UNIVERSITY OF KWAZULU-NATAL

VEHICLE AVAILABILITY, EFFICIENCY AND QUALITY IN FLEET MANAGEMENT: A CASE STUDY OF ETHEKWINI MUNICIPALITY

By

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Declaration

I Lungile Khuzwayo declare that:-

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Abstract

The purpose of this study is to investigate and make recommendations on how to maintain a balance between vehicle availability, efficiency and quality. The objectives of the study were achieved by conducting a literature review on fleet management and acquiring primary data by interviewing eight participants of the fleet management unit of the EThekwini Municipality. The demand for transport is determined by the transportation requirements and needs of transport for the organisation. This demand then informs what type of vehicles, size and capacity that an organisation should acquire. Then the organisation needs to manage and balance this demand by ensuring that there is always sufficient supply or vehicle availability in order to meet the transport requirements or the demand. The critical factors that affect vehicle availability, efficiency and quality in the municipality were identified as, technical skills deficit, shortage of staff, age of fleet, workshop scheduling, fleet size and overall management of workshops.

The limitations that were encountered was availability of staff for interviews, as these were in depth interviews the interviewing takes time from the participants' hours of work.

The recommendations made to the management of the unit are:

To develop an intensive on the job and formal training program for addressing skills deficit and staff shortage that were determined as the critical factors that are affecting vehicle availability, efficiency and quality; Review fleet replacement programme in order to reduce older vehicles that are in the fleet; Review the maintenance and vehicle service program and scheduling of vehicles, in order to regulate the workload that goes through the workshops and Strengthen relationships with the SCM Unit with regards to procurement of spares and Contract Management.

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List of Abbreviations

FMIS:	Fleet Management Information System
GPS:	Global Positioning System
MFMA:	Municipal Finance Management Act
NRTA:	National Road Traffic Act, 93 of 1996
OEM:	Original Equipment Manufacture
OHS:	Occupational Health and Safety Act, 85 of 1993
OTR:	Off the Road
RPL:	Recognition of Prior Learning
SABS:	South African Bureau of Standard
SCM:	Supply Chain Management
SLA:	Service Level Agreement
SOP:	Standard Operating Procedure
S26D:	Section 26 D
TDM:	Transport Demand Management

1

Chapter One

Introduction

1.1. Introduction

It is every organisation's objective to make profits, reduce costs and increase market share. In most organisations transportation is required to deliver services to customers or transport goods to the required destinations in order to meet customers' needs and demand. Some organisations outsource the service of transportation, others purchase and manage their vehicles and other organisations use both options, i.e. buying and leasing in order to fulfil their requirements for transport.

In the organisations that run their own fleets, fleet management becomes an important part of management responsibility, since vehicles are costly to purchase, manage and require expertise in fleet management in order to make sound decisions regarding fleet operations. In the organisations that outsource the service, the expertise is still required in order to accurately determine what are the transport requirements and demand of the organisation and how to meet the demand and fulfil those requirements adequately and cost effectively.

In this study the organisation is the EThekwini Municipality, the main objective and purpose of the Municipality is to deliver services to the communities, which includes mostly basic services like water, electricity, roads infrastructure and policing. The availability of vehicles to deliver these services is crucial and effective and efficient management of fleet cannot be overemphasised. As it will ensure that adequate amount of vehicles is available at all times in order to enable the required services to reach the communities.

The fleet operations are managed centrally by a unit responsible for fleet management. The fleet management process starts from planning, acquisition, maintenance and disposal of fleet. The planning starts from the different service units, who identify their transportation requirements based on operational requirements and needs of their business and submit motivation to the Unit. The Unit then facilitates and make arrangements for procurement of suitable vehicles, ensuring timeous and accurate maintenance of fleet, management of fleet operations and disposal of fleet.

1.2.Motivation for the Study

Availability of reliable transport is the key to service delivery in a municipal environment. This includes provision of roads, water and sanitation, electricity, policing and emergency services to name the few. For the Municipality ensuring adequate supply of vehicles or vehicle availability is a process that involves a few departments each with different objectives, a considerable amount of money is to be invested in different types of plant, machinery and vehicles in order to meet the diverse demands of different service units.

The processes involved in the acquisition of fleet and ensuring that fleet is properly maintained and managed require that all the parties involved understand and acknowledge the importance of activities and functions in order to make sound decisions before investing in fleet.

Through this study it is envisaged that the researcher, the unit involved in fleet management and other service units within the municipality will gain more understanding and knowledge about fleet management, the processes involved in ensuring that there is an adequate supply of vehicles for service delivery, and impact the fleet management and service delivery within the municipality.

1.3.Focus for the Study

Fleet management is a broad area of study and fleet can be refer to different types of transport, machinery and plant. This study focused on vehicles and how to maintain a balance between vehicle availability, quality and efficiency in the EThekwini Municipality fleet management unit.

This was achieved by firstly determining the factors that affects the vehicle availability or supply of vehicles within the municipality, quality and efficiency; the type of relationship that exist between vehicle availability, quality and efficiency and how these factors can be properly managed in order to maintain a balance among them, thus ensuring that there is always adequate supply of vehicles in order to meet the service delivery requirements or demand for vehicles.

1.4.Problem Statement

As a municipality, EThekwini's main purpose is to deliver services to the community, which availability of appropriate transportation in the form of vehicles and plant is vital in achieving this purpose. The key performance indicator for the fleet management unit is vehicle availability or supply of vehicles to different units, which is according to the industry norm of 90%. The vehicle availability indicates percentage of available vehicle and plant at any given time, and the requirement is that it should be at least 90%, as this is an indicator that the departments are suitably equipped and have sufficient vehicles to take services to the communities.

Over the past year period there has been some complaints and dissatisfaction about shortage or insufficient vehicles and plant available to deliver services according to the service unit's mandates. The ageing fleet, the repetitive maintenance; quality of services and repairs done by the technical operations division; longer turnaround times of servicing vehicles which impacts on the vehicle availability are complaints that are received by the fleet management unit. This have negative implications on the fleet management unit as it suggests that there is not always adequate supply of vehicles, efficiency and quality are compromised, as return jobs take more time and resources, fixing the problems that were previously not fixed properly.

Management is also concerned about high costs, which includes costs associated with outsourcing most mechanical related jobs. The outsourcing adds on low vehicle availability, as the jobs are booked and are subject to service standard time of external service providers.

1.5. Objectives of the Study

The objectives of this study are:

- To determine and analyse critical factors affecting vehicle availability.
- To determine and analyse critical factors affecting efficiency and quality.
- To investigate the impact of vehicle availability on efficiency and quality in fleet management and vice versa.

- To determine ways to balance vehicle availability, quality and efficiency.
- To make recommendations to City Fleet Unit regarding how to balance vehicle availability, quality and efficiency in fleet management process.

1.6. Research Questions

In order to achieve the objectives of this study, the research study was guided by the following questions:

- What are critical factors affecting vehicle availability?
- What are critical factors affecting efficiency and quality?
- Does efficiency and quality in fleet management impact vehicle availability?
- What are ways of balancing vehicle availability, quality and efficiency?

The answer to these questions will be able to help researcher determine how to maintain a balance between vehicle availability, efficiency and quality?

1.7.Methodology

The methodology that was used in this study was interviewing of one executive, one senior manager, five middle managers and five junior managers. The reason for the sample size is due to time, willingness and availability of participants.

The criterion was work experience within the industry, role they play in the organization and number of years they have within the organization. The data was collected by making appointments, meeting participants and asking questions which are prepared and request for elaboration. Even though there were a pre-set questions (questionnaire attached), the responses may trigger more questioning and thus collecting relevant data. The data was recorded in the form of audio recording, with the permission of participants.

1.8.Chapter Outline

This section gives an outline and summary of what the chapters in this research paper entails. This paper has six chapters and the summary of the chapters are discussed below.

1.8.1. Chapter 1 Background and Introduction

The aim of this chapter is to give an overview of reasons and objectives to be achieved by the study. The problem statement, the motivation of the study, the research methodology used, the focus of the study, the research questions and sub-questions and brief overview of each chapter of the paper.

1.8.2. Chapter 2 Literature Review

This chapter discusses literature on fleet management, definition of key concepts of the paper, gives explanations and analysis of fleet management concepts. The components of demand or transportation requirements are discussed and reviewed in detail. The components of the supply or vehicle availability are also discussed and reviewed in detail. Other important concepts of fleet management that are crucial for ensuring that there is a balance between vehicle availability, quality and efficiency are discussed.

1.8.3. Chapter 3 Research Methodology

In chapter three, the research literature on the research methodology is discussed and the research methodology used in this study is discussed in detail, namely the research design and the research method, the research paradigm, the population and sampling method, the data collection and analysis used are discussed in detail.

1.8.4. Chapter 4 Presentation of Results

This chapter presents the findings of the study from the data that was acquired and extracted during interviews with the participants. These results and findings are presented in a form of different tables. Each table summarises the responses that were received from interviews with each participants. The summaries of findings are discussed.

1.8.5. Chapter 5 Discussions

This chapter discusses in detail the findings of the study and gives explanations and interpretations of the literature review and the findings from the interviews with the participants. The findings from all the sources are presented in this chapter in detail and interpretations of the findings are given.

1.8.6. Chapter 6 Conclusion and Recommendations

This chapter presents the conclusions drawn from the discussion chapter, which is chapter five, the implications of this research, the limitations of this study and the recommendations for the fleet management unit and future research.

1.9. Summary

The main purpose of this chapter is to introduce to the reader the content of the paper in detail, wherein the objectives of this study were outlined, what motivated the researcher to conduct this study, the focus of the study, the problem the study is going to solve, the research sub-questions, the methodology and the brief overview of the chapters in this paper were discussed. The following chapter will cover literature review based on research objectives.

Chapter Two

Literature Review

2.1. Introduction

The literature review is looking at what other researchers and authors have done and published on the topic and what is relevant to the study, Saunders, Lewis & Thornhill (2012). This chapter will discuss literature review based on the fleet management literature and concepts and research objectives related to the study. It covers the definition of key concepts of the study, the fleet management key concepts, theories and ideas and relevance of these themes to the fleet management unit within the municipality.

The discussions are laid out as follows: firstly the definition of key concepts are discussed, the demand for transport or the transportation requirements and how the organisation determines these requirements are discussed, the supply of transport or vehicle availability or how the organisation can meet the demand is discussed and then the important factors that must be managed in the process of fleet management in order to be able to maintain a balance between vehicle availability, quality and efficiency are discussed.

2.2. Definition of Key Concepts

The key concepts in this study are fleet management; vehicle availability; efficiency and quality, these are discussed below.

Fleet management involves activities of procuring, maintaining, managing and disposing vehicles in the organisation. According to Jarvis (2016), fleet management represents both an expense and an investment and there is a need for Chief Financial Officer to develop a business case that will demonstrate a sound reason for investing in fleet management. Fleet management is crucial as vehicles are assets that required a huge investment and maintenance of those assets is essential in order to keep them fit, safe to use and receive return on investment.

Vehicle availability indicates the ability of the organisation to meet its transport needs and demand. According to Power (2013), fleet is any collection of machinery, including ships,

aeroplanes, but motor vehicles are the most common and fleet management is about achieving two objectives namely "having the correct fleet for your company, and paying the right amount of money for that fleet" and proper fleet management can save companies huge amounts of capital expenses and operational costs including maintenance and fuel, however it remains one of the most underrated management disciplines. This study focuses on managing the vehicles and ensuring that these vehicles are in a suitable state and safe to use by the departments of the municipality to deliver services to the communities.

Efficiency and quality are required in the fleet management operation to save costs and ensure that vehicles are safe and available for use. Hunston (2013), states that today's fleet managers among other things require a combination of effective financial management, business acumen, specialist company vehicle tax knowledge, and the ability to identify the most effective company vehicles on the market. Hunston (2013), further stated that these are important in understanding and managing the cost of buying, running vehicles and the associated services involved in operating them as efficiently and safely as possible.

The efficiency is important in fleet management, as costs of running fleets are high, in order to reduce and maintain these costs to a minimum, it is crucial to endeavour to make savings every aspect of fleet management and ensure that the vehicles are always in a good state and available for service delivery.

Ensuring that the quality standards are maintained is also crucial especially in the maintenance of fleet as these will ensure that vehicles are properly serviced, repaired and maintained timeously to avoid unnecessary stoppages and breakdowns and thus ensuring that there is always sufficient supply of vehicles or vehicle availability for departments to deliver services to the community.

The following section will discuss the demand for transport or the transport requirements in the organisation and how these are determined, met and maintained in order to ensure that service delivery is not compromised because of deficit in the supply or vehicle availability.

2.3. The Demand for Transport and Transport/ Travel Demand Management (TDM)

The demand for transportation services is determined by the requirements and needs for transport in the organisation. This is not usually easy to define as in most cases the

organisations will acquire vehicles and allocate to the users according to their travelling requirements. According to Redmer (2015), the demand for transportation can be defined by a number of kilometres, ton-kilometres, tones, cubic-meters, pallets, litres or any other measure of loads to be transported or transport to be done within a given period of time. Redmer (2015), further stated that there are also different types of demand for transport and these are according to specific types of loads, the distances or kilometres to be travelled, the routes or locations of destination points or customers and how urgent these are and many more. In a case of passengers it can be a number of passengers, destinations and a distance to be travelled and the time that the travel is required.

The organisation must conduct the analysis of the needs and requirements for transport thoroughly in order to determine the accurate capacity that is required in order to meet the need. The term Transport Demand Management (TDM), refers to using ways to minimise demand for transport by using alternative means of transport. The transport demand management is a concept to promote sustainable transport and manage demand for using cars by changing traveller's attitude and behaviour Simunovic (2012). The change in travellers' behaviour will have an effect in managing demand and availability of vehicles, as users will consider whether the need to travel by a motor vehicle or other means of attaining the business objective can be used, thereby avoiding unnecessary use of vehicles and thereby reducing utilization and demand for using vehicles. This then means that the users of vehicles must determine their needs and plan on time how to meet those needs and look at ways to minimise use of vehicles in order to achieve more with less.

2.4. The Supply

In order to meet the demand for transportation in an organisation there should be an adequate supply of vehicles, this supply is made up of number of vehicles and type of vehicles required in order to meet the objectives of the organisation. The supply is defined by a number of vehicles in a fleet; their capacity whether in tonnage or gross vehicle weight and productivity which refers to a maximum annual mileage, states Redmer (2015). The fleet size is supply or number of vehicles that make up the fleet. The following are some of factors that affect and require consideration when deciding on supply of vehicles.

