MAINTENANCE STRATEGIES AND OPERATION PERFORMANCE OF GROUND FLIGHT HANDLING FIRMS IN KENYA

BY

MUGOH, MIKE NJUNJA

A RESEARCH PROJECT PRESENTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF DEGREE OF MASTER OF BUSINESS ADMINISTRATION (MBA), SCHOOL OF BUSINESS, UNIVERSITY OF NAIROBI

2017

DECLARATION

I hereby declare that this research project is my own original work, and that it has not been presented in any other university/institution for any award.

Signature: …… Date: ……

Mugoh, Mike Njunja

D61/74692/2014

This Research Project has been submitted for presentation with my approval as the University supervisor.

Signature: ……Date: …….

Zipporah Kiruthu.

Lecturer**,** Department of Management Science

DEDICATION

This project is dedicated to my family especially my wife Naomi and my children Whitney and Wendy that I respect for their love and support during my time as a student at the University of Nairobi.

ACKNOWLEDGEMENT

It has been an exciting and instructive study period at the University of Nairobi and I feel privileged to have had the opportunity to carry out this study as a demonstration of knowledge gained during the period of study for my degree. I am deeply obliged to my supervisor. Zipporah Kiruthu for her exemplary guidance, comments and support without whose help; this research project would not have been a success.

I also acknowledge the support that I have received from my colleagues while working on this research project.

Finally, and most importantly my greatest gratitude goes to the God Almighty for giving me grace and mercy to complete my research project successfully.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

The business environment has become more competitive so are the operational performance modalities. In this regard, maintenance strategies have been considered as a key component in ground flight handling firms to achieve their global competitiveness. Efficiency in ground flight handling is brought about by sophisticated machines and systems that every firm must install. This study therefore was based on three objectives that includes to determine the maintenance strategies used by ground flight handling firms in Kenya. The relationship between maintenance strategies and operational performance as well as to establish the challenges experienced in the implementation of maintenance strategies by ground flight handling firms in Kenya. The study adopted a census method that involved all the ground flight handling firms in Kenya. Data was collected using a research questionnaire. The study findings indicates that condition based maintenance through monthly reorder are reworked, maintenance personnel spend free time on plant housekeeping at a great extent. Other respondents indicated that reliability centered maintenance through equipment being run to avoid failure and people through their actions affect maintenance activities at a great extent. Moreover, the findings indicates that tools and equipment used affects maintenance activities, lack of expertise training skills affect maintenance activities, lack of tools affects maintenance activities and lack of basic machine operations are challenges experienced at a great extent with a mean (M = 4.38; SD = 0.648), (M = 4.27; SD = 0.660), M = 4.00; SD = 0.648) and (M = 4.00; SD = 0.767) respectively.

CHAPTER ONE

INTRODUCTION

1. 1 Background of the Study

Maintenance strategies are needed to propel ground flight handling firms to competitive global level. Efficiency in ground flight handling is brought about by sophisticated machines and systems. The management has to think about the future by trying to mold it and balance both short and long range objectives (Drucker, 1973).

Strategies are required so as to cope with the dynamic requirements of the external environment, consider shareholders interest, and realize the unused or underutilized resources (human resources, machines and equipment). Visser (1998) in his study has shown that firms which have adopted world class maintenance strategies and practices have the potential to meet their ground handling demands. This cannot solve all the needs but has the potential to be a key factor in making the firm competitive. Maintenance is geared towards a total participatory maintenance technique by all workers. It makes the whole team from machine designing to operation work towards a safe maintenance practice. According to Field et al., (2013), world class maintenance is keeping an equipment at its highest serviceable level. The global competition has made the

senior management to work on the serviceability and availability of the equipment (Kapil, 2013).

The services provided to an aircraft while it is parked on the apron is referred to as ground flight handling. Airlines do subcontract ground handling to handling agents. Most airlines subcontract more than 50per cent of the ground handling that takes. Speed, efficiency and accuracy are important. The carrier's desire is to segment the market and processes so as to earn more profits. Ground handling becomes complex due to outsourcing what is not core to them especially if it is outside their territory.

1.1.1 Maintenance Strategies

According to Pophaley and Vyas (2007), maintenance strategy has been discussed as a long term plan which is used to take care of maintenance management and also sets the path which management should take. The organization's action plan is contained in this strategy so as to enable it get the expected future state for maintenance function. Maintenance strategy should be focused towards the long term achievement of the firm's objective of meeting its market demand and to be competitive. For a firm to compete globally, it should invest well in the required resources such as facilities, assets, technical competence, relationships and finance. Compliance with government regulations on safety and environment, and world best practices in maintenance are core features in the strategy. Maintenance can only be competitive if there is good balance between, the corrective

maintenance and preventive maintenance. If corrective maintenance is too frequent, the equipment and machines will not be available for production. On the other hand if preventive maintenance is too intensive, the maintenance cost escalates and if too little results, it results to frequent corrective maintenance (Maggard et al., 1992).

When an equipment breaks down, there is need to repair it by carrying out corrective maintenance. The cost of repairing such equipment is high as it is stopped unplanned. This type of maintenance will not be able to forecast the time when an item fails (Starr, 2000) .The best usage of corrective maintenance would be in places where predicting of failures is difficult. Whenever we carry out repairs according to the prescribed criteria or set intervals to reduce failure or wear of part, this is referred to as prevent maintenance. "Planned actions carried out on the basis of time, production, machine which works for the extension of life period and also detects the failures (Garg &Deshmukh, 2006).

Preventive maintenance is subdivided into predetermined maintenance as well as condition based maintenance. Condition based maintenance explained by Tsang in his paper on strategic dimensions of maintenance management as when preventive maintenance are carried in a scheduled basis there is an opportunity of over maintenance, monitoring the condition of an equipment on a regular basis allows performing preventive maintenance (Tsang, 2002). However, if preventive maintenance is too intensive, the maintenance cost escalates and if too little

results, it results to frequent corrective maintenance, (Maggard et al., 1992).The serviceability of equipment is checked by sensors which are placed in equipment (Wireman, 1990).

The 6s is an approach which engages all employees to increase the performance of the organizations. It drives workplace efficiency as well as effectiveness improvement towards achieving operational excellence. The method of 6s is one approach to identify and reduce wastes in the workplace. It creates cleaner, safer and well-organized working environment wherein teams get involved in improvements. It is a practice to ensure that all the elements of a "workplace system" functions in order to allow an optimum level of performance of the facilities and services to be delivered. The 6S stands for sorting, setting in order, shinning, standardizing sustaining and safety (Kobayashi, (2008).

