation of telematics on fleet vehicles for maximum optimization. (Byers ,2013) used a case study of Florida Crystals Cooperation which is in the agricultural sector in United States of America. This thesis was different among the rest in the sense that it involved practicality and real figures. Information was gathered and collected from the system directly called the Ford Pro Telematics. The technology implemented highlighted how advanced telematics and data analytics can significantly enhance maintenance processes and reduce costs by predicting equipment failures before they occur. The researcher used secondary data as they carried out a

before and after study. The researcher collected recent data and matched it with last years' harvest season. He used a demo of ten drivers and ten vehicles out of five hundred vehicles so that they can be able to see how telematics could enhance efficiency and if they should adopt telematics to the whole fleet. It mainly looked at fuel usage, driver safety, vehicle maintenance and vehicle utilization. The results that were found were that if Ford Pro Telematics is implemented on FCC's whole fleet they can lower maintenance and fuel costs by 10-15%.

The other research study was undertaken by Mehmood in 2021. It was aimed at investigating the relationship and the effect of information and technology competencies and fleet management practices to achieve effective service delivery in Australia. The case study was an online e-commerce website called "Boutiquaat" which is a company which offers and delivers beauty products all over the world. Since the company was growing, consumers complains about delivery delays also increased so the main objective of the study was to look at the impact of technology on fleet management and how it affects service delivery. The author used a quantitative approach and a descriptive correlational design. Mehmood was in total agreement that effective service delivery is rather at the center of all logistical activities as it reflects the movement of goods all round in the supply chain, and for that to be effective technology has to be applied. Mehmood's results concluded that introduction of new technological measure can improve Boutiquaat and through regression analysis it was found that technology reduced delivery delays. Information technology and fleet management lead to effective and on-time deliveries which affects both inbound and outbound logistics.

2.3 Conceptual Framework



Source: Author (2024)

2.3.1 Fleet technology

It refers to various hardware and software that managers use to monitor and manage their vehicles, drivers and all logistical operations. It has evolved over the years in fleet management as fleet managers changed from manual to electronic procedures, they now use it for various tasks which are maintenance scheduling, monitoring fuel consumption, tracking location of the vehicle, monitoring driver behavior and lastly routing. When rightfully implemented, it tends to reduce overall operational costs for example fuel consumption or maintenance costs. Rachael Plant (2022) states that there are many different types of fleet technologies available, but not all solve the same problem.

i. Telematics

Telematics leverages telecommunication components, vehicular sensors, wireless networking, and data dashboards to enable long- distance data transmission from moving transportation devices(BasuMalick,2022). Telematics feeds data into the telematics control unit/database whereby the system compiles the data, interpret and then that data can be used by fleet managers to review their operations by tracking location, notice alerts when vehicles are at fault. Telematics can impact maintenance costs in a number of ways for example the use of predictive maintenance systems. Fleet managers can make use of this systems in maintenance as it helps management identify potential issues before they become costly breakdowns. Giannoulidis and Gounaris (2022) states that predictive maintenance costs can achieve quality production operation with decreased maintenance costs. This also applies in fleet management as predicting when maintenance will be due will lead to reduction in costs. It is rather preventive than reactive.

ii. GPS Tracking

GPS means Global Positioning System. It makes use of cellular and satellites to receive and send information to receivers of the vehicles. It is a device used widely by many fleet managers to locate the location of their vehicles in real time. According to Zohari (2021) GPS vehicle tracking system is an electronic device project that allows owners of vehicles

to know the exact location of the vehicle. Knowing where the vehicles are, what the drivers are doing and monitoring every event in real time is the key parameters for a well-managed decision making process(Saghaei,2016). By tracking vehicles and driver location, companies can avoid costly situations whereby driver uses the cars for personal use and diverts from proposed routes to run personal errands. They can monitor the driver's speeding which then reduces the rate of accidents therefore a decrease in accident rates results in a great immense decrease in maintenance costs.

iii. Electric Logging Devices(ELD)

According to Alex Scott (2019) in 2017 a mandate was issued in the U.S Department requiring truck drivers to use electronic logging devices. He continues to stress that ELD's automate the logging of a driver's work history, replacing the more-easily manipulated handwritten logbooks. These are e-log books which records the driving time, on and off duty time. These can have a great impact on maintenance costs as these devices also monitor driver behavior by gathering information regarding speed, constant braking and acceleration which are the main factors which increases maintenance costs when vehicles are due for service.

2.3.2 Maintenance costs

Maintenance of the fleet regularly plays a pivotal role in business operations as it increases efficiency and reliability of the vehicles. Maintenance is the combination of all technical, administrative and managerial actions during the life cycle of an item, intended to retain it or restore it to a state in which it can perform the required function(Narayan,2012). Maintenance costs in fleet management refers to all expenses that a business incurs whilst repairing and maintaining a vehicle. There are various factors that increase maintenance costs which are age of the vehicle, regular usage of the vehicle, especially mining fleet which are used on harsh roads, negligence of the driver, untrained drivers and lack of maintenance strategies and initiatives on place. There are various options or approaches of maintenance that a company can adopt, to ensure that vehicles are serviced and maintained timeously in order to avoid unexpected or unpredicted breakdowns due to undetected faults(Khuzwayo,2017). There is predictive, unplanned corrective and preventive maintenance. Predictive maintenance is when a vehicle is serviced before

breakdown or failure. Unplanned corrective according to Khuzwayo (2017) is maintaining a vehicle when damage has already been done and lastly preventive is aimed at service the vehicle by establishing a maintenance schedule so as to prevent vehicle breakdown. Every mile driven contributes to the wear and tear of vehicles so management of mileage through route optimization really affects maintenance costs. Higher maintenance costs may make some fleet managers to opt for vehicle replacement.