2.4.1. Fleet Size

According to Redmer (2015), the demand and types of demand i.e. level and seasonal changes of particular types of demand can lead to an oversized fleet which means vehicles lying idle and waste of resources or to an unmet demand i.e. transportation requirements not fulfilled by the vehicles in a fleet or even both at the same time.

The fleet size should be sufficient enough to meet the demand which is determined by operational requirements. However, fleet size is optimal if there is a sufficient number of vehicles in fleet in order to meet operational requirements and the vehicles are utilised optimally, i.e. there are no vehicles that are lying idle or are under-utilized.

According to Power (2013), the first step in fleet management is to determine what your transport requirements are and this process is called right sizing the fleet and then compile a list of vehicles that will achieve objectives and then look at costs.

Determining the optimal fleet size is crucial as a reduction in the size of fleet can yield huge costs savings in maintenances costs and fuel costs.

2.4.2. Fleet Composition

The fleet composition refers to the types of vehicles that make up the total fleet and it should be informed by requirements of transport in an organisation. The fleet can be made up of light passenger vehicles, which can be used to attend meetings of the organisation, or heavy vehicles which can be used to transport goods or carry out service like plumbing, roads maintenance. Power (2013) says that, fleets are made up of different types of vehicles, including tools of trade vehicles that the organisation actively needs to pursue business, and this includes vehicles provided to employees as part of their remuneration package namely grey fleet vehicles, vehicles that are owned by employees but used for business purposes.

To cater for different types of transportation demand, different types of vehicles which can be universal, specialised or special, with different loads capacity, which can be small, light, medium or heavy are necessary to transport particular types of loads, Redmer (2015).

The benefits of an optimal fleet composition are meeting demand requirements constantly thus reducing level of unmet demand, reduction of high fixed costs associated with vehicles lying

idle, reduction of operating costs which includes maintenance, fuel and insurance costs and assist in increasing utilisation ratio, thus achieving return on investment. Redmer (2015), stated that a right interchangeability or versatility i.e. ability of particular vehicles to serve particular demands in a fleet can also achieve good results in meeting transportation requirements.

It is crucial in fleet management that the types, sizes, the make and models of the vehicles are considered carefully in order to constantly meet the different types of demands, reduce costs and maintain the vehicle availability.

2.4.3. Fleet Acquisition

After identifying transportation requirements, fleet size and what type of vehicles are required to meet the demand; the next step is how to acquire the required vehicles. Fleet acquisition refers to purchasing, hiring or using of grey fleets i.e. cars owned by the employees, but used as a business car while the company covers maintenance, fuel, insurance and other costs says Crişan & Mihăilă, (2015). This decision is related to forecasts regarding the future, the trends of the business and similar businesses, the tendencies concerning car usage and car business itself.

The vehicles can be acquired by either purchasing the vehicles and the organisation owns its fleet, leasing the vehicles or a combination of both. An investment in new vehicles can involve significant costs and a relatively long term commitment for the company and making acquisition decision based purely on the usual financial and operational factors may not result in the best return on investment, states Nurminen & Pojasek (2012). When opting for buying and owning vehicles all costs and processes involved in managing and maintaining fleet must be taken into consideration, in order to ensure that this is the best option for the organisation.

Equally so the option to outsource or acquire vehicles by renting from service providers should be carefully considered based on type of lease, costs and choice of service provider(s) offering best packages. The decision to lease should not be based on cheapest rates as fleets are not created equally, so there is no one size fits all. The analysis should be done around whole of life costs, not only the monthly rental; the whole of life costs takes into consideration the lease rental, maintenance, fuel, and road user charges (RUC) expected over a specific term and kilometres, states Baker (2014).

Baker (2014), further states that, when making a decision to lease or buy, a company should look at its priorities and financial situation and consider if ownership is more important than low upfront costs and no deposit or, if there is a need to use a new vehicle but no funds for a deposit up-front or, it is important to pay off vehicle and be debt free for a while, even if it means higher monthly payments for the first few years and consider likely financial position at the end of the lease or loan period.

2.4.4. Vehicle Selection

There is a variety of makes, models and brands of vehicles in the market that offer competitive prices, features and warranty packages. Vehicle selection refers to selecting models and makes that will be suitable for operations and brands that have a good performance record. According to Baker (2014), vehicle selection is very important and analysis of suitable vehicles required should made and completed around the total cost of owning the vehicles, suitability of the vehicle for purpose it is required and sustainability and safety of the vehicle.

According to Hull, when selecting types of vehicles the first thing is to determine and write down exactly what is needed to do the job, search for the service provider that has what is required by the business and then consider other service providers that cater for similar requirements. Hull, further stated that loyalty is a good habit however the shortfall is that the fleet operator assumes that the favourite dealer has exactly what is required.

According to IMIESA (2015), vehicle selection should be made based on payload requirements as fuel costs can increase by as much as 30% when vehicles are overloaded, could have a long-term impact on maintenance spend and tyre usage, resulting in a cheap vehicle costing far more than the right vehicle; vehicle reliability as some manufactures have a far better record than others in terms of reliability and the cost of the vehicle standing.

When selecting vehicles it is crucial to consider the type of operation, the size of operation, the brands, makes and models of vehicles available and suitable to address these requirements in order to ensure that the right vehicles are acquired, the capacity is addressed and the vehicles are efficient and economical to operate. This will be able to ensure that there is sufficient supply; the efficiency is catered for in terms of costs of maintaining the vehicle and quality during lifespan of the vehicles.

2.5. Health and Safety

Health and safety of employees driving and operating vehicles, passengers, other road users and vehicles is a prerequisite in selecting vehicles. The place or terrain where the vehicles will be driven or operated should be considered, the suitability and the safety features must be taken into account and make selection and acquisition based on these factors.

The safety of people, environment and assets is one of important prerequisites for the success of any organisation, safety not only refers to personal safety, as process safety is also important as its breach could result in major disasters, potentially with multiple fatalities, stated Narayan (2012). Narayan further stated that loss of asset integrity can lead to process safety disasters such as BP Texas City, Piper Alpha, Bhopal and Sayano Shusenskaya.

Health and safety of employees driving company vehicles is very crucial in fleet management as the vehicle are considered as a place of work and employers have a responsibility to ensure their employees are safe when on the road, this extends to organisations running large vehicle fleets or pool car systems, through to grey fleet i.e. staff who use their own vehicles for work, stated Gray (2016), therefore companies must ensure that they are doing everything to ensure that drivers and fleets are safe. Gray (2016), further stated that, this should include ensuring that vehicles are fit for purpose, are regularly serviced, ensuring vehicle familiarity, when a new driver takes over a new car; daily checks are completed on commercial application vehicles, drivers are up to standard, driver assessments and driver licence checks.

Ensuring health and safety is also a legislative requirement, in South Africa we are governed by (OHS) The Occupational Health and Safety Act, 85 of 1993, which prescribe health and safety of employees in the workplace; (NRTA) The National Road Traffic Act, 93 of 1996, (OHS). National Road Traffic Act that regulates safety in the roads. The organisations should ensure compliance with the laws and also take health and safety of employees seriously.

The safety feature is crucial in fleet management, especially in the acquisition of vehicles and during maintenance of vehicles, this secures health and safety of employees and other road users and compliance with the NRTA 93 of 1996 and OHS, 85 of 1993.

2.6. Life-Cycle Costs

As costs of acquisition and running fleet are one of the highest in the companies, fleet managers are seeking ways of how to do more while spending less on fleets and to cut costs whether by changing the way that the fleet is financed, using low-emission vehicles with lower tax implications, training employees to drive more efficiently and safely, or using new technology, such as telematics, to cut mileage costs stated Rooth (2013).

A research done by Birkland in 2014 revealed that, 62% of survey respondents said that the main focus of their company's executive leadership is achieving cost savings. With this goal in mind, fleet managers are using a number of tactics to manage costs. Also noted in the survey, 43% of respondents cited vehicle purchasing decisions as the greatest opportunity for savings, followed by managing maintenance expenses (32%) and activating telematics and analytics solutions (22%)".

Power (2013), stated that the key is to look at total cost of ownership, i.e. what is the total cost of ownership of that vehicle compared to another. Life cycle costs analysis records vehicle costs from the beginning to the end of vehicle ownership, which can assist in making investment decisions that are cost-effective. These include decisions like vehicle replacement programme, whether to purchase or lease vehicles, consideration to extend life-cycle without compromising effectiveness of mission, stated GAO (2015).

The costs of buying, operating and managing fleet includes:

2.6.1. Capital Costs

According to Power (2013), "Financing a fleet is one of the most complex areas of fleet management, and it has traps, particularly around residual value, but also opportunities to save money" and capital costs can be incurred in the following manner:

The vehicle can be purchased out rightly for cash without liability, however depreciation is a major concern as most vehicles are worth half their purchase price after three years, or vehicles can be acquired through a finance lease, this refers to, when a company pays a monthly rental, but have to manage everything including registration and maintenance, and however residual value is a trap. A fully maintained operating lease is another option, which gives access to

systems, expertise and buying power, wherein a fleet management organisation (FMO) provides finance and also manages everything, including maintenance, repairs, fuel cards, and registration.

The finance option depends on company's needs and objectives, and after buying and financing the company must consider costs of running and operating the fleet, which include the following costs:

2.6.2. Operating Costs

- Maintenance Costs: refers to costs incurred in maintaining vehicles, these include costs of spare parts, repairs and servicing the vehicles.
- Insurance Costs: refers to costs incurred insuring vehicles.
- Fuel Costs, which refers to costs of fuel for running the vehicles.
- Labour Costs, costs for all personnel involved in the fleet management function.
- Other indirect costs, which includes costs of facilities, whether rental or ownership costs.

All these must be taken into account when calculating what it costs a company to run its fleet and how can these be reduced in order to achieve economies of scale.

2.7. Driver Management

Managing drivers is an important aspect in fleet management, as vehicles are at the hands of drivers and the drivers are responsible for taking care of the vehicles and safe driving behaviour. Driver management can lead to minimisation of costs in terms of fuel and wear and tear of the vehicle. Some jobs require an extensive driving and as a results the drivers spend most of their time behind the wheel and on the road. It is management responsibility to ensure that the vehicles are in a good condition and health and safety of drivers and other road users are taken into consideration.

The drivers should be trained on health and safety, driving responsibly, checking condition of the vehicle and reporting of faults immediately, in order to reduce possibilities of accident occurrences and unnecessary vehicle breakdowns. A research done by Birkland in 2014

revealed that “top priority of fleet managers was ensuring driver safety, with more than a third (35%) of fleet managers identifying it as their main concern, driver safety outpaced cost savings goals and workforce productivity (27% and 22% respectively) as the top concern for the second year in a row.

The proper driver training, management and care will promote good driving behaviour, ensure that the drivers are driving with proper care and are taking care of the vehicle, by carrying out vehicle inspections, reporting faults timeously, and adhere to service and maintenance scheduled. These will have a huge positive impact in maintaining a balance between the vehicle availability, quality and efficiency.

2.8. Productivity

Another important aspect in fleet management is achieving productivity in the operations of the business that are dependant of vehicles and in vehicle utilisation. Productivity refers to utilising resources efficiently and effectively, in order to achieve goals of the organisation with minimum costs possible. Productivity is very important in business in order to ensure optimal use and return from the resources and sustainability of the business. Productivity requires management control and elimination of delays and wastages, states Narayan (2012). Narayan, further stated that productivity can be achieved by using two approaches namely, manage and reduce work volume by planning and scheduling work properly, in order to minimise resources and reduce downtime or prepare work and eliminate wastage of time and resources. These can lead to high compliance, increase equipment reliability, fewer breakdowns, lower reactive work, increased proactive work which will in turn mean that more work is planned, scheduled, prepared and will improve cycle of productivity.

According to Birkland (2017), productivity in fleet management relates to doing more work and generating more revenue by focusing on fleet and labour productivity, but with fewer vehicles and labour and five to thirty percent is expected to improve return on invested labour and capital by leveraging on-board telematics and workforce optimization applications.

According to Mele (2013), studies revealed that the main concern of fleet managers is maximizing productivity and that productivity is more important than meeting cost savings goals or understanding the impact of new technology. Mele (2013) further stated that, this is true as businesses invest capital in fleet to handle essential work, whether it be carrying freight

for profit, supporting a core business with transportation resources, or providing a way to deliver field service. The survey identified that specification of the right truck for the job as the most important element in getting maximum productivity from a fleet, in another study the same percentage indicated that specification of the right truck was the most valued service that could be provided by a fleet management company, followed by tracking downtime and reducing total cost of ownership.

Productivity is important in fleet management as it will ensure that vehicles are utilised optimally and efficiently, thus reducing costs of managing fleet, balancing vehicle availability, efficiency and quality.

2.9. Vehicle Replacement

The timing of when to replace the vehicles and determining the life cycle of vehicles is very crucial in fleet management. Vehicle replacement refers to how long an organisation keeps or runs the vehicles before they are changed. The criteria can be based on number of years or mileage travelled, or condition of vehicles. The different category of vehicles can have different thresholds.

Fleet replacement is a decision to determine how long should a vehicle be exploited or used or when to dispose or replace them and by what type of a brand new or used vehicles, including selection of vehicles investment or acquisition option namely to buy on cash, or on credit or to lease or rent the vehicles, Redmer (2016). Redmer, further stated that the replacement can be considered on a level of single vehicles or on the entire fleet.

On a level of single vehicle it is important that vehicle must be replaced at an optimum point, not too soon when cost of ownership are too high, or not too late when operational or utilization costs are too high. High ownership costs are caused by depreciation and decrease in the value of the vehicle especially in the initial years of ownership. High utilization costs are associated with decrease in technical condition of a vehicle and high incidents of downtime.

On the level of entire fleet the essence is not to cause high capital investments at once, an adjustments of an individual optimal age to replacement of particular vehicles in a fleet is required in order to keep capital investments within budget limits. The adjustment of an individual optimal age to replacement of particular vehicles can be supported by relatively low

total or unit operational costs function around an optimal age to replacement being the decision variable.