Ground flight handling firm's face numerous challenges in their effort to implement maintenance strategies, addressing these challenges can influence their capability to provide better services at a low cost and speed to reach customers in good time. There are several barriers to successful lean implementation. They include; implementing lean building blocks in the wrong sequence, the organization failing to tie the improvements metrics to financial statements, poorly selecting lean improvements projects ignoring administrative areas in lean improvements.

The lean principal tools are also applicable in maintenance. The tools include; Managing by fear, short term thinking, lack of consistency of purpose, hiding the weak sides, job hopping by management, excessive medical and litigation cost, value stream mapping-process control and planning material flow, elimination of Deming's seven deadly wastes Kilpatrick,(2003).The polytechnics are being converted to universities without others coming up. This has led to reduced number of technicians with know-how, considering that age is catching up with the existing generation creating a shortage of maintenance technicians in the industry. Machine operator without technical training background is believed to cause up to 85% of process related failures and 15% people related failures a tough fact to live in the current competitive world, (Ahuja, 2008). Finding, training and retaining skilled maintenance person has become a serious challenge in maintenance function in ground flight handling firms in Kenya. (Sika, 2013).

According to Gillet, (2001), maintenance is more of technology based activity in the recent years than it used to be a repair activity a years back. This is because of demand for a greater emphasis on predicting and forecasting maintenance needs. Justification of maintenance existence and return on investment can only be proved through reducing machine down time, reducing overtime needed to meet a service schedule and improving on-time delivery.

There has been a boundary between senior management and maintenance team leading to communication breakdown among employees. This also happens within the sub-sections in the department. For instance, there is no trust between finance and maintenance to carry out autonomous maintenance. Top management unwillingness to adopt new ideologies in their firms have affected maintenance practices through application of outdated technologies and practices in carrying out maintenance activities, the organization requires to be flexible, and ready to change with the environment to remain competitive (Prasatetal, 2003).

The top management has to invest in new maintenance concepts. The implementation requires personnel, spares parts, time and money. Lack of proper justification finds it unnecessary to go by that hence budget is never allocated (Sika, 2013). Written down instructions that document any activity done by an organization are referred to as standard operating procedures. The set of written instructions provide a way activities should be carried out in order to maintain consistency. It also assist in conformance to technical and system requirements (United State Environmental Agency, 2007).

The level of failure is minimal when the written down instructions are followed. Many organization's fail in maintenance because of inadequate, procedures and methodologies. Maintenance cannot be considered successful without considering the above. Kenyan ground fight handling firms have inadequate capacity to prepare sufficient SOPs.(Sika 2013).For an organization to perfect maintenance,

both tactical and strategic planning has to be provided by the leadership. Environment of change has to be created although it is not common. The leader must be able to convince the team that they need to think and work differently than they have in the past. Maintenance needs leadership that is driven by results, not activity. The manager in charge of maintenance must control the spending which constitute up to 60% of maintenance cost, stop focusing on repair maintenance which consumes production time and focus on reliability centered maintenance (Prasat et al., 2003). Sufficient time for maintenance of equipment's is not provided in many firms since the operations team is after the service provided by the equipment's. The maintenance team is left with the option of restarting the machine to keep it moving and no space for innovation and creativity (Prasat et al., 2003).

1.1.2 Operation Performance

Operational performance involves an organization performance that establishes acceptable levels of efficiency and effective in lean practices such as cycle time, waste reduction as well as reduced lead time. Operational performance involves an organization's performance in relation to standards or prescribed measures of efficiency, effectiveness, environmental responsibility comprising of waste reduction, productivity, regulatory compliance and cycle time. Operational performance is termed as a dependent variable used by managers to evaluate firms in comparison with their competitors (Blazey, 2009).

According to Crook &Shook (2005), there is a difference between organizational performance and operational performance. Organizational performance involves economic outcomes of a firm whereas operational performance involves all non-financial firm outcomes. Operational performance is tested against the commitment established in the management. The organization management plans are measured to ensure the social ecological and economic goals are achieved (Brandin&Russel, 2009).For operational performance to be effective, organizational performance management system is applied. The common techniques that measure operational performance include; Balanced scorecard, Best practices and quality circles (Mohanty, 2008).

1.1.3 Ground Flight Handling Firms in Kenya

Ground flight services is described as a series of actions that an aircraft needs the period it remains on the ground. Speed, efficiency and accuracy are important in ground handling services in order to minimize the turnaround time. Faster turnarounds for lower ground times are correlated to better profits (Frutos, 2015).There are several categories of ground handling services. They include; Cabin Service-It aims at providing passenger comfort during the flight. Cabin cleaning involves the bulk of the effort and replenishing onboard consumables (International Air Transport Association, 2013).Catering-It involves replenishment of stock to the aircraft that includes various aspects of passenger reservations.

Ramp service is conducted in a special form of prons. It involves directing the aero plane to its ideal position for both entry and exit positions. The luggage on transit re also catered for in respect of cargo trucks and fuel tracks that facilitates their input (International Air Transport Association, 2013). Different firms are involved in grand handling activities that include; Kenya Airways and Swiss Port Limited as key players that handles over 230 million passengers and other related companies services (Swiss, 2017).

Kenya Aerotech Limited is regarded as the largest provider of grand handling services in the E.A. region through its efficient capabilities and equipment. The company have experience in serving world airlines has ensured excellent operational expertise in provision of grand handling survey all round. Other companies include Trade Winds Limited, Eurocraft Agencies Limited, Africa Flight services among others that operate from Nairobi, Mombasa and other big cities (Kenya Aerotech, 2017).Africa Flight Services (AFS) is part of Worldwide Flight Services' (WFS) global airport services group it was voted 'Best Cargo Handler of the Year' for 2016 at Johannesburg's O.R. Tambo International Airport in the annual 'Feather Awards' for service excellence. In Nairobi, AFS is now the largest cargo handler, according to data for September 2016. It handled over 54% of the 19.4 million kilos of import and export cargo moving through Jomo Kenyatta International Airport during the month (Trans global, 2016).

1.1.4 Maintenance and Performance

Maintenance performance measurement is consistent with the organization's competitive strategies and goals. The serviceability of plant and equipment guarantees a firm of its performance through consistencies in their output (Parida, 2009). Different factors we considered in determining maintenance performance such as health and safety, investment justification of revising, allocation of resources, structural changes and advancing to changes in maintenance of strategies in the wake of new technology (Kumar, 2009). A significant portion of maintenance costs is usually set aside in operational costs in any firm. The facilities in a firm or a key component in that respect being measured internally and externally for the benefit of key stakeholders (Parida, 2009).