2.4 Effect of IT on fleet management

The implementation of IT on fleet management poses great benefits to organizations which are as follows:

i. Reduced Costs

In the mining industry, fleet maintenance is a critical aspect of keeping production going because it heavily relies on the transportation of materials for production to operate efficiently. It is expensive to service vehicles that are overdue for maintenance so in order to reduce costs vehicles should be regularly checked so as to keep them in good condition, hence through technology it can alert the management on when each and every vehicle will be due for maintenance. Proper fleet maintenance can also help businesses reduce costs associated with vehicle repairs (Carter,2023). By regularly checking on mileage and when vehicle will be due for maintenance, businesses will be proactive rather than reactive in terms of repairs hence saves money. According to Krol and Rokicki (2021) telematics makes it possible to check driver abuse, hence it monitors level of fuel in the tank and the situations when the tank has been opened. Some companies use anti-tamper alerts to monitor fuel theft. So implementation of technology helps in reduction of fuel costs and maintenance costs.

ii. Improved efficiency

Through technology, vehicles can ensure an improved efficiency through on time delivery and transportation of materials from suppliers. Since departure and arrival time can be automatically predicted, it results in a massive reduction in delivery delays of materials that tamper with production for example delays in delivering conveyor belts in mining. According to (Golicic *et al.*,2010) the global development of systems like the Just in Time whereby it uses more frequent deliveries have put more pressure on fleet managers to be

constantly efficient as it characterized by time, speed and reliability on transportation. If goods are received on time and when needed, that cycle improves production efficiency.

iii. Optimize routes

Fleet technology/telematics can also benefit a company by optimizing routes. This means that by using GPS, companies can be able to determine the fastest routes and the slowest routes to a pick up point hence saves time and money in terms of fuel consumption. By having the details of the location of every vehicle in real time companies can be able to give jobs to drivers that will be close to the location. According to Krol and Rokicki (2021) optimization of routes is one of the benefits of fleet telematics, drivers can be able to drive the fastest routes and avoid traffic jams. Efficient routing in fleet management will ultimately result in reduced travel time and congestion along with reduced vehicle emissions and fuel consumption (Ackaah, 2019)

iv. Improve Fleet and driver safety

Drivers behave well when they know that they are being watched and monitored every step of the way. Telematics is a fully integrated system that tracks acceleration, braking plus have front-facing and dashboard cameras (Cullen, J *et al.*, 2019). It monitors over speeding, sudden braking and driving while on the phone hence protects both the driver and the vehicle. It checks the driving time of the vehicle and it is possible to react immediately if the driver exceeds the maximum limit of hours on the road (Krol and Rockicki, 2021). Hence this leads to driver safety because drivers do not over work themselves as they are banned from driving at a certain given period which leads to reduction of accidents.

v. Supports environmental sustainability

By avoiding congestion companies will also be practicing environmental sustainability in terms of produced gas emissions. Ghaffarpasand (2022) states that over 20% of global carbon dioxide emissions are produced by the combustion of fossil fuels in on-road vehicle engines, making transport currently one of the leading contributors to anthropogenic climate change. According to Effiong (2020) fleet technology can support environmental sustainability through the installation of devices that detects excess CO₂ emissions in vehicles.

2.4.1 Challenges encountered

i. Initial Costs

Upfront costs are one of the major challenges that businesses face when implementing and adapting new technology onto their fleet management. The initial costs of setting up telematics equipment can consume a significant amount of cash (Krol and Rockicki,2021). It is not just set up costs, other costs also include buying and acquiring the technological equipment to be used, installation maintenance and upgrades. As technology changes and upgrades, fleet management software adopted will be also costly in the long run as there will be need to maintain and upgrade the system continuously. That is why small businesses fail to adopt technology into their fleet management.

ii. Resistance to change

Although organizational change is a crucial component of a company, staff members frequently oppose it (Rathi and Ghanghas, 2023). There is a possibility of resistance to use fleet technology from both drivers and fleet managers. Some drivers may not want to be constantly and closely monitored as it may invade their privacy and workers may not be comfortable to switch from their traditional ways and many may not know how the technology should be used. Not all planned changes can be successful and can be accepted by all employees (Darmawan and Azizah, 2019). Hence if employees are negative and resistant, then improvement of organizational innovation will be affected and may even be halted (Wei Lin *et al*,2020).

iii. Lack of Expertise

This is one of the major reasons why companies hesitate to adopt technology in their fleet management. A lot of the organizations do not have the in-house expertise that is needed to install, maintain and operate the system hence it will result in wasted resources like time and money. (Anna,2020) states that the reason why telematics software fail is because businesses may be unsure on how to use the data that is gathered, the device will be unable to make any quantitative changes or benefit the organization in any way since no one is educated on how to make the next step.

iv. Security and Privacy

Since it is a system with wireless transmissions, there are high risks of cyber threats. It could be hacked by criminals so that they access sensitive information in the system to

find out the location of the vehicle, routes and what is being transported. Very important data could be lost which includes operational data and personal information of drivers. It could be unsafe for drivers if the system is hacked and no one is unable to detect when something happens for instance driver might be involved in an accident and management will be unaware. A security breach could mean unfettered access to vehicle systems, endangering its occupants (Oyler and Saiedian, 2016).

v. Risk of malfunction

The dependency of fleet telematics on technology results in greater disappointments when the system malfunctions. Any feature of a malfunction, wrong notification, missed alerts and consignment mismatch can incur huge losses to fleet operators and the entire supply chain (Sakthivel, B *et al*,2024). It leaves management in the dark for a while because they will not know about dangerous and wasteful driver habits for a certain period. In a system without redundancy, failure of one unit may result in system malfunction (Constantinescu and Vladioiu,2014).

2.4.2 Factors leading to telematics adoption in fleet management

i. Perceived Usefulness

Perceived usefulness plays a vital role in the adoption of telematics systems in fleet management. This is one of the factors that makes companies opt for telematics adoption and implementation. According to literature, (Davis,1986), perceived usefulness is the subjective perception of users where they believe that using certain technologies can improve the performance of their work. In this case, fleet managers believe that delivery delays can be improved if telematics is available, and decision making in terms of routing can also be effectively scheduled. So this forces companies to adopt this technology because fleet managers and operators believe that using the system will enhance their job performance and operational performance. (Zalewski *et al*,2021) users who find the system easy to navigate and reliable are more likely to support their implementation.

ii. Cost Reduction

In many occurrences, companies implement telematics because costs keep rocketing amid traditional methods available to use, reducing costs is always top of mind when running a fleet(Wise,2023). Fleet managers aim to reduce costs by monitoring and managing fuel

consumption and providing real-time data on driving behaviors and their location at all times. Also the need to reduce maintenance costs by preventing breakdowns before they occur likewise drives managers to adopt the system. Since telematics streamlines administrative tasks for example route scheduling, some organizations may implement the technology so as to free up labor resources for other productive activities hence this reduces overall labor costs.