2.10. Maintenance

Maintenance of vehicles plays a key role in fleet management, as vehicles require maintenance, service and repairs in order to be on the road and available for use. Narayan (2012), stated that "maintenance according to British Standard BS EN 13306-2010, 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". Maintenance forms part of asset management process. Iyer, Varma, Aragones, Yan, Bonissone & Xue (2016), stated that asset management process includes management of the whole life cycle of an asset, this includes design, construction, commissioning, operating, maintaining, repairing, modifying, replacing, decommissioning, and disposal of physical and infrastructure assets. Since most organisations have constrained budget, they utilise prioritisation methods for effective operation and maintenance of assets. Prioritization methods can be time or period based, i.e. vehicles are maintained after a certain period or condition based, i.e. vehicles are maintained based on the condition or when they require service or maintenance.

There are 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. Iyer et al (2016), further stated that in a time based method, assets are serviced and maintained at a particular interval according to a schedule that enhances the availability of parts and labour to service assets. These time-based methods assume a particular life-span of assets and asset components and accordingly prioritize the service and replacement of assets and asset components based upon these assumed life-spans. The time-based paradigm was popular with large number of assets as costs associated with physical inspection of individual asset are high as a results the benefits of individualized asset management were outweighed by burdens of individual inspections and an unpredictable repair, maintenance, and replacement costs. A major shortfall of time-based method is that assets and asset components may be serviced or replaced prematurely, resulting in wasted resources and loss of asset value in terms of remaining useful life.

In a condition based method, the asset conditions are monitored and assets are identified for diagnostics, repair, or replacement at the time that the individual asset or asset component requires it, this is based upon measured variances from established parameters. It is therefore difficult to develop schedule and as a result there will be variability in asset operation and conditions, in turn causing variability in required labour and required asset inventory. The state of fleet and information related to fleet changes quickly and dynamically, hence use of fleet technology is required.

According to De Oliveira (2013), the purpose of maintenance is to keep machinery or equipment in conditions that are suitable for operations and maintenance activities can be classified as:

Planned corrective maintenance is maintenance carried out from a predictive monitoring through managerial decision making, whether equipment will continue and perform on the basis of predictive monitoring or it will be operated until it fails. So, management can choose options to carry out maintenance before total breakdown or will only repair and maintain when it has already failed.

Unplanned corrective maintenance happens when the machinery or equipment is not performing as expected, i.e. it when damage has already occurred, this leads to high costs as breakdown can happen during operation cycle.

Preventive Maintenance aims at reducing probabilities of equipment failures, by pre-establishing a maintenance schedule that must be conformed to, thereby reducing costs, errors and performance decline.

Predictive Maintenance aims at carrying out maintenance when machinery needs to be maintained, thus identifying failures as they develop, before machinery breaks down thus permitting precise planning. According to Kilcarr (2013), "predictive maintenance is not only about getting advance warnings via remote diagnostic technology or how on-going fluid analysis programs can extend drain intervals for engine oil, transmission oil and engine coolant; it is however more about giving fleets the ability to know when, based on accumulated data and analytical tools, specific components, such as water pumps or wheel hubs, need to be replaced before they fail, thus leaving a truck (not to mention its revenue-generating cargo) stranded on the side of the road".

Detection Maintenance searches for hidden irregularities that were not detected by equipment or system operator, it is usually related to command or to a protection system.

Importance of developing effective and proactive maintenance plan cannot be over emphasized. Crissey (2016), lists tips from leading fleet maintenance professionals in the industry today to help organisations develop and maintain a proactive maintenance plan. Among other things he lists, that preventive maintenance checklist must be specific and detailed; if an organisation have multiple maintenance facilities, consistency must be developed among maintenance facilities by working closely with each facility maintenance managers; tyre tread tolerances must be reduced in order to minimise risk of downtimes; learn from roadside inspections, by analysing roadside inspection reports from perspective of both maintenance and safety, if any defects take corrective action and file documents for audit purposes; knowledge of local law enforcement; emphasize pre and post trip inspections by developing procedures and monitoring implementations.

Right information must be recorded and analysed carefully during maintenance, in order to determine and detect failure trends and records should have at least vehicle make and model, date and mileage at service and services conducted. Any maintenance requests in between scheduled maintenance schedule should be investigated thoroughly to check unexplained incidents, look for pattern and trends of failures in particular vehicles and adjust maintenance schedule to eliminate those failures in the future.

The maintenance of vehicles is a crucial part of fleet management and ensuring that there is adequate supply of vehicles to meet the demand. This is where the quality plays a central role as the maintenance must be carried out according to specific standard, and failure to meet those standards can lead to unnecessary breakdowns. The efficiency during maintenance is also vital as vehicles must be maintained, service and repaired according to certain standard time and delays will mean that the vehicles are standing and vehicle availability is compromised.

2.11. Use of Technology and Fleet Telematics

Use of technology is a vital component of fleet management. As discussed above almost all these functions can be implemented and achieved easily with the help of technology and use fleet telematics. According to Ingram (2016), the future of fleet management depends on emerging technology and technology has an influence on the way products reach customers,

driving rapid change in fleet management and is impacting the competitive landscape in the areas of data analysis and equipment specifications.

Birkland (2016), defines fleet telematics as the use of wireless technology to transmit data from vehicles to their dispatch and management, these are aftermarket devices or bring your own device (BYOD) which can be tablets, smartphones, software-as- a-service [SAAS] solutions that transmit data on vehicle location, and maintenance and event notification like braking, idling or speeding. There are many ways to use fleet telematics, it depends on what kind of fleet and business and how you set priorities.

Vivaldini, Pires & Souza (2012) stated that, fleet management systems are viewed as tools for operational control and fleet management for various types of business like distribution, rentals, transportation. These systems are flexible, adaptable and can be integrated with applications that already exist in the organisation and information can be used in real time. Fleet tracking system does not only offer fleet managers an ability to see vehicle locations and which driver was speeding, however it has more features which can enable fleet manager to look after vehicles thereby attaining better maintenance and improving safety by looking after people, stated L'Ecluse, (2016). The system also allows the fleet manager to see where the drivers are, whether they are travelling or stationary, shows driver and vehicle behaviour in real time so managers can intervene if the vehicle is being driven poorly.

Birkland (2017), argued that fleet management solution enables businesses of all sizes to make significant improvements in the areas of safety, productivity, regulatory compliance, fleet optimization and expandability. The solution can make estimates of existing and potential cost savings based on rich telematics data and using proprietary algorithms based on market and industry research, the report identifies savings in the areas of safety, fuel, maintenance, and productivity. He further states that, the system can be integrated with other internal business systems and applications like mapping add-ins, dispatch, workflow automation, scheduling, routing, customer management, accounting and that will lead to saving time, money and improving the overall efficiency of the organization, however fleet managers must employ due diligence to ensure they purchase the right system from a reputable vendor or else it may end up costing them more money in the long-run. They further must ensure it's a product that can grow and conform to not only current needs but the ever-changing regulatory needs as well.

The following are the features that Fleet Tracking GPS system offers:

(i) Visibility Feature

The system is able to show exactly where the vehicle is located, what each vehicle was doing and at what time, by knowing each vehicle's location, you are able to more easily identify the best routes, which leads to improved dispatching efficiency, lower fuel costs, less mileage and less damaging wear and tear Birkland (2017).

(ii) Driver Behaviour Feature

Fleet telematics is like the black box of an aircraft, an on-board system that captures data from the fleet and helps make decisions that save money by reducing fuel consumption and maintenance costs, states Gray. Fleet tracking system also provides insight into driver behaviour and allows fleet manager to closely monitor driver safety, said Birkland (2017). Driver data can send warning signals whether the driver is wearing seat belt, how fast they are driving, how hard they are stopping, this will enable fleet managers to discuss the driver performance with the driver and change habits before they cost company, said Frank (2014).

(iii) Monitor Fleet Performance Feature

The most cost effective telematics solutions are able to control fuel consumption, monitor compliance, safety, driver happiness, manage record-keeping obligations and overall operating costs states Birkland (2017). According Partington (2016), "while productivity and efficiency ultimately impact the bottom line, a large line item in most fleet manager's budgets is fuel. It is impossible to predict fuel prices, but a fleet manager can control the fuel spend with fuel card integration options offered by GPS fleet management solutions. With dedicated fuel cards, managers can gain a better understanding of their fuel expenses by tracking, monitoring and analysing fuel consumption. This insight will provide fleet managers with the data needed to improve efficiencies, reduce waste and account for unauthorized fuel purchases".

(iv) Fleet Safety Feature

Driver safety intelligence is capable of doing everything companies require under the health and safety legislation, this includes driver assessments and licence management, to name a few,

said Gray (2016). A GPS fleet tracking solution that integrates with in-vehicle technology means drivers no longer must communicate via cell phones with their dispatchers or fleet managers, thus keeping both drivers and other road users safe and could potentially save a business liability if the driver is responsible for an accident. The system can also alert the owner if the vehicle is involved in an accident.

(v) Improve Productivity

GPS fleet tracking solution offer a route planning feature that optimizes routes for drivers. This feature ensures that the business is not losing revenue due to excessive driving and stops that are out of the way. Optimized routing examines all locations and stops in a vehicle's route and orders them to create the shortest route, saving both time and money.

(vi) Communication Feature

Partington (2016) stated that, these fleet management solutions can simplify the lines of communication and make communication between home base and the fleet both safer and more efficient, thus allowing for increased driver productivity and increased fleet efficiency among other things. He further states that they also offer a dispatching tool, scheduling of jobs to the appropriate sites and last minute jobs are scheduled, ensuring that the vehicle closest to the site is assigned to the new job, thus saving time and fuel.

(vii) Maintenance Feature

GPS fleet management system allows fleet manager to sort out service schedules, pull together key information related to service and maintenance and use alerts and reports to adhere to service schedules, said L'Ecluse (2016). This will lead to less downtime and results in a more productive fleet.

(viii) Routing and Geo-Fencing Feature

The system provides routing that map out most fuel efficient routes and geo-fencing that will alerts the owner if the driver drives beyond a designated route.

According to GAO (2015), emphasised that effective fleet management relies on a well-designed Fleet Management Information System (FMIS) that allows managers to monitor performance of fleet and make analysis required for informed decision making. It further states that comprehensive FMIS should include data on critical aspects of fleet management, which includes costs that can be direct like fuel, repairs and depreciation and indirect costs like utility and labour costs; Utilisation information like mileage or other metrics to justify owning or leasing vehicle, repair, maintenance and service history.

There are various benefits of using fleet telematics namely implementation and monitoring of fleet policy, providing proactive management of key areas such as overall running costs, emissions, fuel use, duty of care and much more. These systems can also be integrated with systems and give means to accurately monitor and report on the performance of entire fleet. These systems can also integrate with route planning software, which can also help to reduce mileage and bring costs down even more, stated Rooth (2015).

2.12. Fleet Management Policy

Fleet management policy is the key in achieving objectives in fleet management, as it will give clear directions on how to acquire, maintain, manage and dispose vehicles within the organisation. Its implementation, monitoring and evaluation is crucial as it will serve no purpose in having the policy that is not implemented properly, monitored and evaluated.

The key to the implementation of fleet policy are the people, people who are responsible for all fleet management activities including the drivers of vehicles. Power (2013) stated that "ultimately a company needs a detailed policy to underpin fleet management" and fleet management must not be neglected but must be treated as a serious discipline and a chance to save money.

The policy should cover all activities and functions of fleet which include among other things how and who is responsible to determine transport needs; acquisition; type of vehicles; repair

and maintenance schedule; utilisation; driver management; replacement and evaluation and review of performance.

2.13. Vehicle Availability

The supply of vehicles is comprised of size of fleet and type of vehicles available to meet demands of transport. The ability of a fleet organisation to meet the transport demand is determined by the availability of these vehicles, i.e. vehicles that are available and fit to be driven and utilised as per business needs. According to Narayan (2012), the equipment can be in one of two states, namely operating state or idle state, if it is not working or is in an idle state it can be because of the decision of operator (which is a proactive decision, whether it is not needed or some work must be performed on the asset) or the equipment shuts itself down, because of component failure and management is forced to react in this instance. The vehicle availability refers to supply of vehicles less the number of vehicles that are in an idle state whether due to proactive decision or reactive reasons. Factors that affect availability are:

(i) Asset Integrity: Narayan (2012) stated that it ensures that the equipment performs effectively, the people and environment are safe and protected from any foreseeable harm and this requires a system to be in place and used effectively in order to ensure asset integrity.

(ii) Reliability is the probability that an asset or equipment will perform its intended function for a defined period of time, under stated conditions of use. Human reliability requires competence of people operating and maintaining the equipment; Process reliability among other things, requires operators to look after the equipment and machinery, operate machinery within constraints or prescriptions of manufacturer and take equipment to maintenance as scheduled; Equipment reliability refers to failure free performance of the equipment.

(iii) Operability, refers to how easy it is to start up, operate and shutdown the machinery or equipment.

(iv) Maintainability refers to how quick it is to fix failed equipment and restore it satisfactorily, this includes availability of spare parts and tools, ease of diagnosing faults and availability of logistics support among other things.

All of the above mentioned factors influence availability of assets for operation, taking care of these factors will ensure high productivity, reduce downtime and minimise costs.

2.14. Quality

Narayan (2012) stated that quality has subjective and objective attributes and can be a moving target, quality definitions are numerous and vary in meaning, but the generally agreed attributes of quality are defined as: "A product, information or service that meets or exceeds the customer's stated or implied expectations and or predetermined performance standards; does this consistently, over a long period; has a sense of value to justify its price; anticipates constantly evolving expectations; performs predictably, i.e. no surprises; and ultimately "wows" the customer who comes back for more". Narayan further stated that quality have different aspects which include quality of people and quality of system's output, wherein system means "the combination of the people, process and plant facilities that produces the goods, services or information that the customer wants". Quality must be applied to every business process thus ensuring clarity to roles and responsibilities.

2.15. Efficiency

The efficiency in fleet management is running fleet effectively by improving operational performance and reduce costs of running fleet. "The efficiency in fleet management can be achieved by looking into every function and process, from how an organisation acquires its fleet, how you sell then and where you repair and maintain them" Rooth, (2013).

According to Mele (2013), fleet managers want to get the most work out of their fleets at the lowest cost possible, this basic tenet of fleet management should shape every management decision.

According to Barry (2013), there is no single approach in lowering fleet costs, a multiple approach is required from procurement, to running of the vehicle to disposal and in order to lower fleet costs you must understand your operation and have a benchmark to measure your fleet against. The fleet operator should have a fleet strategy based on the objectives of the organisation, as some would focus on the environment and safety, others on total cost of

ownership or day to day costs of running each vehicle. Whatever the motive is, the main objectives should be that the vehicles are fit for use and are cost effective. This requires among other things development and implementation of a sustainable fleet strategy that will contribute to environmental targets and reduce transport costs according to Transport for London (2016).