1.2 Research Problem

A research has been carried out on maintenance strategies, maintenance practices and effects of maintenance on the productivity in firms. Many countries in Europe allocates enough financial resources on maintenance functions to ensure their growth and sustainability. Despite the increase in demand for reliable production equipment, few companies in Europe still do not embrace the importance of developing good maintenance strategies, which are believed to be key contributors to firms' revenue, (Slonnen, 2003). Skills and training plays a major role in maintenance. Most of the work is normally carried out by Craftsmen and Technician/Foremen. Most of them have learned their skills on job trainee on the basis of watch and learn. However, with the expansion in mechanization and

automation of machines structured technical training programs have been developed to upgrade the skills for the maintenance teams. This is critical for an effective maintenance practice. In many successful maintenance programs, competence of workers in maintenance section is a key factor (Kelly, 2006).This is a combination of skills, passion .knowledge, willingness and attitude towards work (Elsevier, 2009).

A study by Eti et al., (2004) has shown that many firms do not take maintenance seriously, this leads to underutilization of machines hence high maintenance cost. The cause of these problems include; lack of know-how by senior management, inadequate budget on maintenance, few technical courses on maintenance, managers regard maintenance as a cost Centre not a business Centre. In Kenya, a study of maintenance practices in KenGen indicate that the firm has in place good maintenance practices, though breakdown maintenances activities are extremely high. KenGen has had to incur 13% of revenue loss due to poor maintenance handling practices (Karanja, 2012).

A study by Kwambai (2008) on Kenyan geothermal plants has revealed that: to optimize maintenance of Geothermal Power Plants (GPPs) of KenGen. Continuous improvement of maintenance management efficiency is one of the biggest challenges Rao, (2009). From the studies highlighted. None of the studies focused on maintenance strategies used in ground flight handling firms in Kenya. The study sought to fill the gap by addressing the following research questions:

what is the maintenance strategies used by Kenyan ground flight handling firms; what are the challenges faced in the implementation of maintenance strategies used by ground flight handling firms in Kenya.

1.3 Objective of the Study

i. Establish maintenance strategies used by ground flight handling firms in Kenya.
ii. Establish relationship between maintenance strategies and performance.
iii. To establish challenges in their effort to implement maintenance strategies.

1.4 Importance of the Study

The findings of this study enrich the existing knowledge on ground flight handling maintenance strategies and challenge in ground flight handling firms in Kenya. The findings would be quite useful to the researchers and academicians who seek to investigate more in the area of maintenance strategies in the large ground flight handling firms in Kenya.

The findings of the study would come up with maintenance strategies used by ground flight handling firms in Kenya and challenges faced in implementation of strategies used. This would help the management of large ground flight handling firms in Kenya to be aware of appropriate maintenance strategies applicable to their firms, the challenges facing the implementation of these strategies and necessary recommendations for improvements.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The chapter covers a review of other publications that are connected to the research objective. There is thorough assessment of studies by other scholars concerning maintenance. The content of this chapter entails; ground flight handling maintenance functions, maintenance strategies for ground flight firms, maintenance challenges for ground flight handling firms, Role of maintenance strategies and operational performance, the gaps identified and a conceptual framework reflecting the relationships between variables.

2.2 Theoretical Perspective

The theory utilized in conveying clarity to the investigation of the role of maintenance strategies on operational performance. The study obtains from the theory of resource based view to build the concerns regarding the challenges of maintenance in ground flight handling firms.

2.2.1Resource Based View Theory

Resource Based Theory is mostly applicable in different organizational performance issues was established by Penrose (1959) as a significant view of organizational resources. The Resource Based Theory (RBT) holds that given the rapid changes in the external environment, every organization have different kinds of resources that helps them unique in the market depending on the nature

of industry. The uniqueness of the resources are considered to be rare, unsubstantial, more valuable and not easy to imitate by others. Such resources include human capital, physical assets and equipment, technological advances i.e. software applications, financial resources among others. Generally, such resources are perceived to be unique and competitive in nature to aid organizations special hitch in their operations (Barney, 1991). On the other hand, Lopez (2005) asserted that it is not obvious that all the resources will create competitive advantage for a firm, but they can only do so only if they said resources are well integrated and coordinated for smooth running of the firm.

The implementation of the public procurement as a whole requires that state entities to have capabilities in terms of professionally trained, skilled and experienced employees in the field of procurement as well as competent and reliable managers who can direct and organize employees in executing procurement duties as stipulated in the PPADA 2015 (Suppliers Practitioners Management Act, 2007).

2.3 Maintenance Strategies in Ground Flight Handling

Planning, organizing, implementing and controlling maintenance activities is a maintenance management function like any other management function (Gits, 1994).Maintenance as function in the ground flight handling firm has a huge economic potential. Measures of maintenance performance are production rate index, meantime to repair, Breakdown frequency of machines, meantime between

failures of machines. Maintenance productivity indicators are used for measuring resources such as materials, labor, tools and equipment Material usage, work order, efficiency and power utilization are components that form cost indicators (Parida, 2007).

There are various maintenance methods namely; corrective maintenance (run to fail), Predictive maintenance, preventive maintenance. Institutions utilize maintenance management methods to be able to run organization effectively. These maintenance strategies include; lean maintenance, six sigma and Reliability centered maintenance (Sika, 2013).

2.3.1 Preventive Maintenance

Wireman (1990) stated that preventive maintenance program has several subdivisions which include; Routine (inspection, cleaning and lubrication) which ensures that all minor faults are checked before causing machine failure. Proactive replacement is done to worn out parts that are about to fail. Scheduled refurbishing is done when the equipment has been shut down. Condition- based maintenance is usually real time inspection. It is done through sensors installed on the equipment which is complicated and expensive therefore huge investment is required.

According to Wireman (1990), preventive maintenance increases repair parts cost as well as personal costs but decreases costs for scrap or quality, loss of sales and downtime .Firms should balance the two strategies in their effort to optimize the

maintenance activities and costs, over dependent on one strategy leads to loss of revenue either through, high manpower ratio, excess spending on spares or unnecessary stoppages during production time. Reliability engineering is where designing studies of engineering equipment's are carried out. It helps to discover possible modifications of the equipment and prevent failures from coming up.

Preventive maintenance on the other hand uses proactive and predictive approaches; the machine should be maintained at required time of failure or should be done at predetermined interval .Preventive maintenance strategy is regarded as predictive if more of on condition based approach is used and proactive if more activities involve checking and correcting root causes to machine failures. This method is regarded as the best among the two because of lack of interference on the production process since fault is detected before it occurs and its elimination is planned in advance, it reduces quality costs, downtime and costs due to loss of sales. This maintenance strategy can become expensive if it is performed too frequently due to cost of manpower and spares (Labib, 2004).