iii. Technological advancement

Many organizations are familiar with industry 4.0 but the transition to 5.0 is very much underway because companies are adopting it at an unprecedented speed, resulting in companies following suit (Pizon and Kulisz,2023). Technological innovations have significantly influenced the adoption and effectiveness of telematics systems in fleet management. These developments have improved telematics' functionality, dependability and accessibility, making them a vital tool for contemporary fleet operations. Fleet managers are more likely to adopt this system because of the features that they provide. The features have eliminated the traditional methods used before to manage fleets. Since technology is ever evolving, companies aim to differentiate themselves from others thereby gaining a competitive advantage. The need for predictive maintenance in monitoring maintenance costs, processing of large data for efficient decision making and trackers for protecting and recovering lost vehicles due to vehicle theft is one of the reason that push companies to adopt technology.

iv. Risk Management

Risk management is a critical driver of telematics adoption in fleet management. Fleet managers are forced to adopt telematics because they want to manage risk. (Lichtenstein,2022) by leveraging real-time data, users can identify trends, detect anomalies and mitigate risks more effectively. Fleet managers want to lower the risk of accidents and related expenses that come along with vehicle damage or breakdowns by addressing risky driving practices. Telematics is a very useful tool for risk management because of this proactive approach to controlling driver behavior. Also they want to manage risk by preventing vehicle theft, illegal use is made easier with real-time visibility into fleet operation and preventing unexpected failures. Fleet managers know that they can manage risk by using telematics hence push for its adoption.

v. Scalability and Flexibility

Scalability and flexibility are essential factors influencing the adoption of telematics systems in fleet management. The fact that telematics can start slow and can be increased and expanded to accommodate more growth without compromising performance or functionality for example increase in number of vehicles. It is also flexible in the sense that it modifies the system to specific operational requirements. It is important for a telematics platform to be able to adapt to your unique needs(Gaydos,2023). Fleet managers are able to customize some features that best suit their business. These features ensure that telematics solutions provide long-term value and efficiency, making them an attractive motivator for fleet managers who want to enhance operational performance.

2.5Research Gap

Although there is a significant amount of research on the effect of telematics on fleet management, there are a few studies that have mainly looked at the gold mining sector hence it poses as a yawning gap in literature which the author saw fit to venture into this study. As been supported by the above previous studies undertaken by other authors some looked at retail and manufacturing, agricultural and some on State Owned Enterprises. Various studies have provided knowledge on how telematics affect operational performance, reduce accidents, reduce fuel costs and so on but very few have looked at other variables like how certain fleet technologies affect maintenance costs. This research study provided a before and after analysis of maintenance costs to clearly analyze the effect telematics has on fleet management. It tends to foster further knowledge concerning the study area by addressing the benefits that companies encounter by adopting technology, identifying challenges that companies face in adaptation of technology and renders solutions on how the challenges can be mitigated.

2.6 Chapter Summary

This chapter mainly focused on discussing the theoretical review that supported the study, empirical review and also the conceptual framework. It also looked at the benefits associated with implementing technology to fleet management, challenges faced by companies and how they can be mitigated and lastly the research gap. The next chapter will look at the research methodology used.

CHAPTER 3

RESEARCH METHODOLOGY

3.0 Introduction

The previous chapter was a review of literature both theoretical and empirical. It also looked at the conceptual framework, research gap and the summary of the chapter. This chapter pays attention on describing the research methodology which was used on data collection as it seeks to answer the research questions. The research design, methodology guiding the study, data sources, data collection methods, data collection instruments, data collection procedures and data analysis are all presented under this chapter.

3.1 Research Design

This research study used a mixed method design. Comprised of both qualitative and quantitative methods. A mixed method research employs both approaches iteratively or simultaneously to create a research outcome stronger than either methods individually (Malina, 2010). It used a mixed design because some research questions need statistical data while some need personal perceptions which cannot be quantified.

The researcher chose quantitative design because it can accurately quantify the research findings which is hard for qualitative to do, results can be statistically analyzed hence it can be clear to a larger proportion unlike qualitative whereby use of some jargon in clarifying the findings may make the results difficult to understand. It reduces bias unlike qualitative which might use observations whereby people may react inversely when they know they are being watched. In quantitative design, the researcher used a time series and a variance of analysis in an attempt to answer the first objective. This design permits the measurement of differences or change in a variable from one period to another, that is the description of change of patterns over time (Ployhart et al. 2010). The researcher chose to use a time series because it is the design which will help this

study be more valuable, since it presents trends of a before and after. It reflects the strength and /or direction of the relationship between two variables(Bhandari,2021). Data is very easy to interpret and explain because no complex formulas are used, the patterns of the trend are self-explanatory as to a decrease in costs or an increase. It was also used because of its simplicity, uniformity and accuracy to analyze maintenance costs before and after adaptation of telematics. This is best to answer the objective because the variables under study are not manipulated they are studied as they are for example experimental designs exploit variables whereby one variable is changed to weigh the effect of the other.

Qualitative research design helped the researcher in exploring the challenges that companies face in maximizing potential of telematics and establishing the factors that lead to telematics. There are a variety of tools that can be used which are focus groups, case study and observations but this research used a case study approach. To achieve the two objectives a case study was seen fit to use, using the thematic process, whereby data collected was presented in narrative themes. This contributes to the effort of answering research questions by thoroughly collecting information that is related to the specific research topic through grouping them into themes. It allowed the author to gather and analyze a lot of perceptions, thoughts and experiences of selected individuals on the two objectives.

3.2 Population

The study targeted logistics employees at Dallaglio Group of Mines as they had the information needed for the study. It constitutes a population of approximately 55 employees.

3.3 Sample

The researcher used the method proposed by Krejcie and Morgan (1970) to determine the sample size of the research. According to Krejcie and Morgan's determination table a total population of 55 participants should have at least a sample size of 48 representatives. For qualitative data collection, a sample of 48 participants was used.

3.4 Sampling Method

In this study a purposive technique was employed to select participants who could provide the most relevant and insightful data regarding the information needed to answer the research questions. It is highly applicable in qualitative research. Purposive sampling was deemed appropriate for this case study due to its focus on obtaining detailed and specific information from individuals who have practical experience with telematics within the organization. By targeting participants who are knowledgeable and experienced, the study aims to generate rich, detailed data that can provide valuable insights and contribute to the understanding of the research questions. This sampling technique ensures that the study's findings are based on informed perspectives and real-world experiences, enhancing the credibility and applicability of the results.