According to Birkland (2014), the following areas must be taken into consideration in order to achieve efficiency in fleet management.

2.15.1. Environmental Efficiency

Balsas (2016) said "Transportation is critical to the functioning of society as movement of people and goods depends on transportation, however its magnitude generates both negative and positive impacts. Its positive impacts have grown to a point where they create incremental reductions in mobility and accessibility for cities and some segments of society. The congestion, air and noise pollution, traffic accidents, sprawl and consumption of finite resources are examples of what is unsustainability of transportation". Travel Demand Management can reduce land used for parking and leave more for green space and use of travel plans can lower transport energy use, fewer greenhouse emissions and less noise pollution Western Australia Department of Transport (2016).

Mele (2013), argued that "the best way for fleets to cut CO2 and meet the growing demand for lower GHG emissions is to use less fuel".

2.15.2. Energy or Fuel Efficiency

"Energy or fuel efficiency is using the least possible amount of fuel to get the job done" Motor Transport, (2017). It further states that optimised specification to ensure that the vehicle is the right model for the job and driver performance are the key elements to achieving fuel or energy efficiency. Use of alternative fuel vehicles also reduces fuel costs, however the articles states that the greatest challenge is not to develop engines that operate on alternative fuels, but to match their performance to that of the traditional diesel engine. There are a few alternative fuel ranges that are available in the market, namely biogas, natural gas, hydro-treated vegetable oil, biodiesel, bioethanol, hybrid and electric models to name a few.

Power (2013) stated that, in recent years fuel costs have been increasing and are one of the major areas of financial impact, as companies can't control fuel prices, they need internal controls to ensure optimal use, these may include watching out for filling up on weekends and reviewing of reports indicating consumption, this will show the high fuel consumption drivers.

Birkland (2014) stated that fuel management by both the driver and management is another very effective cost management tool. This can be achieved by providing drivers with real-time feedback, effective training and reward programs, this assists in creating better drivers and better drivers are safer, use less fuel, incur lower maintenance and insurance costs.

2.15.3. Driver Behaviour

How the driver is driving the vehicle makes a huge impact on fuel consumption and wear and tear of the vehicles. The driver performance can be tracked using fleet telematics systems that records driver behavioural patterns and produces driver scorecards and reports on different aspects of driving vehicle, like hours of service violations and stability, hard braking, driving in neutral and speeding events said Skydel (2017). Skydel, further stated that there should be rewards for good driver behaviour and a programme to help correct habits that are not safe. According to research by Telogis suggests that a driver can boost overall fuel-efficiency by as much as 30 percent through simple maintenance and attention to driving style, fleet that adheres to the speed limit can save 20 percent on fuel and a fleet that avoids heavy braking and accelerating can save 40 percent, stated Oxley (2016).

2.15.4. Safety

Birkland (2014) said, safety is one of the fastest ways to minimise running costs because there is a direct correlation between driving safety and driving cost-effectively. The less jackrabbit starts, speeding and hard-braking across a fleet, can lower the operational costs, including fuel, maintenance, damage and insurance costs. It is not unusual to see a more than 90% reduction in unsafe driving behaviours, resulting in 5% to 15% reduction in avoidable operating costs".

2.15.5. Fleet Acquisition

Lease or buy decision should be based on comparison of direct and indirect cost projected for the life-cycle of the owned vehicle to the total lease costs over the identical life-cycle. If a full set of costs is not considered or an analysis of lease or buy, may results in inappropriate conclusion that one method is better than another and that could therefore lead to higher overall fleet management costs.

2.15.6. Fleet Composition

Specification are important in order to ensure that the vehicle is the right model for the operation. Kostora (2014) said that some vehicles get better fuel mileage than others and some better maintenance costs than others, it is therefore up to the fleet manager to determine the best option for their fleet and how to balance different challenges they face. He further states that these short and long term benefits are important for the decision making process, whether to get a cheaper vehicle with lower fuel efficiency or a more expensive vehicle with better fuel efficiency.

2.15.7. Fleet Size

Costs can be reduced by reducing fleet size to optimal amount of vehicles needed to meet organisation's mission. In a memorandum issued by the American President in May 2011, federal agencies were directed to determine their optimal fleet inventory and set targets for achieving these targets by the end of 2015.

2.15.8. Fleet Telematics

The features that fleet telematics offer can help to audit and measure productivity of drivers, provide correct routes to drivers, manage costs effectively, improve occupational health and safety compliance, reduce fuel consumption and minimise carbon emissions stated Guan (2012). These solutions do not come cheap however they give an opportunity to organisations

to show how they can create a better return on investment in their fleets in terms of time, money and employee productivity with use of fleet telematics, data analysis and reporting, said Jarvis (2016).

According to L'Ecluse (2016) looking after maintenance and employees goes a long way toward driving profitability and reducing cost, whether you run a small or large business. When operating in an increasingly tight market, GPS fleet management can play an important part in sharpening your competitive edge.

Fleet systems can map every turn of the key, every stop and all other activities of a vehicle, this assists management to make informed decisions to improve operational efficiencies and reduce costs, Birkland (2017). Proper telematics solution can pay for itself by allowing fleet managers to easily supervise driver speeds, routes, safety and idling which enable vehicles to end up with more uptime via fewer compliance issues, increased fuel savings, better compliance and reduction of greenhouse gases.

2.15.9. Vehicle Utilisation

As reducing fleet size holds greater potential for cost savings, vehicle utilisation criteria should determine a minimum number of kilometres, days or trips a vehicle should be used in a given period of time in order to be considered adequately utilised. These reviews should be done periodically, in order to identify under-utilised vehicles, and make plans to replace, reassign or dispose vehicles based on the results of the study GSA (2015). Mele (2013) stated that better route planning will allow fleets to be more productive while offsetting rising costs, trucks that use less fuel and fleets that run fewer unproductive miles, fleets will reap tangible benefits from their contributions to environmental sustainability.

2.15.10. Fleet Maintenance

Fleet maintenance is an area that has a huge impact on fleet in terms of costs to maintain the fleet and to keep the vehicle operational. Successes in the vehicle maintenance depends on preparing a good maintenance program and adherence to the program; vehicles must be maintained regularly, as delaying maintenance until something goes wrong will only lead to

higher costs, there is a difference between maintenance and repair. A well planned preventive maintenance program, will assist fleet managers to keep vehicle repair costs down and reduce downtime, however a poorly designed program wastes time and money.

2.15.11. Fleet Replacement

Redmer (2016), stated that the main aim in fleet replacement must be to minimise overall exploitation, operational or utilization costs; it is important to look at minimising unit costs like costs per kilometre as opposed to annual total costs. Redmer, further stated that, there are two methods that can be used in fleet replacement, namely preventive based method, where time to replace must be determined and failure based method is where replacement takes place when vehicle failure occurs.

According to Ingram (2015), the philosophy of economic obsolescence is that it is much more efficient and cost-effective to run trucks until it becomes cheaper to get a new truck than to operate an old one, rather than trying to extend vehicles' working lives by operating trucks until they become functionally obsolete. He further states that by focusing on economic obsolescence, companies can implement a continuous improvement model thus enhancing efficiency, lowering costs and providing environmental leadership via reduced greenhouse gas emissions.

2.16. Summary of Literature Review

The literature presented in this study indicates that the fleet management activities are an important aspect of an organisation as they involve high capital investment and high operational costs and therefore require proper application of management functions.

Planning must be properly done in order to develop strategy of fleet management and establish needs and requirements for transport in the organisation and how those needs and requirements can be met. The development of fleet policy is crucial as it will guide the fleet management operation.

Organisation of activities in order to meet the needs and requirements involve who is responsible for making specifications of type of vehicles to be acquired, develop policies and

where, when and how maintenance, replacement and other fleet management activities should take place.

Timeous implementation and evaluation and control of fleet management strategy of the organisation. Failure to properly manage fleet requirements and management activities can results in unnecessary high costs which can be of maintenance and fuel, high rate of breakdown or downtime of vehicles, procurement of unsuitable vehicles for types of operation and ultimately failure to deliver goods and services to the customers, which will have negative repercussions for the organisation namely bad reputation, loss of profits and market share.

The application of management cycle activities of planning, organising, leading and control of fleet management in the organisation will ensure that:

(i) The critical factors affecting vehicle availability, quality and efficiency are identified,
(ii) The relationship and impact of efficiency and quality on vehicle availability is identified; and
(iii) The ways of balancing the quality, efficiency and vehicle availability are identified, well managed and balanced.

2.17. Conclusion

In this chapter the concepts, themes and ideas of fleet management were discussed comprehensively in relation to quality, efficiency and availability of vehicles. The important aspect is firstly to determine demand and requirements for transport in the organisation. Establish how these will be met, whether to buy, lease or use the mix, by what types, brands and makes of vehicles. The maintenance of these vehicles is crucial in order to ensure safety of the driver and other road users, the availability of vehicles and reducing costs of running the vehicles. All these factors must be taken into consideration in order to maintain a balance between vehicle availability, quality and efficiency.

In the following chapter the research methodology that was used in obtaining primary data will be discussed in detail.

Chapter 3

Research Methodology

3.1. Introduction

In many cases the term research is used loosely to refer to talking to a few people and getting their opinions about a certain matter or subject or collecting facts without analysis interpretation. However according to Saunders, Lewis & Thornhill (2012), a true sense of the word research refers to, having a clear purpose to find out things, collect and interpret data systematically.

In business, research is useful as managers can commission research in order to gain more insight on what is happening within their organisation and make informed decisions to solve business issues and practical management problems, based on the recommendations of the findings of the research. The knowledge can also be drawn from research conducted globally from similar industry and organisations so that decisions can be made from current and practical findings and recommendations.

The research methodology refers to how the research is done scientifically, in order to solve the research problem systematically. In this chapter the research methodology literature will be discussed and how was the research methodology applied in this study. The research design, the population, sampling, the data collection, data analysis and ethical considerations will be discussed in the chapter.

3.2. Aim of the Study

This study explores broader look of fleet management; management activities involved in managing fleets within organisations and how to ensure that fleets are managed effectively in order to reduce costs of running fleets.

The aim of this research is to collect information about fleet management activities through review of literature and interviews with relevant participants, by asking relevant questions on vehicle availability, efficiency and quality in fleet management. These were done in order to determine or establish how efficiency and quality affects vehicle availability and how a healthy

balance among these can be maintained in order to achieve vehicle availability targets, while maintaining quality and achieving efficiency at the same time.

3.3. Research Design and Methods

The research design refers to the plan and decisions regarding what is the study about, which refers to aim and objective of the study and in this study, this was established as to determine how to maintain a balance between vehicle availability as a performance indicator, quality and efficiency in the fleet management unit.

This is a case study of EThekwini Municipality conducted in order to establish how these factors affect each other and to make recommendations based on literature review and responses received from the interviews that were conducted.

There are two main types of research design methods namely quantitative design method and qualitative design method. The quantitative method refers to data collection and analysis method or procedure that uses or generate numerical data like graphs or statistics. The qualitative design method uses collection techniques like interview to collect data and data analysis procedures like categorising data to generate non-numeric data, Saunders, Lewis & Thornhill (2012).

The qualitative method refers to data collection method (like interviews) and data analysis method that will generate non-numerical data, i.e. meaning is derived from words not numbers. In this study the qualitative design method was chosen in order to meet the objectives of this study, the data was collected by conducting personal interactive interviews with the senior, middle and lower management of the organisation and data was analysed from the responses of participants using non-numerical data.

3.4. Research Paradigm

There are four categories of social science paradigms that represent major belief systems of business and management researchers regarding the ontology of research and nature of society. The researcher can adopt one of these paradigms namely, radical humanist paradigm, radical structuralist paradigm, interpretive paradigm or functionalist paradigm.

Interpretivism refers to the way human beings try to make sense of the world around them. The paradigm the researcher was working within this study is the interpretive paradigm, as the researcher was seeking to understand and discover how to maintain a balance between vehicle availability, efficiency and quality within the operations of the organisation.

3.5. Study Setting

Fleet management in the eThekwini Municipality is carried out using a centralised model where vehicles are bought and owned by the municipality and are let out to different departments. The vehicle availability is a performance measurement to monitor whether the supply of vehicles on any particular day meets the demand and the target is 90%.

However because vehicles are depreciating in value and performance over the years, they require to be serviced, maintained and repaired for them to be safe and available for use at all times. It is against this background that this study seeks to investigate how a balance between vehicle availability, quality and efficiency can be maintained in order to ensure that the vehicles are available for service delivery, they are safe and fit for use and the repairs, service and maintenance is done timeously in order to achieve the vehicle availability target.

3.6. Population and Sample of the Study

In research the population refers to a full set or category or total number of people or members, elements or subjects that are implicated or relevant to the study. The data can be collected from every member which is referred to as census, however in some cases it is not possible to conduct a study and include or target all the members, hence sampling is required. In this study the target population is the management of the department and the population size comprises of two executive managers, two senior managers, five middle managers and ten low level managers, totalling twenty two.

The sample refers to selecting members that represent a full set of cases; the sampling should be meaningful and justifiable, states Saunders, Lewis & Thornhill (2012).

In this study the participants were selected using purposive sampling method and the criteria was based upon work experience within the industry, role they play in the organization and

number of years they have within the organization. The sample size consists of ten to twelve managers, targeting at least one executive, one senior manager, five middle managers and five junior managers. However, during interview process one executive, one senior, three middle managers and three junior managers were interviewed due to time limitation, willingness and availability of participants and also saturation of data.

3.7. Sampling Method

There are two types of sampling techniques namely probability and non-probability sampling methods. In the probability sampling method each item or case has an equal chance or probability of being selected and the probability of each item or case is known. This type of technique is usually undertaken if the size of the population is huge and it might not be possible, it will be costly and take time to reach the whole population. Also the generalization for the whole population can be made based on the sample. The non-probability method is used if probability or chance of selecting items is not known and the answers to research questions do not require statistical inference.

The sampling method used in this study is non-probability sampling method, because the population size is twenty and to address this research objectives and answering this research questions does not require to use statistics. The purposive sampling was used, targeting the management team due to the role they play in the organisation and experience in the field of fleet management.

3.8. Construction of Research Instrument

The qualitative research does not require a specific instrument like a questionnaire, however in order to guide the researcher to focus on the objectives and answering of research questions there were pre-set questions and in order to accommodate the opportunity for responses that may trigger more questioning and thus collecting relevant data. The data was recorded in the form of audio recording, with the permission of participants and was then transcribed in writing.