2.3.2 Condition Based Maintenance

According to Brown (2003), condition based maintenance is done on the evidence to do repairs. The sensors embedded on the equipment provide real time assessment. Measurement is usually done using a portable equipment. The trends are used to compare measured physical parameters against known engineering

limits so as to detect, analyze then correct the problems before the machine fails. The maintenance actions of predictive maintenance makes it become part of condition based maintenance. Since the maintenance actions are similar to measured parameters, condition based maintenance confirms faults that are about to occur and enables preparation of preventive maintenance. The machine is inspected while it is operating and a decision on repair is confirmed. The inspection is done physically or by automation of the machine so as to monitor failure.

2.3.3 Corrective Maintenance

Corrective maintenance involves working on the equipment after failing hence reactive. It has no routine maintenance and involves repairing, restoration or replacement of faulty parts. This strategy is costly hence only applicable for areas that are not critical (Starr, 1997).Repairs or breakdown maintenance uses a reactive approach. It is applicable when the machine has failed and has to be repaired. There is no schedule or routine maintenance task, and consists majorly of repair, restoration and replacement of parts or components. This strategy of maintenance is quite costly, it leads to downtime of production machines/equipment and replacement of a machine/equipment or part of it which is not always cheap, it requires substantial investment. The strategy is only useful in cases where the equipment or parts are required to run to fail (Dhillon, 2002). Run to fail equipment's have more competitive replacement cost to preventive

maintenance and the function it performs, this includes equipment's like electronic panel cooling fan motor.

2.3.4 Root Cause Failure Analysis Maintenance (RCFA)

Root cause failure analysis involves the history of failures that occurred in the past and the corrective action is usually taken past the component stage and into the system deficiency (Marquez, 2007).

2.3.5 Reliability Centered Maintenance (RCM)

The main goal of this maintenance method is to improve efficiency of the system, through consistency of scheduling functions. This is analytical maintenance method that determines the right failure management strategy for a safe and cost effective operations. One must understand the equipment goals, needs, how it works, the age and how many times it has ever failed. However you must put into consideration time management and work rate consistencies (Kwambai, 2008).It ensures that the equipment continues to work. The user is only interested in the service provided by the equipment at that moment (Kirby, 2012).

2.3.6 Productive Maintenance

Lean maintenance is considered to be a productive maintenance in operation that facilitates efficient planning and scheduling of functions in a firm. Its logic and precise capabilities ensures easy strategy development that are reliable and applicable at all times. Teamwork is part of lean maintenance that is guided by 65 procedures that ensures continuous improvement in all operations (Smith, 2004).

The flexibility of six sigma allows sustainable development in business operations at all levels of management. The procedure is made possible through discipline use of facts, attention driven concerns, customer satisfaction practice, business process re-engineering as well as continuous improvement on general performance of an organization (Pande et al, 2000).

2.4 Operational Performance

Operational performance means aspects of an organization that can be evaluated against some predefined parameters (Gregory, 2015).It is an indicator of the efficiency and effectiveness with which firms produce output, Cost, speed, quality and flexibility are commonly used measures of operational performance. These metrics are also viewed as the drivers of operational competitiveness(Youniss,2014).Operational performance measurement is an important role in operations management because according to Benadette (2015) performance measurement results allow organizations to realign their systems and processes to the operations strategy once deviations from the desired performance are exposed. It acts as the basis of organization improvement .Ndubi (2011) states that operational performance is the strategic dimension a firm chooses to compete on whose Measurement is continuous unlike the traditional end of year financial analysis done using common metrics including the following.

Speed is the time lapse between the customer's order placement and delivery of the goods (Maina&Muya, 2014). Lawson (2011) argues that the speed of

response which is very closely related to flexibility is a dominant performance metric in time based competitive environment. Organizations obtain various benefits as a result of their speedy operations. However David et al., 2016) identified the major two benefits namely, increased customer loyalty resulting from quick response to customers' orders and an opportunity to charge premium prices against speedy delivery. Consequently speed results to reduced inventories and increased response time. In the service operations the length of the queue is an important indicator of the speed of the processes e.g. customers in a supermarket or a fast food outlet would avoid those with long queues. This impact on their loyalty to outlets (Kotler, 2011).

Dependability is carrying out activities in a timely manner to ensure that customers receive goods or services when needed or exactly as per the due dates promised. It therefore means being right on time (Certan&Koren, 2014). Dependability can only be determined after a customer has consumed organizations products/services and the perception formed about organization has a strongly influence on his/her decision of repurchase. Consequently it is important to note that dependability overrides all other customer purchase decision criteria, example, irrespective of how cheap products/services of an organization. In a retail outlet if the waiting queues are long, products are regularly out of stock, service is always late or delivery is always delayed, customers will always shift their loyalty to more dependable competitors (Gregory, 2015).

In a turbulent environment, organizations change their products or services or the way they carry out business. This is called flexibility. It is the capability to adapt in way that is reversible as opposed to re-engineering which is irreversible (Neely, 2012). Operations need to be flexible. This means changing what is done, how and when it is done in order to confer upon customers product or service flexibility, product mix, flexibility volume and delivery flexibility. According to Neely,(2012) flexibility measures the ability of a supplier to shorten lead times earlier agreed on when the situations demands or upon request, e.g. if a manufacturer requires a supplier to delivery raw materials thirty days before the scheduled due date is the supplier flexible enough to respond to this requirement? Flexibility speeds up response, saving time and maintains dependability (Slack, 2011).

Cost efficiency means low price. David et al.,(2016), aver that manufacturing related costs are direct product costs, manufacturing overhead costs and inventory costs. They urge that the best competing organization is that which puts concerted effort to reduce costs through various rationalization strategies like, automation from mechanizations, just in time inventory control approach out sourcing among others to provide a competitive edge over competitors (Kuria, 2014). Quality means consistency in conforming to the needs of customer. It's about doing things right first time. The influence of quality on customer's satisfaction or dissatisfaction is so pronounced such that it is the major performance dimensions that customers use to judge product or service (Otavio et. al., 2017). The concept

covers a broad array of dimensions in product/service that include performance features, fitness for purpose, conformance, durability and, serviceability. In services, operations, quality entails personalized attention, consistency, dependability, knowledgeability, courtesy, empathy and safety (Vencataya, 2015).

Wairimu (2014) argued that in as much as the above stated dimensions are the epitome of competitiveness, success for an organization occurs if it increases its productivity and reduces its costs. Productivity is the input –output ratio; a measure of the efficiency of an organizations operations. According to him therefore, in order to achieve success there needs to be a blend of improved productivity, cost reduction, capacity balancing, system reliability and availability; as drivers of success.