3.5 Data sources

3.5.1 Secondary data

In an attempt to answer the research questions on the topic under study, the researcher used secondary data sources. The researcher used archived financial records, annual income statements to record the expenditure for maintenance services of the fleet. Upon selecting the secondary data to use in this research, a census of financial records from December 2015 to December 2023 was done. The data was sourced from the internal database of the logistics department which integrates information from telematics systems and traditional maintenance logs. The documents were all selected so as to avoid bias on data reliability. The chosen period for data collection spans nine years, from 2015-2023, this time frame was selected so as to provide a comprehensive overview of maintenance costs and to find the exact trends of costs before adaptation of technology and the costs after technology was adopted. Data was selected in this sequence and proportion so as to minimize errors because each year has an equal chance of being included. It saves time and resources and it provided accurate results and was reliable to depend on the results because they were simple and general to interpret.

The study used secondary data because some of the data needed for analysis in the research could not be found through primary data like questionnaires or interviews. According to Sisira Kumara (2022) secondary data is a great source for gathering data because the researcher may be able to skip the stage of 'collecting data' which allows him/her to proceed quickly to the stage of data

analysis. The other advantage of using this research instrument is that the data gathered showed the exact trends that are more reliable and valuable to this research.

However, due to the various changes on the currency and fluctuations of the exchange rate from 2015 till date by the reserve bank, the data has got problems in terms of quality, consistency, accuracy and reliability. Hence it made it difficult for the researcher to use the real values in different currencies hence opted to use data expressed in US dollars for uniformity.

3.5.2 Primary data

To collect primary data for this study to use for data analysis, presentation and interpretation, the researcher used primary data. It used a semi-structured questionnaire making use of open ended-questions and closed –ended questionnaires. Closed-ended questionnaires were used to present the demography and open-ended questions were chosen to gather an in-depth qualitative insight into exploring the challenges companies face in maximizing fleet telematics. The unstructured nature of the questionnaire allows respondents to provide detailed and nuanced responses, offering rich source of data analysis (Bhandari et al,2021). Open–ended questions are the best for collecting qualitative data. They are inexpensive to conduct, with the limited time the researcher had to carry out the study, they were reliable. Mcleod (2023) data can be collected relatively quickly because the researcher would not need to be present when completing the questionnaires.

However, they are affected if there is a low response rate, misinterpretation can occur due to unclear wording, ambiguous phrasing and technical jargon that participants are unfamiliar with(Lindemann,2023).

3.6 Data collection Procedures

The researcher accessed the internal database where all maintenance costs records were identified and extracted. The income statements from 2015 to 2023 were used, collecting the maintenance costs annually, on the 31st December of each year. After collecting the maintenance costs, since mixed currencies were used over the 9-year period, all the currencies were converted to one currency which is the US dollar by using rates from the Reserve bank of Zimbabwe for easy understanding of the trend in costs and for easy comparability. After, the data was organized and segmented into pre- and post-telematics implementation periods distributing the years 6:3. That is

6 years back before the fleet technology was adopted from 2015 to 2020 and 3 years after the technology was adopted from 2021 to 2023. This process was crucial for the later time series analysis allowing for a clear comparison of maintenance costs over time.

The primary data for this study was collected using a semi-structured questionnaire. It was crafted to include both closed-ended questions which provided quantitative demographic information and open ended which answered the two objectives. The researcher distributed the questionnaires through online platforms as they are affordable, fast to use than hand delivering them, reliable and accommodated participant's preferences. After distributing them on online platforms, completed questionnaires were sent back, they were downloaded and saved for analysis and interpretation.

3.7 Data Presentation and Analysis Procedures

The data presentation and analysis involved a detailed examination of maintenance costs records from December 2015 to December 2023. A Time series was employed to identify trends of costs throughout the 9-year span. The graph showed annual maintenance costs from 2015 to 2023. It marked the point of telematics adoption on the graph for clear visualization of the trend with the X-axis representing years and Y-axis with maintenance costs. The researcher compared before and after cost trends of telematics implementation. She analyzed the trends of secondary data to examine if there were indeed changes in either a reduction or increase in vehicle maintenance costs before and after adaptation of fleet technology. Data was prearranged and entered into the computer and analyzed using a time series graph with the aid of the Statistical Package of Social Sciences (SPSS) and Microsoft Excel.

On qualitative data, the researcher used themes to synthesize and summarize the data from the respondents after the field data collection of Dallaglio employees. The responses were grouped accurately to create a comprehensive data set. It was thoroughly read multiple times to become deeply familiar with the content and impressions, ideas and potential patterns were noted and coded. Based on the commonalities coded data was grouped into potential themes. The themes were assigned with precise names so as to reflect their content and significance accurately. Direct quotes from the data were used to illustrate and support each theme.

3.8 Chapter Summary

This chapter succeeded to discuss the methodology utilized to analyze the effects of technology on fleet management. It also discussed the research design guiding the study, data collection instrument was discussed airing out their strengths and weaknesses and then justification as to why a certain instrument and research design were used. The data collection process, data analysis and data presentation are all explained in this chapter. The next chapter is dedicated to presenting findings.

CHAPTER 4

DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.0 Introduction

The research methodology used to address the study objectives was presented in the previous chapter. This chapter reported the results of the research which were analyzed, presented and discussed in line with the research questions articulated in Chapter One. For the first objective of determining the effect of fleet telematics on maintenance costs, secondary data on tables and graphs was used to present the quantitative data collected from the annual income statements from 2015-2023 and the other two objectives of exploring challenges that organizations face in maximizing the potential of telematics and establishing the factors leading to telematics adoption in fleet management used qualitative data collected from the questionnaire and it was presented by themes. However, prior to the presentation and analysis of findings from the study, it was essential to discuss the response rate and demographic characteristics.

4.1 Response rate

In this study, a total of 48 questionnaires were distributed to participants. Out of these, 40 were completed and returned resulting in a response rate of 83%. This high response rate indicates a strong engagement from the participants thereby enhancing the reliability and validity of the findings derived from the survey data, it also suggests that the majority of the participants found the study relevant and were willing to provide feedback. According to (Bryman et al 2018), a response rate of above 50% is for analysis to continue.