3.9. Data Collection

The data can be collected through observations, research interview or questionnaires. Observation refers to watching behaviour of people as they carry out their normal or usual activities. When using questionnaire, a standard questionnaire is developed with same questions, in a predetermined order. The respondents can answer questions in person, telephonically or electronically. Saunders, Lewis & Thornhill (2012) refers to research interview as a conversation between two or more people, where a researcher asks purposeful questions that are relevant to the objectives of the study in order to receive responses that are relevant to objectives and questions the study seeks to answer. The interview can be structured, where there is a questionnaire with identical predetermined questions; semi structured where there are key questions and they may differ in every interview; unstructured interviews which are commonly referred to as informal.

In this study the data was collected by interviewing participants individually, by making appointments, meeting participants and asking questions, elaboration was requested where required and other questions were asked based on responses from the participants. The interview type is a semi-structured as there is a questionnaire, however some questions or responses may trigger more questions in order to acquire more relevant information to answer questions and meet objectives of this study namely:

- Determine and analyse critical factors affecting vehicle availability.
- Determine and analyse critical factors affecting efficiency and quality.
- Investigate impact of vehicle availability on efficiency and quality and vice versa.
- Determine ways to balance vehicle availability, quality and efficiency.
- To make recommendations to City Fleet Unit regarding how to balance vehicle availability, quality and efficiency in fleet management process.

3.10. Data Analysis

Data analysis stage in the research process refers to making sense of the data that was collected in order to arrive at the conclusion. This involves editing, sorting, coding and interpreting data.

The qualitative data can be analysed from an inductive perspective, a deductive perspective or from an abductive approach. The inductive perspective is when a certain phenomenon is observed and then arrive at the decision whereas a deductive approach arrives at a reasoned conclusion by generalizing known facts, says Sekarana (2003). The abductive approach combines inductive and deductive approach, this begins by observing a fact or a behaviour and then work out a plausible theory of how this could have occurred, Saunders. In this study data will be analysed using an abductive approach.

The research philosophy used in this study is more of that of interpretivism, as there is much involvement of human beings in this study. The issue of vehicle availability touches on human delivering services to the community, the issue of quality and efficiency touches on human activities while performing their jobs. Hence a choice of a qualitative data collection and data analysis. The researcher analysed data by transcription of data from interviews, by listening to the recordings a number of times and transcribed into a document.

3.11. Reliability and Validity of the Study

Reliability and validity are important characteristics of research quality, reliability means that if the study, using similar data collection methods and analytical procedures, was repeated in another occasion or by a different researcher would produce consistent findings. Validity refers to whether the research measures what the researcher intends to actually measure, whether there is a causal relationship between two variables and whether the findings can be generalised to other similar and relevant settings, states Saunders, Lewis & Thornhill (2012).

Reliability and validity was ensured firstly by conducting a pilot study. A pilot study also referred to as a preliminary survey is a process of refining research idea, to turn it into research question and then into a research project. A pilot study may involve a literature review, discussions with people who experienced and have knowledge about the research idea, Saunders, Lewis & Thornhill (2012).

In this study the pilot study was conducted by observing, listening and discussing the research idea with management of the unit involved. The questions were also tested prior to finalising questionnaire.

During sampling process the reliability and validity was ensured by selecting participants from different management levels and locations i.e. the managers are managing different workshops.

During interviewing process the researcher clearly stated reasons and objectives of the study, went through research questions and adhered to same questions and only asked extra questions where the researcher required clarity on responses and also to ensure that the participant understood the question correctly. The data was recorded by taking down notes and use of audio recording device.

3.12. Elimination of Bias

The researcher endeavoured that there were no biasness during literature review, collection of data by sampling participants from different levels of management and from different sections or depots and analysis of data. The researcher approach each process with integrity and objectivity.

3.13. Ethical Consideration

Ethical issues were considered consistently throughout the research process, from formulating the research topic, to obtaining gate keepers letter, obtaining the consent from the participants and in ensuring that there is confidentiality during interviews and during analysis.

3.14. Summary

In this chapter the research methodology was discussed in detail with reference to research literature. The research design, research paradigm and research methods were mentioned, the population and sample was explained and data collection and analysis

In the following chapter the results and findings from interviews will be discussed in detail.

Chapter 4

Presentation of Results

4.1. Introduction

In this chapter the data from the interviews is presented in a form of tables, these results are summarised based on the objectives of the study. Interviews were conducted with management of the unit, namely one executive manager, one senior manager, three middle managers and three supervisors were interviewed from different depots. The interview questions were based on the objectives of the study as outlined below:

4.1.1. Determine and analyse critical factors affecting vehicle availability.

4.1.2. Determine and analyse critical factors affecting efficiency and quality.

4.1.3. Investigate impact of vehicle availability on efficiency and quality and vice versa.

4.1.4. Determine ways to balance vehicle availability, quality and efficiency.

4.1.5. To make recommendations to City Fleet Unit regarding how to balance vehicle availability, quality and efficiency in fleet management process.

4.2 Presentation of Results Based On Objectives

4.2.1 Objective 1: Determine and Analyse Critical Factors that Affects Vehicle Availability

In order to achieve objective 1, the following four questions were asked:

- What is your understanding of vehicle availability?
- Why is vehicle availability important to your business?
- What would you say are the critical factors in maintaining your target?
- What do you consider are the main challenges in managing the vehicle availability?
- How is your section or workshop contributing in managing or achieving the vehicle availability?

4.2.1.1 What is your understanding of vehicle availability (Question 1.1?)

The responses from each participants are outlined in table 4.1 below.

Table 4.1.

Response		**Key Words**
P1	Vehicle that is not defective; available for department to use.	Vehicle available; not defective
P2	Vehicle that is available for a department to deliver services.	Vehicle available; deliver services
P3	Vehicle is available	Vehicle available
P4	Vehicles available for the customer or the various user departments to utilise to provide service delivery; having vehicles on the road, not in the workshop; It is more profitable to have the vehicles on the road than having them standing in the workshop waiting to be repaired; If the vehicles is with the customer or the user department they are being charged per day, if it is in lying the workshop there is no income.	Vehicle available; service delivery; on the road; income
P5	Total amount of vehicles at the disposal of the city at anyone time to be able to execute their relevant duties for their relevant business units.	Vehicle at the disposal; duties; business units;
P6	All vehicles are available to the user at all times, the vehicle does what it was bought for almost daily, to enable the departments to carry out their duties.	Vehicle available to user departments to carry out service delivery.
P7	Vehicle is available for user departments to conduct daily duties, or their field of work to complete their request by the public.	Vehicle available to user departments to fulfil public requests.
P8	The availability of vehicles to be utilised by various departments to provide service delivery to the community. Ensuring that vehicles are well maintained, there are less	Vehicle available to user departments to deliver services,

	breakdown, as that results poor service delivery to essential services.	ensure vehicles are well maintained and there are less breakdowns.

4.2.1.2 Why is Vehicle Availability Important to Your Business? (Question 1.2)

The responses from each participants are outlined in table 4.2 below.

Table 4.2

Response		**Key Words**
P1	Our unit offer support to service delivery unit, by ensuring that the vehicle is available to deliver services, reduce service delivery protests and ratepayers get benefit for their money.	Support; service delivery; protests; ratepayers;
P2	We are the heart of service delivery, if there are no vehicles there is no service delivery.	Service delivery;
P3	Standing vehicles cost money, the work does not get done; vehicle is a tool to perform duties.	Cost money; vehicle is a tool
P4	We have emergency services and various other services that depend on the vehicles on a day to day service delivery	Service delivery; services
P5	Creates customer satisfaction; Ensures that the vision of the City and the demands of the communities and the ratepayers is met; cannot execute service delivery if vehicle availability stats are low; sustainability of business;	Customer satisfaction; vision of the City; service delivery; communities; demand; ratepayers; sustainability
P6	It is important to carry out our business; to deliver service.	Carry out duties; deliver service
P7	The departments are our customers, we are assisting the departments to carry out the services efficiently and effectively to the ratepayers.	Carry out functions; services to ratepayers.

Response		Key Words
P8	Support essential service units to deliver services to the community.	Support essential services

4.2.1.3 What Would You Say Are The Critical Factors In Maintaining Your (Vehicle Availability) Target? (Question 1.3)

The responses from each participants are outlined in table 4.3 below.

Table 4.3

Response		Key Words
P1	Shortage of technical skills; training of technical staff on new technology; availability of staff (attendance); availability of spare parts; fleet age; drivers' handling of the vehicle; turnaround time.	Skills shortage; training; staff shortage; fleet age; spare parts; turnaround time;
P2	Ensure enough manpower; Correct tools, proper tools to do functions; Enough resources to maintain target; Management of resources	Manpower; tools; resources; management;
P3	Set standard of availability; measure availability; put mechanism to maintain availability; Age of vehicle, the older the vehicle the more likelihood of breakdowns and repairs, OEMs remove original spare parts from the shelves on vehicles older than ten years and you have to use alternative parts which are cheaper, however in fleet cheap is nasty.	Standard; availability; vehicle age; spare parts; cheap parts;
P4	The employment of qualified artisan mechanics; attracting the right demographics; employing right person for the right job; SCM processes have too much of red-tape when procuring goods and services; The availability of spare parts in the stores is low; The way the user departments are utilising the	Qualified artisans; demographics; SCM processes; spare parts; vehicle utilisation; contracts; staff shortage;

Response		Key Words
	vehicle, bring it to a standard that is, bring it to a critical condition where the vehicle would have taken us 1 day to fix and it will now take us five days to repair; Using the right vehicle for the right application. Utilising correct vehicle for the job; SCM processes that needs to be followed and contracts where there is no contracts that delays the entire process; SCM has no staff, no purchasing get done, so vehicles cannot be repaired due to no spares; Replenishing of stock timeously; Not enough Staffing; Fleet size has grown drastically; Technology has grown and skills of staff is limited; Availability of spares from suppliers; The aging fleet; Multiple drivers of vehicles; Accidents amount is high.	fleet size; stock; technology; accidents;
P5	Work-loading vs. available man-hours to be complimentary; skills deficit; reliant on outsourcing; SCM staff shortage and long turnaround times; Contracts must be in place.	Work-loading; man-hours; skills deficit; outsourcing; SCM staff shortages and long turnaround times; contracts
P6	Availability of spares, how soon we receive spares; quality of work; quality of technicians, skills needs polishing.	Spares; Workmanship; Technicians
P7	Spare parts, unavailability of spare parts. SCM delays in ordering of spare parts. Training of staff should be more regular to keep staff abreast with industry technology developments. Employment equity initiative, hiring of inadequately skilled staff due to complying with policy to meet demographics.	Spare parts; Training; Empowerment Policy; Contract Management.

Response		Key Words
	Contracts Management, with expired contracts it takes longer to acquire parts and outsourcing.	
P8	Ensure equipment and tools to perform the work are available for employees to perform their duties; Involving employees in the operational decision making; Good planning of workload, start with quick jobs, regular meetings with staff to discuss work in progress and understand their challenges. Balance the work to be done in-house and for outsource.	Availability/provision of equipment and tools

4.2.1.4 What Do You Consider Are Main Challenges In Managing The Vehicle Availability? (Question 1.4)

The responses from each participants are outlined in table 4.4 below.

Table 4.4

Response		Key Words
P1	Pressure on managers and staff to achieve target and that leads to inaccurate information when reporting; Poor workmanship because of pressure to turnaround vehicles and results in high volumes but poor quality; age of vehicles; vehicles are being driven by multiple drivers; Skills shortage of the trade, which includes artisans, supervisory and management level	Pressure; inaccurate reporting; poor workmanship; high workload; poor quality; multiple drivers; skills shortage
P2	Lack of initiative as some employees focus more on their duty schedule instead of what is in front of them; Poor management of vehicle utilisation; Abuse of vehicles; poor enforcement of fleet policy;	Initiative; duty schedule; vehicle utilisation; abuse of vehicles; fleet policy

Response		Key Words
P3	Age of vehicle; drivers who are driving vehicles poorly; qualified, capable and skilled maintenance staff to carry out repairs and maintenance in a particular vehicle; regular servicing and maintenance of vehicles; measure fleet performance by number and types of breakdowns; separate mechanical and non-mechanical breakdowns;	Vehicle age; skilled staff; regular servicing and maintenance; fleet performance; vehicle breakdowns; mechanical and non-mechanical faults;
P4	The availability of technical staff; Availability of spares; contracts to be fast-tracked; Renewing the fleet	Technical staff; spares; contracts; fleet
P5	Skills deficit; non-availability of vehicle testers; aging workforce; service scheduled in hours instead of kilometres driven by the vehicle which leads to over-subscribing; scheduling of vehicles by a non-technical person; ability of fleet system to restrict work to be done on certain intervals; high work-loading leads to not following proper processes; staff shortage; inability to fill up positions due to requirement to hire women for demographic balance; women artisans not easily found in the market; unscheduled work coming into the workshop; other departments scheduling their own vehicles; outsourcing which leads to longer turnaround times; low quality or competence of artisans qualified through RPL and S26D programmes;	Skills deficit; testers; aging workforce; service schedule; hour driven; kilometre driven; fleet system; work-loading; staff shortage; demographics; women artisans; unscheduled work; outsourcing; turnaround time; qualified artisans; RPL and S26D programmes.
P6	Procuring of spares on time, the longer it takes to receive spares, the longer the vehicle stays off the road; SCM processes, there's an artisan who make request for parts, the clerk who facilitates requisition and the buyer who deals with procurement of parts. Sometimes buyer does not know what contracts are in place, use of three quotes system which is takes longer;	Spare parts; SCM processes; unscheduled vehicles; inadequately skilled staff through RPL ; age of vehicles;

Response		Key Words
	Unplanned or unscheduled work, causes delay and increases workload; Inadequately skilled personnel due to RPL programme and low staff morale, affects turnaround of vehicles in the workshops; Age of vehicles, the vehicles spend longer time due to whether the spares are not available or other faults as the vehicle is old.	
P7	Shortage of staff Size of facilities, due to increase in number of vehicles over the years, workspace is small and volumes are high. SCM Contracts Management; staff training and demographics.	Shortage of staff; size of facilities; Contract Management, training and demographics.
P8	Staff attendance, staff who are regular on sick leave, as work versus staff availability; Rate of accidents; Improve relationship with SCM as they support us in purchasing the spares; improve relationship with other suppliers; Contract management, if there are no contracts in place, the process is longer as we have to go through a 3 quotes system. Poor quality of work that we produce from our workshop, repairs not done correctly; Replenishing of fast moving items in the stores.	Staff attendance; rate of accidents; relationship with stakeholders; contract management; poor workmanship in carrying out repairs and maintenance; replenishing of parts;

4.2.1.5 How Is Your Section Or Workshop Contributing In Managing Or Achieving The Vehicle Availability? (Question 1.5)

The responses from each participants are outlined in table 4.5 below.