2.5Maintenance Challenges

People based challenges include: lack of skilled manpower and training for both production machine operators and maintenance personnel whereby the maintenance workforce is aging and others retiring. Lack of expertise to alter machine design and the monotony by manufacturers to have service level agreement leaving the operators with very little experience in maintenance. Culture based challenges include; Negative organization work culture which promotes careless behavior by its staff. This limits the firm potential as well as its own growth. It leads to the maintenance staff having low energy due to lack of motivation and new ideas. It also discourages workers from paying careful

attention to machines. Firm's resistance to change is brought about by lack of trust, a feeling of exclusion, skills dearth, self-interest and poor communication. Equipment and tools based challenges include: lack of appropriate tools is a serious challenge because the staff tend to utilize what is available as a substitute. Equipment and Machine Park with outdated technology is a major challenge in the firms. Every firm should embrace new technology for better productivity. Every machine has a lifecycle and if you go beyond its natural life productivity, profitability reduces and unnecessarily puts itself at a disadvantage.

Financial based challenges include: control of maintenance cost and budgets whereby lack of finance providers who have an in-depth understanding of a lifecycle of a machine and providing solutions that match the lifecycle and business cash flow. Unwillingness to commit resources by the viewing the process as expensive. System based challenges include: process related problems and none availability of standard operation procedures. Management based challenges include: maintenance leadership whereby the engineers are able to plan strategically and tactically. The technician's in charge should be able to update the engineers and create a conducive environment of change. The engineers should be able to convince the team members as well as the senior management that they need to work differently than they are used to. Leadership can only be proven through results not activity. Procurement of maintenance spares and machines tend to take long before they are supplied. Inability to plan and design change and

2.6Summary and Conceptual Framework

This section summarizes types of maintenance strategies used in ground flight handling firms, challenges faced by the firms in using the strategies, the gaps to be filled in the study, inputs and outputs of maintenance function.

2.6.1 Summary

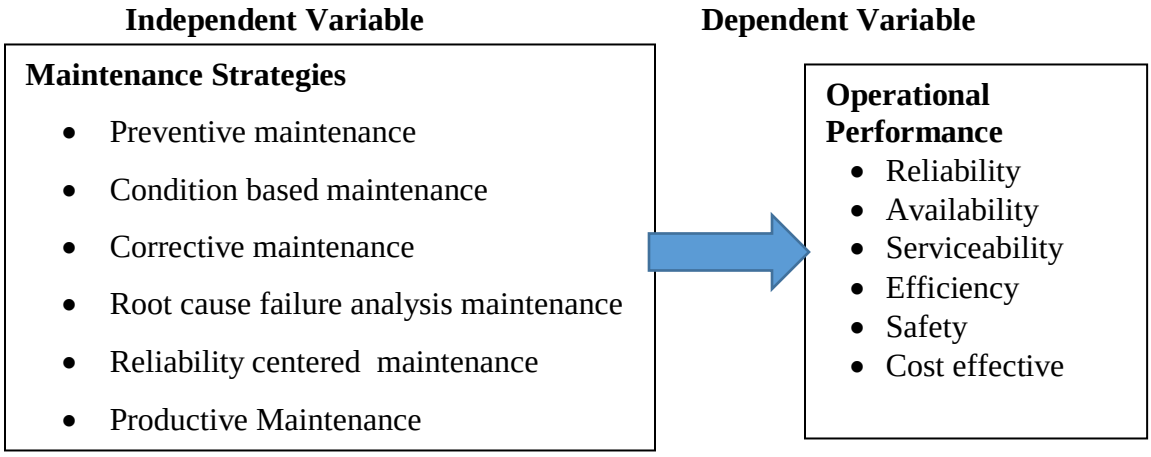
This study seeks to explore the strategies used in Kenyan ground flight handling firms, challenges faced in using the strategies and the relationship between maintenance and performance. The study is worthwhile since very few studies have been done in this area in Kenya. The only recent studies done were on Ken Gen maintenance practices; in thermal, geothermal and hydro power plants, maintenance practices on medical equipment's in Kenyan public hospitals and maintenance strategies on large manufacturing firms in Kenya.

2.6.2 Conceptual Framework

Independent variables in the maintenance function are resources maintenance strategies containing elements like labor, materials, spares, tools, information, money and external services which are made available to the maintenance function through other functions like human resource function, procurement functions and others, within the enterprise. The maintenance system generates output or dependent variable in the form of service overall performance with measures like availability of the equipment, reliability of the equipment, efficiency the equipment, serviceability of the equipment and safety operation of

the equipment. Maintenance system through maintenance strategies gets labor in terms of skill and experience; material in terms of maintenance consumables; spares in terms of machine and equipment spare parts; tools to help in carrying out maintenance activities; information regarding new technologies, training; money to invest in new technologies and services and external services like outsourcing maintenance services to support internal maintenance activities as given in the Fig 1. The maintenance system on receiving the inputs ensures that the machines are available, safe, reliable and maintainable for the service process to continue at a competitive cost.

Figure 2: Conceptual Model



Source: Researcher (2017)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the research design, population of the study, sampling, sample size, data gathering and data analysis that was used in the study.

3.2 Research Design

The research adopted descriptive survey design because it accepts inside and out examination of the issue being studied (Yount,2006).It will also show the existing relationship between variables(Kothari,2004).Basic synopses about the example and the perceptions that have been made are usually given in descriptive studies(Prem,1995).

3.3 Target Population

This study was a census since it will involve all the ground flight handling firms to be studied. According to Kenya Airports Authority directory, (2017) there are sixteen ground flight handlers in Kenya.

3.4 Data Collection

Mugenda & Mugenda (1999) described population as a set of people, services, elements and events that are being investigated. A research questionnaire was employed as a tool for data collection by giving it to the maintenance engineer, technicians or a crafts man. The questionnaire was divided into three sections such that section A covered the background information, section B covered maintenance strategies, and section C covered challenges faced and section

covered relationships between maintenance strategies and operational performance.

3.5 Data Analysis

Data was extracted from the questionnaire and analyzed quantitatively. The results were presented in tables to give a clear finding. For ease of analyzing the data as well as reducing the margin error, questions were coded accordingly to each of the separate variables. Data analysis tools and software packages was applied to analyze primary data. The raw data was analyzed using statistical Package for social sciences (SPSS) program. Regression method was used to demonstrate the relationship between maintenance strategies and operational performance in ground flight handling firms in Kenya.