Table 1: Questionnaire Response Rate

Questionnaire administered	Questionnaire completed and returned	Percentage
48	40	83%

4.2 Demographic profiles

Under demographic profiles gender, level of experience working at Dallaglio and age are presented on the graphs below.

4.2.1 Response by gender

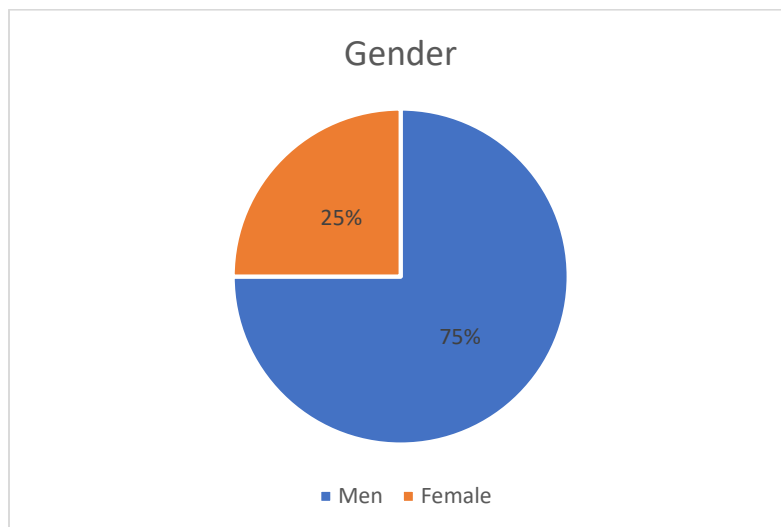


Figure 1 :Gender

Source: Primary data 2024

The pie chart above clearly illustrates a trend of male dominance of 75% in the transportation segment in the mining sector and a female of 25%. This reflects the broader industry norm which was supported by (Turnbull ,2013) where he described transport as one of the several sectors that have traditionally been regarded as no place for women. This demographic detail is crucial for interpreting the results accurately and ensuring that the findings are applicable to similar contexts within the industry as it is believed that men in the transport sector may have more experience than

women with the technical aspects of fleet management hence will be very significant in assessing the challenges that are faced with operating the telematics system.

4.2.2 by duration at Dallaglio

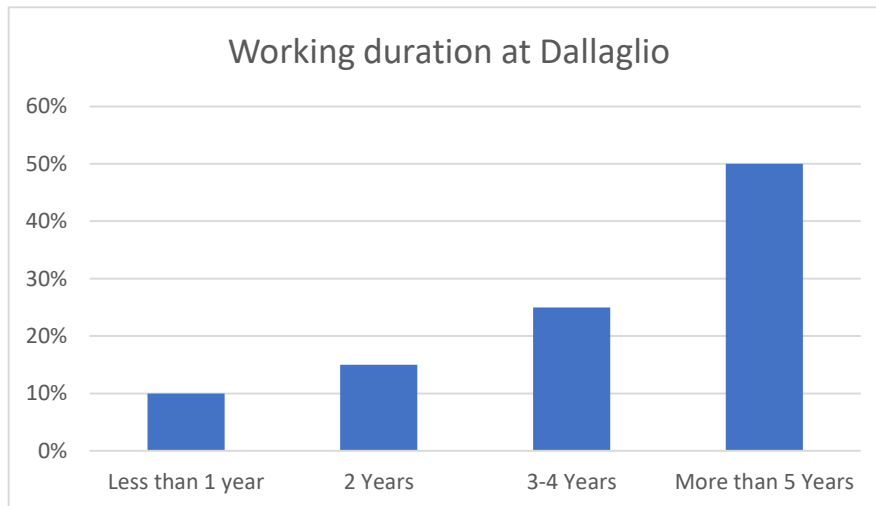


Figure 2: Duration

Source: Primary data 2024

In analyzing the working experience of the respondents at our case study company, the researcher observed that 50% have been with the company for more than 5 years, 25% have worked 3-4 years hence have been there when technology was introduced. Those with 2 years and less than a year, are believed to be probably the newest employees, with limited experience. These findings were very significant to the research study as a greater percentage of employees have been working at Dallaglio for more than 5 years, they have experienced the pre- and post-telematics era hence their contributions will be useful with analyzing the factors that led to the adoption of the telematics system.

4.2.3 by Age

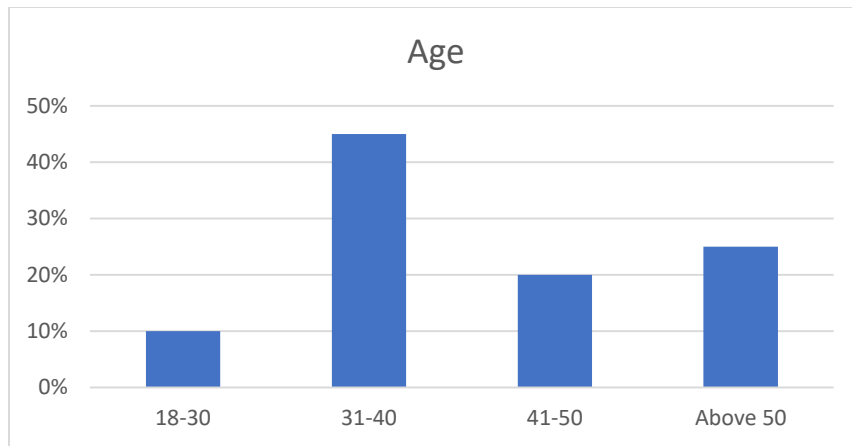


Figure 3: Age

Source: Primary data 2024

The age distribution of respondents provides crucial insights into the dynamics of telematics adoption within the company. With 10% of respondents aged 18-30, the younger respondents are likely more adaptable and keen about telematics, the groups with 45% and 20% of ages 31-40 and 41-50 respectively are significant to this study because these two groups combined is the age that is believed to provide adequate industry experience with a positive outlook on technology and likely the key drivers of telematics adoption and implementation balancing experience and innovation, they will provide valuable insights on the reason why they pushed for telematics adoption. The last group with 25% of respondents aged above 50 are the ones that are theoretically more resistance to change. This is very significant to the study because it will assist in getting responses from the older employees as to why they resist the system. This is supported by literature (Twenge and Campbell 2008), when they said the older ages often prefer tried-and –tested methods over new systems.