Table. 4.5.

Response		Key Words
P1	Taking personal accountability of vehicle availability; ensure contracts are in place; arrange necessary training for technical staff; conduct mystery shopper visits to workshops in order to verify facts, look at cleanliness.	Accountability; contracts; training; mystery shopper.
P2	Implement service schedule plan to ensure vehicles are serviced and maintained timeously; preventative maintenance to eliminate number of breakdowns; roadshows to orientate drivers on the use and care of vehicles.	Service schedule; preventive maintenance; breakdowns; roadshows.
P3	Regular servicing and maintenance to identify failure before it occurs; managing downtime by ensuring adherence to turnaround time.	Servicing; downtime; turnaround time.
P4	schedule overtime to get vehicles completed; 24 hours standby to have vehicles repaired, we have staff that are working 24 hours to provide availability and emergency; ordering parts in advance, so that they could turn the vehicles around; outsourcing some of the jobs, just to get quicker turnaround as well; regular meetings with suppliers with regards to availability of parts and outsourced work; daily reports are pulled through to monitor the availability.	Overtime; parts; outsourcing; regular meetings; suppliers; daily reports.
P5	Assess and scope work that's required per vehicle; prioritise workload; allocate work per task type to the most competent person; outsourcing some work, which has its own disadvantages; overtime.	Workload; prioritise; outsourcing; overtime.

Response		Key Words
P6	Internal stores that keep spares to minimise delays in receiving spares; Close supervision and management of processes Vehicles stick and adhere to service schedule.	Spares in internal stores. Close supervision and management of employees; Adherence to service schedules, proper tools.
P7	Prioritization of certain departments due to nature of their duties. Communication with staff to understand goals and challenges and they can assist in meeting goals and challenges.	Prioritization; communication with staff.
P8	Regular meetings with staff to move vehicles; prioritise vehicles according to service;	Regular meetings with staff; prioritise vehicles.

4.2.2. Objective: 2 Determine and Analyse Critical Factors Affecting Efficiency

In order to achieve objective 2, the following questions were asked:

- What is your understanding of efficiency?
- Why is efficiency important to your business?
- Please name the critical factors that affect efficiency and explain why and how.
- What is your understanding of quality?
- Why is quality important in your business?
- Please name the critical factors that affect quality and explain why and how.

4.2.2.1. What Is Your Understanding Of Efficiency? (Question 2.1)

The responses from each participants are outlined in table 4.6 below.

Table 4.6

Response		Keywords
P1	How soon can a mechanic do a job and complete correctly; Provision of tools timeously; Provision of spares timeously; Manager signing-off timeously; Superintendent approves; How soon the clerk is capturing information correctly; Efficiency of entire manpower; Effectiveness, you can do the job quickly but are the results satisfactorily.	Time to perform job; accurate; tools; spare parts; signing-off; artisan; clerk manager; superintendent; manpower; effectiveness
P2	Do job accurately the first time.	Accurate; first time;
P3	You can measure efficiency in terms of inputs versus output. All your fleet should be running on the road; turnaround time, i.e. in and out efficiency of downtime; measure like vehicle should not be down for more than ten days a year.	Inputs; outputs; on the road; turnaround time; downtime; measures
P4	Efficiency is giving the best possible value; efficiency is turning vehicles around; efficiency is how effective that one's workshop could be e.g. when the vehicle comes in for service, within 2 hours the vehicle should be turned around and keeping to standard times and SLAs.	Value; turnaround; effective; standard times; SLAs
P5	Time customer drives through the premises; front counter staff and reception; foreman assessment of vehicles and distribution of jobs; artisans' analysis and assessment of vehicle, ordering of spare parts, fitting parts on time and correctly and capturing of job-card; clerks capturing all components and ordering parts on the system; buyers requesting quotations from OEMs; OEMs delivering parts;	Customer; front counter; foreman; analysis and assessment of vehicle; distribution of jobs; spare parts; job-cards; capturing; buyers; quotations; OEMs; fitting parts on time and accurately.
P6	Repair by the OEMs standard times, have proper tools to carry out duties.	Adherence to standard time

Response		Keywords
P7	How quick or fast you can do a job without compromising quality.	Doing job fast without compromising quality.
P8	Inputs vs. outputs; how soon do I complete jobs to sustain availability;	Inputs vs. output;

4.2.2.2. Why Is Efficiency Important In Your Business? (Question 2.3)

The responses from each participants are outlined in table 4.7 below.

Table 4.7

Response		Keywords
P1	Achieve turnaround vehicles timeously and correctly, with no comebacks; Contributes to high availability; adherence to standard times; performance management; no return jobs	Turnaround time; accuracy; returns or comebacks; availability; standard times; performance management;
P2	Efficiency enables quick turnaround time so that the vehicles will be available to the users to deliver services as quickly as possible; By doing that you will be avoiding service delivery protests	Quick turnaround times; vehicle available; service delivery protests;
P3	It's all about turnaround time of the vehicle in our workshop, so the quicker we can spin the vehicle around and put it back on the road, and then we are efficient we can be; in fleet the underlying factor is always costs, cost when the vehicle is off, cost when the vehicle is standing, you minimise cost by having vehicle on the road.	Turnaround time; quick; costs; vehicle on the road;
P4	Efficiency is important because you could turn vehicles around much quicker; Your input is greater: whatever vehicles coming to the workshop	Turnaround vehicles quicker;

Response		Keywords
	you can turn them around and have them completed much quicker; How quick one could do something.	
P5	The overall efficiency of the organisation or of this particular workshop will result in total compliance to the SLAs of all the business units; results in decline OTR stats; results in every business unit, can conduct the business that is relevant to the respective unit; achieve the promises made by the city in terms of service delivery, there is people that basically don't even have the basic infrastructure yet, hence that's why you see people being uptight, and that encompasses the efficiency side.	Compliance with SLAs; decline OTR; service delivery; promises;
P6	Time is money, keep to times as promised to customers.	Keep to time and meet customer promise.
P7	How quick you can turn the vehicle around, get the repair the vehicle done and get it to the customer to carry on with their business. It's important in order to make the vehicle available to the department to carry out its duties.	Turnaround time
P8	Efficiency measures staff and workshop performance, in terms of number of hours of production. Guard against fruitless and wasteful expenditure	Performance management;

4.2.2.3 Please Name The Critical Factors That Affect Efficiency And Explain Why And How. (Question 2.5)

The responses from each participants are outlined in table 4.8 below.

Table 4.8

Response		Keywords
P1	Know-how; Right tools for the job; Spare parts availability: if not it will take longer to go back to it and can be dangerous as something can be left out.	Know-how; tools; spare parts;
P2	SCM processes are long and involve a lot of people; knowledge is important as it takes longer to do something you do not understand or have knowledge of; emphasis on standard time and supervision thereof.	SCM processes; knowledge; standard time; supervision;
P3	Aging as the older your vehicle is the more attention is required, so your vehicle needs to be in the workshop more often, it needs to be serviced and maintained more regularly, so I think age definitely plays an important part. The terrain, if the vehicle is running in the terrain that is not conducive for that vehicle to run, it will affect the efficiency because the vehicle will always be unavailable. The most important will be the type of product that you are running, the make and model of vehicle will determine your efficiency also.	Fleet age; terrain; make and model of vehicle
P4	Quality of parts or equipment that has been ordered, because it takes you much longer to fit or to do something that of substandard, because it comes with so many pieces use parts of a sub-standard because it comes in so many different pieces, whereas if you go and buy the correct part it comes as one where it is much quicker to fit; also when you buy a part that is not of standards then you have to make adjustments and modifications to suite; quality lasts much longer and with quality you get a longer warranty;	Spare parts; warranty; staffing; knowledge; skills; expertise;

Response		Keywords
	Staffing that do not have a technical knowledge, technical expertise, people that don't have the people's skills to work with people; The labour issue	
P5	There is a shortage of manpower or front counter staffing; your high work-loading vs. your low available man-hours; unplanned work from customers and customers arriving at the workshop unannounced; skills deficit of RPL programme and S26D artisans; number of models and brand; repair and workshop manuals and SOPs; non-availability of over the counter repair manuals; non-availability of correct diagnostic tooling	Manpower; staffing; work-loading; man-hours; skills deficit; RPL programme and S26D; repair manuals; workshop manuals; diagnostic tooling;
P6	Inadequately skilled staff, takes longer to detect and fix faults. Highly unionised environment, people abuse their rights. Low staff morale, people have little interest in their work.	Skills deficit; highly unionised environment; low staff morale
P7	SCM delays in placing orders and receiving parts. Training of staff, if you are trained you gain knowledge and it will make you efficient in producing your work. Induction of staff to understand business and their responsibilities. Shortage of staff versus high volumes of workload. Contract Management, contract	SCM, Training, Staff induction; staff shortage; contract management.
P8	Staffing versus fleet size, high volume of workload with low staff capacity. Unplanned work that comes through the workshop;	Staffing versus fleet size; unplanned work; consultation with user departments prior to

Response		Keywords
	Consultation with user departments before vehicles are bought; Proper specifications of vehicles to avoid modifications; Special Projects, causes delay as we have to deal with these vehicles that are already in operation. Availability of spares, if not delivered timeously vehicles stay longer in the workshop.	purchasing vehicles; proper specifications; special projects; availability of spares.

4.2.3. Objective 2: Determine and Analyse Critical Factors Affecting Quality

The responses from each participants are outlined in table 4.9 below.

4.2.3.1. What is your understanding of quality? (Question 2.2)

Table 4.9

Response		Keywords
P1	Whatever you touch becomes gold; do thorough check up of a vehicle and not only look at a single fault.	Thorough; single fault;
P2	Quality comes with time, must be thorough to avoid mistakes, you must understand what you do and have a know-how.	Time; thorough; mistakes; understand; know-how;
P3	Amount of time vehicle lets you down or breaks down; high efficiency and high availability;	Time; breakdown;
P4	Quality is the standard of job that you receive, it's about meeting certain specifications as per the OEMs recommendation and SABS standards.	Standard; meet specifications; OEMs; SABS

Response		Keywords
P5	Way work is executed according to SOPs; type and fitting of components; when vehicle leaves does not come back; look at every aspect of vehicle; brake testing machine to ensure quality of braking components; not to compromise safety;	Work execution; SOPs; type of components; fitting of components; brake testing machine; safety;
P6	Doing repairs properly, use quality spares; quality workmanship by applying knowledge.	Repair properly; quality workmanship; knowledge application
P7	Repairs and services must meet certain specification or benchmark, OEM standard must be used for any type of repair.	Meet specification and standard;
P8	Repair done correctly at the first instance without any comebacks; quality controller or inspector to ensure quality.	Repairs are done correctly the first time.

4.2.3.2. Why Is Quality Important In Your Business? (Question 2.4)

The responses from each participants are outlined in table 4.10 below and summary of responses given below the table.

Table 4.10

Response		Keywords
P1	The reputational damage if customers are complaining and loose business and take it elsewhere; It affects availability negatively, if no quality work the vehicle will keep on coming back	Reputational damage; loss of business; availability; return jobs;
P2	Quality is important because it saves money; Because when you have quality it means that vehicle will take a long time to come back; That	Saves money; vehicle take longer to return;

Response		Keywords
	means it increases the productivity when there is quality, productivity and service delivery.	productivity; service delivery.
P3	Quality is important in a sense that you can measure by saying that the least amount of time that your vehicle is not available, it will be quality of your availability. Because if you benchmark against ten days a year, and if you are less than 10 days for me it is good quality because you haven't let anybody down you are able to achieve your standard. I think quality is about how you achieve your standard and how you do business	Availability; standard;
P4	Quality is, always every job must meet a certain standard and if quality is compromised, then there will be vehicles returning to the workshop for return jobs; Inferior parts fitted do not last, so quality is very important due to reliability and efficiency. Like you buy a pirate part it would not line up because the quality of that material is of sub-standard, and it takes you much longer to fit whereas if you buy original part it is much quicker and more reliable and you have a warranty that goes with it.	Standard; vehicle return; return jobs; inferior parts; reliability; efficiency; pirate parts; sub-standard;
P5	If work is not executed with quality in mind repeat jobs are gonna become order of the day; and, the vehicle comes back and then your OTR time increases, your vehicle availability decreases, and your standing time of people that utilise vehicles increases, some of the staff are actually gangs of them that belong to some vehicles, so all of those people and we don't have replacement vehicles for those specialised vehicles; quality of workmanship,	Repeat jobs; OTR; vehicle availability; standing time; fitting; components; warranty; workmanship; paying double; sustainable

Response		Keywords
	fitting of components your warranty management and quality of the way that work is executed tie up hand in hand. You cannot take the component that failed and send it for a claim, and then they tell you that defective workmanship is why it failed; So the quality side of it can result in you paying double for something because it was incorrectly done in the first instance; if quality is not adhered to and you pay twice for how long you can sustain that for this is questionable, because eventually you are gonna find that your cost centre as a business unit is going to increase to a point that you are not sustainable to the organisation anymore.	
P6	Saves time; prolongs vehicle lifespan.	Saves time; prolongs vehicle lifespan.
P7	People's lives are involved; the vehicles are branded and they will compromise image of the municipality if they are breaking down on the side of the road.	People's lives; image
P8	The reputation of the artisan and manager of the workshop. Quality reduces comebacks and breakdowns, guarantees vehicle availability standard of 90%;	Reputation of mechanic and workshop; reduce breakdown and comebacks; guarantees vehicle availability standard;

4.2.3.3. Please Name Critical Factors That Affect Quality And Explain Why And How? (Question 2.6)

The responses from each participants are outlined in table 4.11 below.