The model used in the study is given as:

$$y = \alpha + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 4X4 + \beta 5X5 + \beta 6X6 + \varepsilon$$

Where: y=Operational performance.

α=Constraints; y-intercept, that is the value of y when x is equal to zero.

β1to β6=the scope demonstrating degree of variation in independent variable by one unit variable.

X_1 =Preventive Maintenance

X_2 =Condition Based Maintenance

X_3=Corrective maintenance

X_4 =Root cause failure analysis maintenance

X_5 =Reliability centered maintenance

X_6= Preventive Maintenance

ε=error term

CHAPTER FOUR

DATA ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter presents quantitative information gathered from the ground handling firms in Kenya. It gives the findings from the questionnaires and other observations that were encountered during the fieldwork. The study targeted technicians, electricians, engineers, craftsmen, mechatronics, interns and ICT systems support.

The study targeted 64 respondents on the ground flight handling maintenance firms in Kenya at the airport. 52 respondents filled and returned the questionnaires. This accounted for 81% response rate in the study.

4.2 Background Information

4.2.1 Designation

Table 4.1: Designation

		Frequency	Valid Percent	Cumulative Percent
Valid	Technician	18	34.6	34.6
	Engineer	9	17.3	51.9
	Electronics	4	7.7	59.6
	Mechatronics	6	11.5	71.2
	ICT System support	6	11.5	82.7
	Crafts Man	4	7.7	90.4
	Intern	5	9.6	100.0
	Total	52	100.0	

Source: Research Data, (2017)

The study findings on table 4.1 shows that majority 18 (34.6%) of the respondents were Technicians, 9 (17.3%) were Engineers, 6 (11.5%) were Mechatronics, 6 (11.5%) were ICT System Support, 5 (9.6%) were interns, 4 (7.7%) and 4 (7.7%) were electricians respectively. This suggests that the respondents were positioned to give the necessary information sought by this study.

4.2.2 Gender

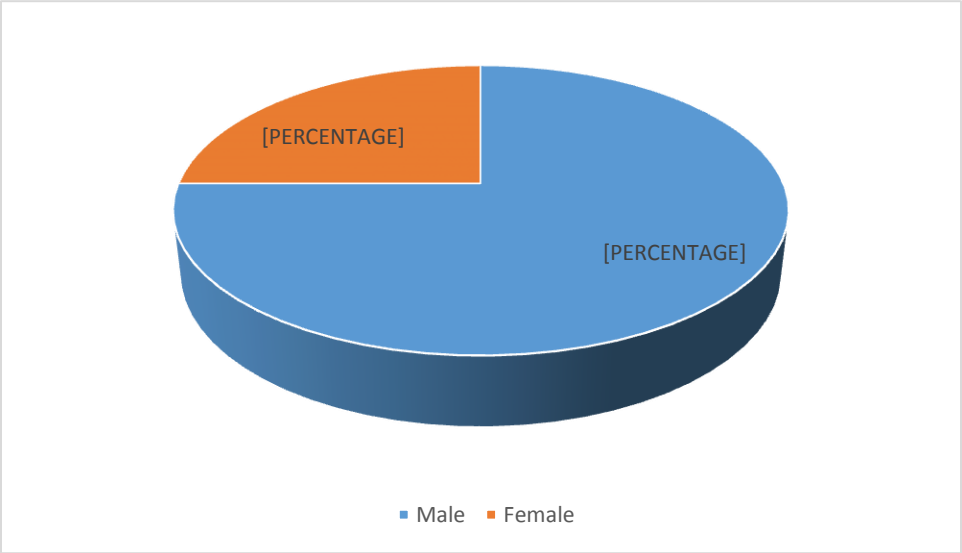
Table 4.2: Gender

		Frequency	Valid Percent	Cumulative Percent
Valid	Male	39	75.0	75.0
	Female	13	25.0	100.0
	Total	52	100.0	

Source: Research Data, (2017)

From the study findings on table 4.2, 39 (75%) of the respondents were male while 13 (25%) of the respondents were female. This implied that gender distribution at the ground flight maintenance handling firms was not well balanced.

Figure 4.1: Gender



Source: Research Data, (2017)

Table 4.3: Highest Level of Education

		Frequency	Valid Percent	Cumulative Percent
Valid	certificate level or equivalent	15	28.8	28.8
	Diploma level or equivalent	24	46.2	75.0
	Degree level or equivalent	13	25.0	100.0
	Total	52	100.0	

The study findings in table 4.2 shows that 24 (46.2%) of the respondents had attained diploma level or equivalent, 15 (28.8%) of the respondents attained certificate level or equivalent and 13 (25%) were degree holders or equivalent.

4.2.3 Length of Continuous Service with the Organization

Table 4.4: Duration of Stay/Service in the Organization

		Frequency	Valid Percent	Cumulative Percent
Valid	0-2 years	10	19.2	19.2
	3-5 years	23	44.2	63.5
	6-10 years	12	23.1	86.5
	11 years and above	7	13.5	100.0
	Total	52	100.0	

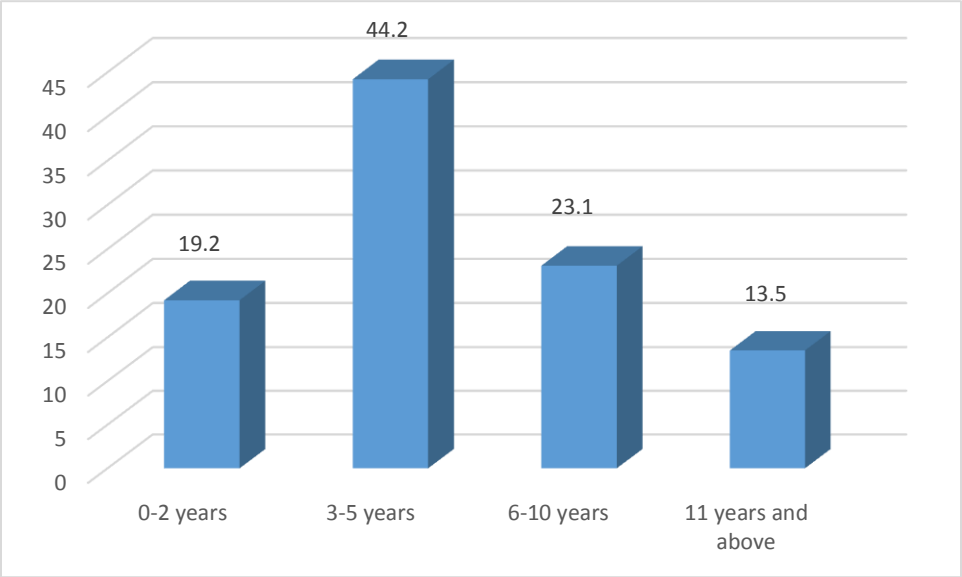
Source: Research Data, (2017)

The study sought to find out the duration of stay or time served by the respondents in their respective organizations. The study findings on table 4.3 shows that majority of the respondents; 23 (44.2%) had served in their organization for 3 – 5 years, 12 (23.1%) had served for 6 – 10 years, 10 (19.2%) had served between 0 – 2 years and 7 (13.5%) had served for 11 years and above. Therefore, this implies that the respondents had enough experience in their firms to give accurate information sought by the study.