4.3 To determine the effect of telematics on maintenance costs

Table 2: To determine the effect of telematics on maintenance costs

ANOVA					
Cost	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	40.500	1	40.500	14.538	.004
Within Groups	19.500	7	2.786		
Total	60.000	8			

Figure 0.4 t-test

The first objective of the study was to investigate the effect of telematics on maintenance costs. The ANOVA was used to calculate the t-test. The t-test resulted in, Sig (p-value) = 0.004, since the p-value obtained is less than the commonly accepted significance level 0.05, the results concluded that there is a statistically significant difference in maintenance costs before and after the implementation of telematics.

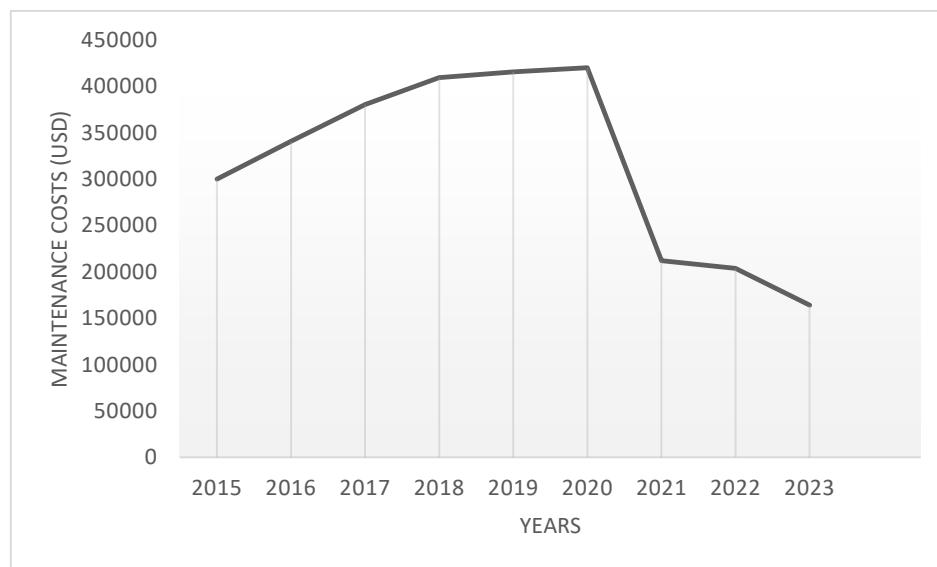


Figure 4: To determine the effect of telematics on maintenance costs

Source: Secondary data (2015-2023)

As presented in the above diagram in figure 0.5, the graph of maintenance costs from 2015 to 2023 reveals distinct trends before and after the implementation of telematics systems in 2021. It is segmented into two primary periods, pre-telematics (2015-2020) and post telematics (2021-2023). As per the above diagram, in the pre-telematics period maintenance costs exhibit an increasing trend of costs. Following the adoption of technology, there is a noticeable decline in maintenance costs from 2021 to 2023.

From figure 0.4 and 0.5 respectively, it can be statistically proven that adopting telematics systems to fleet management operations reduces maintenance costs and these findings are reinforced by (Asparuh Koev, 2024) whose study also found out that telematics helps trucking companies reduce fuel and lower maintenance costs. These results are also similar to (Waiyaki and Brits, 2015) who also found a massive reduction of maintenance costs after a company had adopted telematics. The increases in costs from 2015 to 2020 shows that traditional methods used were not efficient in addressing the increase in maintenance costs. This can be attributed to several factors such as aging fleet vehicles, inefficient maintenance scheduling, lack of vehicle allocation in real time and unmonitored driver behaviors. The decrease after implementation shows that the system likely provided real time location of vehicles, monitored driver routes and behaviors and preventive analysis for enabling effective maintenance scheduling hence as a result, the fleet experienced fewer breakdowns and reduced emergency repairs

4.4 To explore the challenges that organizations face in maximizing the potential of telematics.

This objective aimed at establishing the challenges that organizations are facing in maximizing potential of telematics amid its implementation. The guiding research question was: what are the challenges that organizations face in maximizing the potential of telematics? In exploring this research question, several key themes emerged from the qualitative data.

4.4.1 Theme 1: Resistance to change

It is evident from the respondents below that they share a common challenge of resistance to change. Many respondents blame some other employees for not accepting change hence it affects the potential of telematics. The responses were quoted below:

“Older drivers are hesitant to rely on telematics, preferring their traditional methods over new technology.”

“We face significant resistance from some team members who are set in their ways and reluctant to adapt to telematics.”

“Management needs to show more support for the telematics program, without their backing, it’s hard to get everyone on board.”

Therefore, it can be generally concluded that resistance to change is a major challenge in trying to maximize technology hence one of the reasons why some companies do not reap the full benefits that it brings. They reported that this is a major issue particularly with older employees who preferred traditional ways over new methods and lack of support from the senior management. This is supported by (Miller ,2019) whose study found out that employees can be resistant to work-based change specifically when the change is due to disruptive or new technology. It is also similar to (Darmawan and Azizah, 2019) who stated that not all planned changes can be successful and can be accepted by all employees.

4.4.2 Theme 2: Privacy and Security Concerns

Nowadays people are becoming more increasingly aware of the importance of data privacy, hence in exploring the other challenges faced, privacy and security concerns were noticed from the responses. Employees are focusing on the need to ensure the security of the data collected through telematics system. The responses were quoted below:

“There are substantial concerns about the privacy of the data collected by telematics, especially from our drivers.”

“Keeping telematics data secure is very important, but it’s difficult to put strong safeguards in place.”

“Some employees are anxious about what’s being done with their data and if their privacy is protected.”

Therefore, in general it can be concluded that data privacy and security are major concerns and it is a challenge as to why telematics is not maximized to its full potential. Some respondents raised concerns as to if management is monitoring the drivers too much, and what they do with real time location of the drivers. They indicated that it is difficult to put measures on data privacy because of cyber criminals, important information might be misused if in the wrong hands (Oyler and Saiedian, 2016). The above findings are similar to (Ruby et al,2023) stated that proven experiments have been highlighted through the ability to hack a telematics unit within a vehicle, it affects full acceptance of the technology and increases skepticism toward its use.