Table 4.11

Response		Keywords
P1	Poor workmanship; Quality of spare parts; Conducive Working conditions e.g. there are parts that do not require dust; Proper tools and well maintained tools.	Workmanship; spare parts; working conditions; tools
P2	Lack of knowledge; inferior parts it will affect quality.	Knowledge; parts
P3	The standard of our outputs in other words the amount of time that the vehicle leaves a workshop and returns with same defect, would determine our quality; Quality is more about keeping the vehicle on the road, the longer you can keep on the road the better the quality; Type of product will play a big part (make and model); maintenance personnel; availability of your parts will be a big factor.	Standard of output; on the road; make and model; maintenance personnel; parts;
P4	Vehicles that are old that you cannot get original parts, you have to go and buy pirate parts; and in today's market you have various makes of pirate parts available that you compromise quality; purchasing officer with no technical background of quality and in relation with the trade that is purchasing spare parts for a vehicle. It's not always about price it's about getting the right part for the right job.	Vehicle age; spare parts; knowledge;
P5	Skills and qualification of mechanics; proper fitting of spare parts; volumes of man-hours that's here, versus the work that is coming in, it resulting in artisans walking around some of them, with 6,7,8 job-cards per person, it's too busy, so you are not going to achieve that quality level that you want it's a major threat; the testers of yester year were the	Skills; qualification; fitting; spare parts; man-hours vs volumes; testers; customer satisfaction; vehicle lifespan; unreported accidents; multiple drivers; poor workmanship; vehicle

Response		Keywords
	guys that actually put the cherry on the top of your QMS, that vehicle was not released unless it was tip-top.; that they have to be fully qualified, and they got the skill to actually identify, so that when that vehicle goes back to the customer you have total, total customer satisfaction; We have a vehicle lifespan, but unreported accident damage is another thing that you need to understand that has a gross negative contribution to quality management. In that the customer and some of them have multiple drivers, so the car you are using you may never have dented it in your life, but your colleagues that use your car; poor workmanship; the vehicle replacement programme, is that are we they realistic and are we achieving it; We need to look at how does the customer get that vehicle back fully auto valet, and washed	replacement programme; car washing; auto valet;
P6	Lack of skills, skipping important part of work, Age of vehicles, the older vehicles do not have original parts and have to use pirates parts which are inferior and do not fit properly.	Skills deficit; age of vehicles; pirates' parts or inferior quality parts.
P7	Demographics target, hiring of inadequately qualified staff due to meeting targets; training of staff; staff morale	Demographics target; training of staff; staff morale
P8	Staff attitude, negative attitude have negative effects on quality. Lack of regular inspections by the supervisor; Proper tooling and equipment, if not appropriate it results in poor workmanship	Staff attitude; regular inspection by the supervisor; equipment and tooling; standards, specifications and

Response		Keywords
	Adherence to standards, specifications and procedures. Pay attention to details on what you are doing.	procedures; attention to detail.

4.2.4. Objective 3: Investigate Impact Of Vehicle Availability On Efficiency And Quality And Vice Versa.

In order to achieve the objective this objective, the research sought to find out if "Does efficiency and quality in fleet management impact vehicle availability?" the following questions were asked:

Do you think that there is any relationship among quality, efficiency and vehicle availability?
Please give explanation for your response.

4.2.4.1. Do You Think That There Is Any Relationship Among Quality, Efficiency And Vehicle Availability? (Question 3.1.)

4.2.4.2. Summary and Interpretation of Responses of 4.4.4.1 from all the participants.

All the participants' responses said yes, there is a relationship between vehicle availability, quality and efficiency.

4.2.4.3. Please Give Explanation Of Your Response. (Question 3.2)

The responses from each participants are outlined in table 4.12 below and summary of responses given below the table.

Table 4.12

Response		Keywords
P1	If there is no quality the vehicles fail, if no efficiency will stay longer off the road and turnaround time. Before and during the time (quality), the vehicle will come back	Vehicle failure; off the road; return jobs.
P2	Quality you need to understand, you must have knowledge, if you do not have knowledge you cannot be efficient, you will take long to do what you are supposed to do and that means that vehicle will take longer to come out of the workshop and that means that vehicle will not be available to be used.	Knowledge; longer turnaround times;
P3	Efficiency is the minimum time that your vehicle is available that will be your efficiency, which will determine your availability, so quality and efficiency will determine your availability, Quality, also the type of vehicle, the make and model those thing are all quality, will determine your vehicle availability, the turnaround time when your vehicle goes down off the road those things that determine your vehicle availability.	Type of vehicle; turnaround time;
P4	Quality is having a vehicle fixed a 100%, for use and knowing that the vehicle will run till the next service. Availability is having the vehicle available for use and not breaking down, so that customer got full usage of it. Efficiency is how quick one could make the vehicle available for one to use.	Available for use; turnaround time;

Response		Keywords
P5	The efficiency of your staff, and when I say the staff I want to encompass the staff from the front counter, to the efficiency level of my artisan, to the efficiency level of my clerical staff, to the efficiency level of my buying staff, and then to the efficiency level of the OEMs or the service providers, that do the repair and get it back in a specific time. If each one of those steps are not taken, for me just to explain it simply, there's a flight of 12 stairs, the average person is expected to go up there in 30 seconds, alright if we are taking 5 minutes we have got a problem, now that my efficiency side; The simple term of the quality is the way that the artisan executes himself and assembles all of those components, if he does it in accordance with SOP or as per the instructions of the workshop manual and he does it in the time and the process as specified by the OEM, the way that the components are assembled is the quality level of the workmanship that is defined, if that workmanship is defined and is done, that is quality, on the technical side, then the vehicle is released alright, and is tested by somebody that guy identifying any alternative faults and making sure that there is nothing else, is defined by the customer that drives the vehicle, they always turn as poor quality workmanship. So if you managed to tick all of those boxes and you don't have that thrown back at you, but unfortunately for us as workshop we, we cut if off at that level,	Efficiency of staff, OEMs; SOPs, manuals, workmanship,

Response		Keywords
	so there is a time process to go up the 12 steps of efficiency, there is a time process to go up the 12 steps of quality, in terms of the vehicle and the workmanship and how the vehicle leaves here and add the two together if they are not complimentary and they don't work for us, what happens is that the vehicle just stays off the road and for longer period of time and OTR simply is in contradiction to vehicle availability, the vehicle is standing so it is not available and that just puts it in a nutshell of, of explaining it in a very simple term, that if the time frame of those 12 steps is exceeded in all aspects the customer is not happy at the end of the day, the vehicle stands and all those people that use that vehicle are sitting somewhere and not doing any work and that is that for me that encompasses the explanation as a whole.	
P6	If we are not efficient the vehicles stay longer in the workshops; If we do not perform work of high quality vehicles will come back often to the workshop, before it is due to come back.	No efficiency, vehicles stay longer; Poor quality vehicles come back before they are due.
P7	Efficiency is how quick you turn vehicle around; Quality is repairing against a certain standard. If there is no quality, it will come back frequently and will affect efficiency and will cause breakdowns, vehicle stays longer in the workshop and have failures of components. Knowledge and skills affects availability as it takes longer to repair and compromise quality.	Turnaround time; quality standard; breakdown; component failure; knowledge and skills;

Response		Keywords
P8	Quality and efficiency plays a major role in vehicle availability, if your quality is of substandard it will affect your vehicle availability by having regular breakdowns and efficiency by repeating jobs, which leads to higher unnecessary costs and hours of work.	Poor quality results in regular breakdowns; return jobs which impacts on vehicle availability and efficiency.

4.2.5 Objective 4, Determine Ways To Balance Vehicle Availability, Quality And Efficiency.

In order to achieve this objective the researcher asked the following question:
In your opinion, how can the three factors be optimised?

4.2.5.1. In your opinion, how can the three factors be optimised? (Question 4.1)

The responses from each participants are outlined in table 4.13 below.

Table 4.13

Response		Keywords
P1	Training, don't dive into a job take a look at it and assess it, establish what it is, what is the cause, how can I fix it, it will give you all; Take a step back, why did it happen and then how you do it. Because straight away you will know what to target; You will be efficient by attending directly what you need to fix and achieve quality and vehicle availability at the same time.	Training;
P2	You can balance it out by firstly, have sound replacement programme and adherence to it;	Replacement programme; preventive maintenance

Response		Keywords
	Sound preventive maintenance programme and adherence; Have the qualified people for the job, right people for the job, people must be trained to maintain the vehicle and people must be qualified; standard time for each job and every vehicle.	programme; qualified people; training; standard time.
P3	The best way of balancing fleet availability is by having a newly, if you can keep your fleet young the parts are available, the chances and likeliness of them breaking down is minimal the cost will come down, you don't have to replace engines and gearbox, and things like that, the downtime is minimal; Another way to improve vehicle availability is doing repairs and servicing in-house, because you can prioritise your vehicles according to your needs and improve efficiency, quality and vehicle availability.	New/young fleet; in-house repairs and servicing;
P4	Proper planning from fleet section in regards to the loading of workshops. Planning in advance so you have proper equipment, staffing for that specific job. Also following manufactures specifications And departments could follow service schedule.	Workshop loading plan;
P5	Adherence to standard times and SOPs; Monitor unreported accidents; involve workshop superintendents more in the operation, management and decision making in the workshops; consultation with technical operations before vehicles are purchased;	Standard time; SOPs; unreported accidents; involve superintendents; consultation prior to buying vehicles;
P6	Keep vehicles within lifespan recommended; work on staff morale; skilling staff properly; adherence to service schedule; unscheduled work.	Vehicle lifespan; staff morale; training; adherence

Response		Keywords
		to service schedule; unscheduled work.
P7	Faulty checks, quality checks by foreman on completion of repairs; Efficiency foreman check the time taken to perform the tasks meet OEM standards and our benchmarks; checklists for each tasks; pick up additional defects immediately.	Quality checks; adherence to standard time;
P8	Training of staff to improve quality; staff motivation; regular meetings with role players; respect at all levels; less union intervention; support from senior management.	Training; motivation; regular meetings with role players

4.3 Summary

In this chapter the perceptions of the participants from the data extracted during the interviews were presented in a tabular form according to the objectives of the study. The critical factors affecting vehicle availability are namely; technical skills deficit, shortage of staff, age of fleet, fleet size, scheduling of vehicles, SCM processes and contract management and management of vehicle utilisation. The critical factors affecting efficiency are technical skills deficit, age of fleet, type and model of vehicles, scheduling of vehicles, management of vehicle utilisation and overall management of workshop. The critical factors affecting quality are technical skills deficit, age of fleet, make and model of vehicle and overall workshop management. And how the three can be optimised.

In the following chapter the discussions and interpretation of the research findings of this study are discussed in detail.

Chapter 5

Discussion

5.1. Introduction

In this chapter the findings of this study will be interpreted explained and discussed in detail. The objectives of this study are to determine the critical factors affecting vehicle availability, efficiency and quality. Firstly the definitions of these terms are presented and the factors affecting vehicle availability, quality and efficiency are presented.

5.2. Objective 1: Factors Affecting Vehicle Availability

Vehicle availability is about meeting demand for transport in an organisation and is made up of the size of the fleet and fleet composition. Redmer (2015) states that the most crucial factor influencing the fleet size and fleet composition is a demand for transportation services, the demand level, seasonal changes, trend and also its character resulting in particular types of transportation requirements to be fulfilled. The demand can be met by purchasing, leasing or outsourcing the function which is called fleet acquisition and then selecting the suitable types of vehicles. The decision to acquire fleet for the organisation can be made by purchasing vehicles, leasing vehicles or both, in order to meet transportation demands and requirements. According to Redmer (2014) this is make or buy option, whereas make option refers to company acquiring transportation means by purchasing and owning vehicles; and buy refers to a company buying or outsourcing transport services that meet its transport requirements.

The general perception of the participants about the vehicle availability is that it refers to the vehicle that is not defective, is on the road, at the disposal of the business units to carry out their duties and deliver services. Vehicle availability is important because, a vehicle is a tool to perform duties and must be available on a daily basis to deliver services, if there are no vehicles there is no service delivery and standing vehicles costs money. Vehicle availability creates customer satisfaction, ensures that the vision of the City and demands of ratepayers are met and ensures sustainability of the business.

The following are the factors that were identified by the participants that affects vehicle availability:

5.2.1. Technical Skills Deficit

The participants identified that, there is a limited supply of relevant technical skills and insufficient training of technical staff. Technology has advanced and there is not enough training of technical staff on new technology. Skills shortage or deficit of the trade, which includes artisans, supervisory and management level and low quality or competence of artisans qualified through RPL and S26D programmes. This affects vehicle availability negatively, as it takes longer for less experienced artisan to carry out repairs.

5.2.2. Shortage of Staff

There is a shortage of technical staff due to:

- Inability to fill up positions timeously in order to fulfil the requirements of addressing demographics to incorporate black women. The challenge is that the supply of women artisans in the market is very low and it takes time to develop artisans.
- The aging workforce, most of experienced artisans are going on retirement and some are due for retirement soon.

This affects the vehicle availability negatively, as volume of vehicles is more than manpower, as a results the vehicles will spend much longer time in the workshops waiting to be serviced.

5.2.3. Age of Fleet

The age of fleet was identified as another critical factor that affects vehicle availability as, the older the vehicle the more likelihood of breaking down and need for frequent maintenance and repairs. The availability of original spare parts becomes difficult, as OEMs remove original spare parts from the shelves on vehicles older than ten years. Then there is an option of using

alternative spare parts, which are cheaper but are also of inferior quality, however in fleet cheap is nasty.

This affects the vehicle availability negatively as older vehicles will visit workshops frequently more than newer vehicles and fitting of pirates parts takes longer than original parts. Some pirates' parts come in smaller pieces rather than whole component and fittings may not be the same size with original parts and this will results in vehicle spending much longer time in the workshop.

5.2.4. Fleet Size

Over the years there has been an increase in fleet size and high volume of workshop loading, which results to longer turnaround times. The work has to be outsourced and has to follow a queue on the service provider's side which adds to the number of days the vehicle is not available.

5.2.5. Scheduling of Vehicles

- The vehicle services are scheduled in hours not in kilometres driven by the vehicle, in some cases the vehicles travel low kilometres but have to come in for service based on the time.
- The unscheduled vehicles coming into the workshop, which adds to workload and vehicles spending more time in the workshop.
- The non-adherence to service schedule, results in vehicles coming in when it is long overdue for service, in most instances with many defects that will require vehicle to spend more time in the workshop.

These results to high volume of workload and vehicles spending longer time in the workshop.

5.2.6. Supply Chain Management Processes and Contract Management

The SCM process in acquiring spare parts is long, as artisan identifies parts required to do repairs, the clerk prepares requisition and buyer facilitates procurement process. Any delay in

one of the steps results in vehicles spending more time in the workshop waiting for procurement of spare parts.