4.2.4: Duration of Time the Company has been in Operation

The study sought to establish for how long has the respective ground flight handling maintenance firms have been in operation in Kenya.

Figure 4.2: Duration of Time the Company has been in Operation



Source: Research Data, (2017)

4.3 Maintenance Strategies used at Ground Flight Handling Firms in Kenya

The study sought to determine the maintenance strategies employed by ground flight handling firms in Kenya. Based on the study findings on table 4.4, it indicates that condition based maintenance through monthly reorder are reworked, maintenance personnel spend free time on plant housekeeping at a great extent with a mean (M = 3.85; SD = 0.958), (M = 3.75; SD = 0.860) respectively. Other respondents indicated that reliability centered maintenance through equipment being run to avoid failure and people through their actions affect maintenance activities at a great extent with a mean (M = 3.60; SD = 0.891) and (M = 3.60; SD = 1.038) respectively.

Moreover, other respondents revealed that workers attend training in a year and workers orders are planned before outage at a moderate extent respectively with a mean (M = 3.44; SD = 0.802) and (M = 3.35; SD = 1.153).

On the other hand, corrective maintenance through large proportions of monthly maintenance margins available used in emergency maintenance, workers allocated to the maintenance team on a daily basis is preventive. Maintenance and contractors depends on the total maintenance workload was reported to be adopted at a moderate extent with a mean (M = 3.33; SD = 1.133), (M = 3.31; SD = 0.961) and (M = 3.33; SD = 0.897) respectively. Other respondents indicated that productive maintenance through maintenance activities being carried out by workers order, financial aspects constraint maintenance activities in a firm and monthly total available maintenance hours are dedicated to planned reactive maintenance adopted in a moderate extent as well with a mean (M = 3.119; SD = 0.908), (M = 3.17; SD = 0.923) and (M = 3.13; SD = 0.886) respectively.

Furthermore, other respondents reported that root causes failure analysis maintenance through failure in machines are detected before the machines fail. Monthly total available maintenance hours are dedicated to predictive maintenance at a moderate extent (M = 3.02; SD = 0.87) and (M = 2.98; SD = 0.828) respectively.

Table 4.5: Maintenance Strategies at Ground Flight Handling Firms in Kenya

Statement	Mean	Std. Dev.	N
Condition – Based Maintenance Monthly reorders are reworked.	3.85	0.958	52
Maintenance personnel spend free time on plant housekeeping.	3.75	0.860	52
Reliability Centered Maintenance Equipment are run to avoid failure.	3.60	0.891	52
People through their actions affect maintenance activities.	3.50	1.038	52
Workers attend training in a year.	3.44	0.802	52
Workers orders are planned before outage.	3.35	1.133	52
Corrective Maintenance Large proportions of monthly maintenance hours available used in emergency maintenance.	3.33	1.133	52
Preventive Maintenance Work allocated to the maintenance team on a daily basis is preventive maintenance.	3.31	0.961	52
Contractors depend on the total maintenance a workload.	3.31	0.897	52
Productive Maintenance Maintenance activities are carried out by a workers orders.	3.19	0.908	52
Financial aspects constraint maintenance activities in a firm.	3.17	0.923	52
Monthly total available maintenance hours are dedicated to planned reactive maintenance.	3.13	0.886	52
Root Cause Failure Analysis Maintenance Failure in machines are detected before the monthly total available; maintenance hours are dedicated to predictive maintenance.	3.02	0.874	52
Monthly total available maintenance hours are dedicated to predictive maintenance.	2.98	0.828	52

Source: Research Data, (2017)

4.4 Maintenance Challenge

The researcher further sought to establish the challenges experienced by the ground flight handling maintenance firms in their efforts to implement maintenance strategies.

Table 4.6: Maintenance Challenges

Statement	Mean	Std. Dev.	N
Tools and equipment used affects maintenance activities.	4.33	0.648	52
Lack of expertise training skills affect maintenance activities.	4.27	0.660	52
Lack of tools affects maintenance activities.	4.00	0.648	52
Lack of basic machine operation.	4.00	0.767	52
Inadequate maintenance budget affects maintenance activities.	3.83	1.232	52
Financial aspects, constraints maintenance activities.	3.78	0.968	52
Unwillingness by management to commit resources affects maintenance activities.	3.77	1.041	52
Management leadership can fail maintenance activities.	3.68	1.167	52
Management systems have no effect to maintenance activities.	3.67	1.167	52
Procurement of spares is a challenge in maintenance activities.	3.62	1.016	52
Procurement of maintenance machine is a challenge in maintenance activities.	3.59	0.897	52
Inability to repair machines in time has an effect in maintenance activities.	3.52	1.054	52
Inability to design changes has no effect in maintenance activities.	3.38	1.239	52
Inability to plan has no effect in maintenance activities.	3.23	1.169	52
Uncontrolled maintenance costs affects maintenance activities.	3.12	1.247	52
Lack of basic technical training.	2.37	1.085	52
Outdated technology affects maintenance activities.	1.52	0.804	52

Source: Research Data, (2017)

The findings of the study as shown on table 4.5 indicates that tools and equipment used affects maintenance activities, lack of expertise training skills affect maintenance activities, lack of tools affects maintenance activities and lack of basic machine operations are challenges experienced at a great extent.

Other challenges experienced in a great extent includes financial aspects constraints (M = 3.78; SD = 0.968), unwillingness by management to commit resources affects maintenance activities (M = 3.77; SD = 1.041), management systems have no effect to maintenance activities (M = 3.67; SD = 1.167), procurement of spares is a challenge in maintenance activities (M = 3.62; SD = 1.016), procurement of maintenance machines is a challenge (M = 3.52; SD = 1.054).

On the other hand, other respondents reported that inability to design changes has no effect in maintenance activities, inability to plan has no effect to maintenance activities and uncontrolled maintenance costs affects maintenance activities at a moderate extent with a mean of (M = 3.38; SD = 1.239), (M = 3.25; SD = 1.169) and (M = 3.12; SD = 1.247) respectively.