4.4.3 Theme 3: Technical and Operational Challenges

It is evident from the respondents that employees abandon telematics because users find it frustrating. Examples of the technical issues that users face include system integration issues, underutilization of telematics features and inconsistent data issues. These issues are the major reasons why companies do not reap the full potential benefits that telematics brings. Responses were quoted below:

“Integrating the telematics system with our existing software has been a major obstacle, causing delays and confusion in the first year.”

“The telematics data can be unreliable at times, making it difficult to trust and use for decision making.”

“We’re not using the telematics features to their full potential because many employees aren’t fully aware of all the functionalities.”

From the responses, conclusions can be generalized to say technical and operational challenges affect companies to use their telematics system to its full potential. Telematics provide a lot of data, which need to be interpreted and analyzed so as to have a meaning. Interpreting loads of data offers an endless trickle of information. These findings are similar to (Enterman,2023), who stated that between a high volume of data, the reliance on a variety of platforms and inconsistent formats, telematics can feel like more trouble than its worth. Respondents noted that telematics comes with

a wide range of features and if no proper training has been acquired or the employee is new, it can be hard for them to use all the functions of telematics. Lastly, it is evident telematics system on its own cannot be reliable as it can be affected by system glitches and viruses hence can disrupt operations and decision making.

4.4.4 Theme 4: Lack of training and skill development

Study findings indicated that they lack training and skill development on how to effectively use telematics hence one the major challenges on why they fail to maximize the full potential of telematics. This is a critical challenge because training ensures that workers fully leverage telematics capabilities. Below are 3 key responses illustrating challenges related to lack of training:

“Telematics features evolve continuously, we need regular training sessions to stay updated on new features and keep-up.”

“There is a noticeable gap in technical skills, especially the older group, they are letting us down.”

“The introduction of telematics was rocky noticeably in the first year of its implementation, we underestimated the need for thorough initial training,”

From the above responses, we can generally conclude that employees will not get the most out of telematics systems unless they are properly trained. They pointed out that the older employees are the ones lagging behind the system hence this is a challenge because for it to work everyone should be on board. This is in line with the study carried out by(Mitzner,2008), which stated that adults need more training than the younger counterparts especially in using technology. The need for regular and ongoing training was pointed out because technology is never constant, new features are developed everyday hence employees need to keep-up with the changes for them to fully maximize the benefits of telematics.

4.5 To establish the factors leading to telematics adoption in fleet management.

This objective aimed at establishing the factors that lead to telematics adoption in fleet management. The research question guiding the research objective was: What are the potential

factors that lead to telematics adoption in fleet management? In exploring this research question, several key themes below emerged from the qualitative data.

4.5.1 Theme 1: Cost Reduction

Study findings indicated that cost reduction was one of the motivations of adopting telematics. Many respondents highlighted the fact cost reduction was the major reason why the company adopted telematics to its fleet management and operations. This is supported by the quotes below:

“The major reason why we implemented telematics was to reduce our maintenance costs, as we were spending a significant portion of our budget on the expenses.”

“We really needed predictive maintenance which telematics system had, so as to enable us avoid costly breakdowns and reduce our overall maintenance costs.”

“By optimizing routes and reducing idle times, we anticipated telematics to significantly cut down on operational costs.”

It is evident from the responses below that cost reduction is one of the reason why companies adopt technology in their fleet management. Since the system offers a range of features, the need to practice predictive maintenance systems for maintenance costs reduction especially in the mining sector where fleet management is crucial is what drives most companies to adopt telematics. From the respondents above, it was also highlighted that some adopt the system because of the anticipated benefits that they expect to achieve from it, “cost reduction”, from route optimization, driver monitoring and servicing vehicles at the optimal time. These findings are similar to (Pilon,2017) who stated that today’s fleet managers are continuously looking for ways to manage their fleet’s total cost of ownership (TCO), minimize their operating expenses, and increase profitability. It is also similar to (Wise,2023) who stated that reducing costs is always top of mind when running a fleet.

4.5.2 Theme 2: Risk Management

“We adopted telematics because we wanted to mitigate risks associated with vehicle theft and unauthorized use by providing real-time location tracking.”

“We adopted telematics partly because of the need to monitor vehicle and driver performance for safety.”

“Our primary goal was to identify potential problems early and address them before they became major problems.”

From the respondents above it can be noted that risk management is a critical factor in the decision to adopt telematics systems, especially in industries like mining where operational hazards are high. One of the respondents highlighted the need to protect vehicles from theft, vehicle theft is very common risk hence to manage that risk companies opt for GPS tracker to locate their vehicles so that their assets can be quickly recovered. It was also noted that in the case of accidents, telematics quickly alerts management and emergency services hence speeds up response times. This is in line with (Lerner, 2022), who stated that telematics has become a more integral part of commercial vehicle fleet risk management. In general, we can conclude to say adoption of telematics helps mitigate various risks.

4.5.3 Theme 3: Technology Advancement

It is evident from the respondents below that pressure for technology advancement in their operations is very high in the industry. The research also reveals that technological advancements are a pivotal factor in the adoption of telematics system in fleet management. As technology has grown, the capabilities of the telematics system has also improved considerably by offering new and advanced features continuously. This theme was drawn by the responses below:

“Telematics offered sophisticated tools for data collection and analysis, which were superior to our previous systems.”

“When I started working here we used traditional methods of using mileage records and logbooks, it wasn't efficient.”

“The advanced data analysis capabilities were a significant factor in our decision to adopt telematics.”

From the research study we can conclude that traditional methods are inefficient hence companies want the features that can advance their operations for example manual log books in replacement of electronic log books, GPS trackers replacing fuel records and mileage matching. It was reported

that inefficiency of traditional methods pushes management to adopt the technology. This is in line with (Chang,2016), who stated that technological innovations continue to disrupt traditional business models, leading to the emergence of new services and features. The results also showed that technology is not constant, it is ever evolving hence new features in telematics pops-up every day hence companies always strive to keep up with the new features.

4.5.4 Theme 4: Future Expansion

“We needed a system that could grow with us, and telematics offered scalable solutions that met our needs.”

“The flexibility to add more vehicles and features as our fleet expanded was the last push we needed to adopt the system.”