The management of contracts is another factor that affects availability as if there is no contract in place the three quotes procurement process is followed, where the buyer must acquire quotes from three suppliers and choose supplier from the three. This process sometimes takes longer as suppliers may not respond immediately and vehicle will be standing and not available for use.

5.2.7. Management of Vehicle Utilisation

The vehicles are driven by multiple drivers with different driving patterns, are prone to abuse, and in some instances are not utilised for right application and unreported minor accidents causes vehicles to have a lot of faults that must be taken care of when coming in for services, repair and maintenance.

These results in vehicles spending longer time in the workshop when coming in for services.

5.3. Objective 2: Critical Factors Affecting Efficiency

Efficiency in fleet management refers to reducing costs of running the fleets. According to Birkland (2014), efficiency is about reducing operational costs, savings of 5-20% are achievable by reducing unnecessary fuel and labour costs related to inefficient driving and poorly optimized routing. The organisation can achieve efficiency in many ways from how the acquire the fleet, the types of vehicles, fuel efficiency, environmental and monitoring of driver behaviour.

The data collected from the study revealed that efficiency is understood in terms of inputs against outputs, in a technical workshop environment this refers to the turnaround time to perform or complete the maintenance, repair or service of a vehicle without any defects. The examples that were given are: how soon can a mechanic do a job and complete it correctly according to the OEMs specifications and standard times; how effective and quickly a workshop or a mechanic could be, in turning vehicles around accurately, the first time without vehicle coming back with the same defect.

In the workshop environment efficiency should be embedded throughout the process, i.e. from the time a customer drives through the premises, to front counter staff and reception, to foreman assessment of vehicles and distribution of jobs, to artisans' analysis and assessment of vehicle, ordering of spare parts, fitting parts on time and correctly and capturing of job-card, the clerks capturing all components and ordering parts on the system, the superintendent approving, the buyers requesting quotations from OEMs and OEMs delivering the spare parts. The provision of tools timeously and spares timeously, the manager signing-off timeously, the entire efficiency of manpower during process is required.

The efficiency is important in the business particularly in the workshops as it minimises the time the vehicles are standing, reduces costs and enables the service units of the Municipality to achieve their service delivery goals and avoid service delivery protests.

The participants further identified the critical factors affecting efficiency as:

5.3.1. Technical Skills Deficit

The skills deficit, expertise of technical staff, as know-how is important as it takes longer to do something you do not understand or have knowledge of, which is partly due to the candidates who qualified through RPL programme and S26D artisans.

5.3.2. Age of Fleet

The age of fleet is critical as the older vehicle requires more attention and vehicle needs to be in the workshop more often as it requires servicing and maintaining more regularly and that means it will be in the workshop more often than the newer vehicle. The availability of original spare parts, also becomes a challenge and results in buying pirates parts. Pirates' part can take much longer to fit, because it comes with so many pieces and sometimes there is a need to make adjustments and modifications, whereas if it is the original and correct part it comes as one unit and original spare parts last much longer and have a longer warranty.

5.3.3. Scheduling of Vehicles

The loading of workshop loading also plays a critical role in achieving efficiency, the high work-loading versus low available man-hours, the unplanned work from customers and customers arriving at the workshop unannounced are critical in achieving efficiency.

5.3.4. Management of Vehicle Utilisation

The management of vehicle utilisation in that, if the vehicle is running in the terrain that is not conducive for that vehicle to run in, it will affect the efficiency because the vehicle will always be in the workshop and unavailable.

5.3.5. Fleet Size and Type and Model of Vehicles

Another critical factor affecting efficiency is the type and model of vehicles, as some vehicles are easy to maintain and their original spare parts are easily obtainable. Another critical factor is the multiple number of models and brands that are in the fleet. There multiple models and brands in the fleet and it is easier and more efficient to do with a single brands and fewer models that with a multiple.

5.3.6. Overall Management of Workshop

The overall management of workshops is another critical factor. The workshop manager must ensure that there is availability of proper tools for the job especially correct diagnostic tooling, the performance management in terms of emphasis on standard time and supervision thereof, the availability and adherence to procedures namely SOPs and repair and workshop manuals, and that SCM processes are well managed in order to improve efficiency in the workshop.

5.4. Objective 2: Critical Factors Affecting Quality

According to Narayan (2012), the generally agreed attributes of quality are: "A quality product, information or service is one that: meets or exceeds the customer's stated or implied expectations, and or predetermined performance standards; does this consistently over a long period; has a sense of value to justify its price; anticipates constantly evolving expectations; performs predictably, i.e. no surprises; and ultimately "wows" the customer who comes back for more". Quality has subjective and objective dimensions therefore it is important to be clear with regards to the expectations and standard.

According to Knezevic (2012), quality in maintenance refers to faultless execution of maintenance task, which can be defined as the probability that maintenance job will be completed without any faults that can results from the process of maintenance.

According to the empirical study, the data revealed that quality is perceived as a job or performance standard, it's about meeting certain specifications as per the OEMs recommendation and SABS standards, it's about executing the work according to the SOPs, the job must be thorough to avoid mistakes so that when the vehicle leaves the workshop it does not come back, until the next scheduled service and with quality whatever you touch must become gold.

Quality is important for maintaining performance standards, its saves money, it increases productivity and affects vehicle availability. If there is no quality work, the vehicles will keep on coming back to the workshop, productivity drops as the standing time of people that utilise vehicles increases as some of the staff are actually gangs that belong to some vehicles, so all of those people will not be working.

If there is quality there will be high vehicle availability and less amount of time vehicle lets you down or breaks down and high efficiency.

The study further revealed that the critical factors affecting quality are:

5.4.1. Technical Skills Deficit

Lack of knowledge affects quality negatively, e.g. purchasing officer with no technical background of quality and in relation with the trade that is purchasing spare parts for a vehicle.

In the previous years there were testers who were fully qualified and ensured quality management as vehicle were only released on them authorising that vehicle was done according to standard. The skills and qualification of mechanics are critical factors that affect quality.

5.4.2. Performance Standard

The standard of outputs in other words the amount of time that the vehicle leaves a workshop and returns with same defect, would determine quality. The customer must get that vehicle back fully auto valet and washed.

5.4.3. Age of fleet

The age of vehicles are critical as old vehicles breakdown often and it is difficult to get original parts, you have to go and buy pirate parts, and in today's market you have various makes of pirate parts available that compromise quality. The realistic vehicle replacement programme and adherence to it is critical in order to achieve quality.

5.4.4. Make and Model of Vehicles

The type of vehicle, i.e. make and model will play a big part in quality. Some makes have durable quality some are of poor quality. Quality is more about keeping the vehicle on the road, the longer you can keep on the road means there is quality and vehicle availability is high.

5.4.5. Management of Vehicle Utilisation

The management of vehicle utilisation and proper care of vehicles is also critical factor, as vehicles have a lifespan, but unreported accident damage and unreported faults have a gross negative contribution to quality management, some vehicles have multiple drivers and they dent the vehicle and do not report it.

5.4.6. General Management of Workshop

A conducive working environment and conditions are critical in order to achieve quality e.g. there are parts that do not require dust. The availability of proper tools and well maintained tools.

5.4.7. The Workshop Workload

The workload that workshop has is a critical as volumes of man-hours available versus the work that is coming in, if it not balanced properly will results in overloading artisans and affecting quality of their performance.

5.5. Objective 3: Investigate the impact of vehicle availability on efficiency and quality and vice versa.

Generally the analysis and interpretation of data revealed that the vehicle availability, quality and efficiency all have impact on service delivery, as poor quality means that vehicles are breaking down often and are off the road and not available for use by the departments and there will be no service delivery. The efficiency is turning the vehicle around quickly and minimising the time the vehicle is off the road so that the vehicles are available for the departments to deliver services and vehicle availability means that vehicles are available for delivering services to the community.

5.6. Objective 4: Determine Ways to Balance Vehicle Availability, Quality and Efficiency.

In general the perception about ways to balance vehicle availability, quality and efficiency are:

- Proper planning for loading of workshops, in order to ensure that there is no overloading.
- The sound replacement programme and adherence in order to keep the age of fleet young and avoid regular breakdowns due to old fleet.

- The adherence to preventative maintenance program and vehicles to be serviced and maintained as per the OEMs recommendations and instructions. Fleet must be serviced and maintained in-house and reduce outsourcing, in order to be able to prioritise vehicles. The SOPs of how to identify, analyse faults and repair the vehicles and training and up-skilling of technicians in order to bridge the skills deficit gap.
- Improve management of vehicle utilisation and proper care of vehicles.
- Selection of reliable vehicle models.

According to Narayan (2012), safety of people, the environment and process is vital for success of the organisation. In order to achieve this the following factors must be taken into consideration namely, asset integrity, reliability, operability and maintainability.

5.7. Conclusion

According to Kostora (2014), every kilometre made by a company vehicle goes towards the company's bottom line in a form of fuel costs and eventually maintenance costs, and it is important for companies to have a sound business strategy for the size and maintenance of their fleets and whether it is a big or small fleet there should be an attempt to increase efficiency and properly maintain vehicles in order to achieve sustainable profitability. The vehicle availability, quality in repairing and maintaining vehicles and efficiency are required in order to ensure that there is no breakdown in service delivery due to unavailability of vehicles to deliver services. This chapter discussed the findings of the study, interpreted and explained the findings. The following chapter will discuss recommendations and conclusion.

Chapter Six

Conclusions and Recommendations

6.1. Introduction

The aim of this study is to determine how efficiency and quality affect vehicle availability, and the relationship that the three factors have on each other and to determine the ways to find a balance among these three factors. The literature review on fleet management was discussed in Chapter 2, Chapter 4 discussed the results of the empirical study that was conducted and Chapter 5, discussed the findings of the study.

In this chapter the conclusion from both the literature review and the primary data, the recommendations and scope for future research will be discussed.

6.2. Conclusion

The study determined the factors affecting vehicle availability, quality and efficiency. The data acquired from interviewing the participants and literature review reveals that:

- There is a relationship between the vehicle availability which is the supply of vehicles in order to meet transportation demand and requirements. These requirements must be informed by the needs for transport of the organisation, the type and the size of those needs;
- The quality which refers to performing maintenance repairs and services according to the specified laid down procedures and OEM's standards. The maintenance must be performed on a regular basis informed by the type, model of vehicle; and
- The efficiency, which refers to ensuring that repairs, service and maintenance activities are performed timeously, the vehicles are available for use at all times to avoid vehicles lying idle, improve productivity and thus reducing the total cost of running of the fleet.
- The efficiency and quality are essential in maintaining and achieving the vehicle availability target. Lack of quality would results in vehicles breaking down and returning to the workshops frequently, which will have a negative effect on the vehicle availability and will hinder service delivery. Also lack of efficiency would results in

vehicles taking longer to be repaired and would increase the time the vehicles spend in the workshop.

It is therefore crucial that there is efficiency and quality in order to maintain the vehicle availability. The participants generally agreed that there is a relationship between the vehicle availability, quality and efficiency and the three must be in balance in order to ensure that there is sufficient supply of vehicles to meet the demand. The available supply must be taken care of regularly, in order to be safe and fit for use. This will ensure that the service delivery requirements of the municipality are met.

6.3. Implications of this Study

This study has highlighted the critical factors that affect the vehicle availability and how can these factors be managed in order to meet transport requirements of the municipality and achieve service delivery. The critical factors affecting efficiency and how can these be managed to ensure that vehicles do not spend long time standing and are serviced, maintained and repaired timeously. The critical factors affecting quality and how these can be managed in order to ensure that vehicles do not breakdown frequently, are safe to use and maintain the vehicle availability.

The relatedness and similarity of the critical factors that affect vehicle availability, quality and efficiency was revealed and taking care of these factors will ensure that the vehicle availability target is maintained, the quality is improved and the efficiency is achieved.

6.4. Limitations of this Study

The research process was not without challenges, what the researcher encountered was that the literature that discusses fleet management in the organisations is limited. The time was limited in terms of interviewing the participants, due to availability of participants. The interview interviewed eight participants, due to saturation of information and responses that were received from the participants.

6.5. Recommendations to Solve the Problem

In order to maintain a balance between vehicle availability, efficiency and quality, the following recommendations to the management of fleet management unit of the EThekwini Municipality are made, based on the findings of literature review and evidence gathered through interviews, with regards to the critical factors that were determined and identified as affecting vehicle availability, efficiency and quality:

- To perform a periodic review of the transport needs (demand) of the organisation and stock of vehicles and align the demand and supply with fleet replacement programme. This will assist in reducing older vehicles, replacing older vehicles with appropriate types and size, thereby improving vehicle availability.
- To review of maintenance and vehicle service program periodically and monitor adherence thereof, to ensure that the vehicles are serviced timeously, thus reducing unplanned and excessive downtime of vehicles, improve vehicle availability and productivity.
- To develop an intensive on the job and formal training program for addressing skills deficit, staff shortage and improve quality by ensuring that services, maintenance and repairs are performed according to specified laid down procedures and OEMs standard, which will improve quality and vehicle availability.
- To strengthen relationships with the SCM Unit with regards to procurement of spares and Contract Management and other service units with regards to proper care and management of vehicles and adhering to service and maintenance schedule.

6.6. Recommendations for Future Studies

The findings in this study was limited to EThekwini Municipality and the fleet refers to and only covers the motor vehicles side and excludes the plant, equipment and machinery and any other form of transportation like rail, sea or air transport.

Further studies can be done and encompass the transportation needs and requirements for the whole organisation and look at other forms of transportation.

6.7. Summary

In this chapter the implications of the study and its limitations were discussed. The recommendations were made based on the findings of the study and the research questions were answered.

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Ethical Clearance

21 August 2017

Mrs Lungile Khuzwayo (911304811)
Graduate School of Business & Leadership
Westville Campus

Dear Mrs Khuzwayo,

Protocol reference number: HSS/1332/017M
Project title: How to maintain a balance between vehicle availability, efficiency and quality in fleet management: A case study of eThekwini Municipality

Full Approval – Expedited Application

In response to your application received on 14 August 2017, the Humanities & Social Sciences Research Ethics Committee has considered the above-mentioned application and FULL APPROVAL for the protocol has been granted.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number.

PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

[redacted]

Dr Shamila Naidoo (Deputy Chair)

/ms

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Cc Academic Leader Research: Dr Muhammad Hoque
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