“We anticipated a future growth of opening more mines when we started with just one site in 2015, now 8 years later we have 3 operating mines and on the verge of opening the 4th, that is why we needed a system that could accommodate our expanding fleet effortlessly.”

The findings from the responses above have showed that ability of telematics system to scale and adapt to the ever growing needs of the organization is a key factor in their adoption. The other respondent mentioned flexibility, in mining companies, they needed systems that allowed them to expand their fleet, and can be customized to track different types of vehicles. According to the Mining Business Africa (2023) all transport fleets across various industries, especially specialized industries like mining, have different challenges, needs and constraints therefore a telematics system, needs to be flexible and sufficiently scalable for easy adoption.

4.6 Chapter Summary

This chapter presented the findings of the research mainly focusing on the presentation and analysis of collected data establishing whether the findings are concurring or different from what others observed. The next chapter will look at the study summary, conclude and suggest possible recommendations to the challenges identified in this study.

CHAPTER 5

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

The previous chapter presented the study findings. This chapter will give an overview of the whole research study. The goal of this final chapter is to summarize the data collected, present the main conclusions drawn from the analysis and to offer recommendations based on the findings. Suggestions for further studies are also included in this chapter.

5.1 Summary

The study investigated the effect of telematics on maintenance costs within fleet management, focusing on Dallaglio Group of Mines as a case study. The other objectives were to explore the challenges companies face in maximizing telematics and to identify the factors that drive its adoption. On answering the main objectives, a mixed method approach was used with quantitative design using secondary data to create a before and after study of pre- and post-telematics from 2015 to 2023 and to conduct an analysis of variance of the variables. On the other two objectives, a sample of 48 employees was used to collect qualitative data which was presented on themes. The study was largely prompted by the need to analyze the effect of Dallaglio's adaptation of telematics on maintenance costs. Findings and observations were made and the following conclusions were drawn.

5.2 Conclusion

From the findings the following conclusions were made:

5.2.1 The findings indicated a significant increase in maintenance costs before adoption of telematics in their fleet management (2015-2020) and a significant reduction in costs (2021-2023) following the adoption of telematics technology and systems. It showed that there is a statistically significant difference of a p value of 0.004 in maintenance costs before and after the implementation of telematics.

5.2.2 Despite the benefits that telematics brings organizations face challenges in maximizing the potential of telematics which are the reluctance to move away from traditional methods and adopt new technological systems, employees are uncomfortable with the continuous monitoring of their activities, many are not aware of the functionalities of the full system and lastly without proper training employees might underutilize the full potential of telematics system.

5.2.3 The discoveries of the study revealed numerous factors driving fleet managers to adopt telematics in their operational activities within the mining sector which are reduction in operational costs by using predictive maintenance systems, the ability to monitor and mitigate risks such as vehicle breakdowns, continuous improvement and innovation and lastly its flexibility and scalability allows companies to expand their operations without additional investment needed.

5.3 Recommendations

5.3.1 Outsourcing: By outsourcing the management of the system it decreases costs of training in-house workers, maintenance costs and it eliminates pressure to focus on multiple tasks hence the business can focus on its core competencies. Costs. Organizations can be able tap into the latest technologies since they have expertise in managing fleet telematics. Companies can also work with 3rd party personnel that offer flexible payment terms and conditions so as to reduce upfront costs.

5.3.2 Invest in training for workers and drivers: Employees should be trained on how to configure the system, analyze data received from the system and interpret that data so that when technology is installed equipment does not lie idle because no one knows how to use it.

5.3.3 Regularly update and review the system: Fleet managers are recommended to regularly update the hardware and the software so that it meets the needs of the company rather than actually being an expense when it malfunctions. Regularly updating and reviewing the system may also prevent data loss by constantly backing up data.

5.3.4 Robust plan for data security and privacy: Companies are recommended to enforce cybersecurity measures, enforce strong passwords policies and access controls for the telematics platform. He also stated that companies should choose 3rd parties who provide security features like data encryption and intrusion detection systems.

5.4 Recommendations for further studies

To build on the findings of this research, further studies should explore the long term impact of telematics on overall fleet management performance and not just one aspect as this study was concentrated on maintenance costs. Further research studies could benefit from a comparative analysis of telematics adoption across different industries such as freight companies, public companies or construction companies so as to identify industry-specific challenges and benefits. There should also be further studies which focuses on human factors associated with telematics adoption and implementation including employee training and user acceptance, it would offer a more comprehensive understanding of how to overcome resistance and maximize the potential of telematics. Lastly, further studies should be done on a cost –benefit analysis associated with telematics adoption as it would help organizations make informed decisions about investing in this technology.

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Appendix One
BINDURA UNIVERSITY OF SCIENCE EDUCATION



FACULTY OF COMMERCE
DEPARTMENT OF ECONOMICS

Dear Respondents

I am an undergraduate Purchasing and Supply student at Bindura University of Science Education. As part of the requirements for the award of the degree, i am undertaking a research on “**The effect of technology on fleet management: A case study of Dallaglio Group of Mines**”. In this regard I am kindly asking you to provide your information, experience and time in answering the attached questionnaire. After completing the questionnaire, it should be submitted back to the researcher. Please note that the information sought is purely for academic purposes and all responses are strictly confidential.

Thank you for your co-operation.

Your faithfully,

Nathalie P. Mutoya

Appendix Two

Questionnaires for respondents

Section A

Tick where applicable (Closed-ended questions)

1. Demographic Information

i. Gender: Male ☐

Female ☐

ii. Age

Years: 18-30 ☐ 31-40 ☐ 41-50 ☐ Above 50 ☐

iii. How long have you been working at Dallaglio?

Less than 1 year ☐ 2 years ☐ 3-4 years ☐ More than 5 years ☐

Section B

Open-ended questions

2. Can you describe any specific operational challenges your organization encounters when utilizing telematics system?.....

3. What challenges, if any, arise in terms of driver acceptance and engagement with telematics systems?.....

4. What challenges, if any, do you encounter in interpreting telematics data for decision making purposes?.....

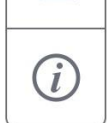
Section C

5. What were primary reasons for motivations behind your organization's decision to adopt fleet telematics?.....

6.What anticipated benefits or outcome did your organization expect to achieve through the adoption of telematics?.....

The End

Thank You!!



Match Overview



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