Lack of basic technical training and outdated technology were reported to be challenges affecting maintenance activities at a small extent with a mean (M = 2.37; SD = 1.085) and (M = 1.52; SD = 0.804) respectively.

4.5 Regression Analysis

The researcher performed a regression analysis to establish the relationship between maintenance strategies and performance of ground flight handling in Kenya.

$$Y = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + B_6X_6 + e$$

Where

Y = Operational Performance

B_0 = Constant Term

B_1 = Beta Coefficients

X_1 = Preventive Maintenance

X_2 = Condition Based Maintenance

X_3 = Corrective Maintenance

X_4 = Root Cause Failure Analysis Maintenance (RCFA)

X_5 = Reliability Centered Maintenance (RCM)

X_6 = Productive Maintenance

e = Error in the model

4.5.1 Strength of the Model

Table 4.7: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.856[a]	.642	.457	.564

Source: Research Data, (2017)

a. Predictors: (Constant), Large proportions of monthly maintenance hours available used in emergency maintenance, Work orders are planned before outage, Failure in machines are detected before the machines fail, Monthly total available maintenance hours are dedicated planned reactive maintenance, Work allocated to the maintenance team on a daily basis is preventive maintenance, Financial aspects constrain your maintenance activities

The analysis in table 4.6 shows that the coefficient of determination (percentage variation in the dependent variable being explained by the changes in the independent variables) R^2 equals 0.642 or 64% that is, preventive maintenance, condition based maintenance, corrective maintenance, root cause failure analysis maintenance, reliability centered maintenance and productive maintenance. This leaves out 36% as unexplained variable that was not covered in this study.

4.5.2 Analysis of Variance

Table 4.8: Analysis of Variance

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10.905	6	1.818	5.709	.000[b]
	Residual	14.325	45	.318		
	Total	25.231	51			

Source: Research Data, (2017)

a. Dependent Variable: efficiency

b. Predictors: (Constant), Large proportions of monthly maintenance hours available used in emergency maintenance, Work orders are planned before outage, Failure in machines are detected before the machines fail, Monthly total available maintenance hours are dedicated to planned reactive maintenance, Work allocated to the maintenance team on a daily basis is preventive maintenance, Financial aspects constrain your maintenance activities.

The ANOVA findings of this study P- Value of 0.000 indicated the correlation between the independent variables (preventive maintenance condition based maintenance, corrective maintenance, root cause failure analysis maintenance, reliability centered maintenance and productive maintenance) and dependent variable (operational performance). Therefore, the model reveal that operational performance was significant.

4.5.3 Coefficient of Regression Equation

Table 4.9: Coefficient of Regression Equation

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.670	.536		8.710	.000
	Monthly total available maintenance hours are dedicated planned reactive maintenance	-.256	.096	-.322	-2.655	.011
	Work orders are planned before outage	.039	.079	.064	.493	.024
	Failure in machines are detected before the machines fail	.468	.107	.581	4.383	.000
	Work allocated to the maintenance team on a daily basis is preventive maintenance	.294	.093	.401	3.153	.003
	Financial aspects constrain your maintenance activities	-.105	.107	-.138	-.985	.330
	Large proportions of monthly maintenance hours available used in emergency maintenance	.116	.072	.187	1.618	.013

a. Dependent Variable: efficiency

$Y = 4.670 – 0.256X_1 + 0.039X_2 + 0.468_{X3} + 0.294X_4 – 0.105_{X5} + 0.116X_6$. This therefore indicates that:

Constant = 4.670, showing preventive maintenance, condition based maintenance, corrective maintenance, root cause failure analysis maintenance, reliability centered maintenance and productive maintenance all rated as zero operational performance would be 4.670.

X_1 = -0.256 shows that one unit change in preventive maintenance results in -0.256 decrease in operational performance.

X_2 = 0.039 indicates that one unit change in condition based maintenance results in 0.039 increase in operational performance.

X_3 = 0.468 shows that one unit change in corrective maintenance results in 0.468 increase in operational performance.

X_4 = 0.294 shows that one unit change in root cause failure analysis maintenance results in 0.294 units increase in operational performance.

X_5 = -0.105 shows that one unit change in reliability centered maintenance leads to -0.105 unit decrease in operational performance.

X_6 =0.116 indicates that one unit change in productive maintenance results in 0.116 units increase in operational performance.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter offers a tentative discussion on the study findings that was established in chapter four. It will also involve conclusion of the study and offered recommendations as well. This chapter also offers areas for further research to be done by future researchers.

5.2 Summary of the Findings

The results of the study provide very key information on maintenance strategies in the ground flight handling firms in Kenya; it indicates how it influences operational performance through reliable services, availability of key services on a timely basis, cost reduction of operation activities and general efficiency of operations. The findings revealed that majority of the respondents were technicians at (34.6%).

With regard to maintenance strategies, the study findings established that conditional based maintenance strategy through monthly orders and maintenance personnel spending free time on plant housekeeping were implemented at a great extent respectively. Other respondents reported that reliability centered maintenance strategies through equipment being run to avoid failure, people through that action affects maintenance activities as well as workers attending training in a year were adopted at a great extent. Productive maintenance

strategies through maintenance activities being carried out by work orders and monthly total available maintenance hours are dedicated to planned reactive maintenance are implemented at a moderate extent.

The results imply that prior to implement maintenance strategies operations, managers and operation officers need to implement innovative ideas that can streamline their operational performance based on new technological innovations. The major challenges that were identified by the respondents include tools and equipment used affect maintenance activities, lack of expertise training skills affect maintenance activities, lack of tools, lack of basic machines operation, inadequate maintenance budget, unwillingness of management to commit resources as well as challenges of procurement of machines and spares that is experienced at a great extent. However, lack of basic technical training and outdated technology challenges were experienced at a small extent by ground flight handling maintenance firms in Kenya.

5.3 Conclusion

The strategies are required so as to cope with the dynamic nature of the external environment. In this study, the respondents have indicated that firms have adopted world class maintenance strategies that have the potential to meet their ground handling demands despite the challenge. The findings of the study are consistent with the resourced based view theory such that resource diversity concentrates on affirm owning a resource or capability to compete in the industry to have a

competitive edge over other players. Ground handlers in various firms are major resource to operational performance as established by the study.

The major challenges faced by ground flight maintenance includes lack of experience firms include; lack of expertise, lack of tools affecting maintenance, lack of basic machines, inadequate maintenance budgets and unwillingness by management to commit resources to maintenance operations. The findings imply that ground flight handling maintenance firms in Kenya need to put in place additional maintenance strategies to the existing ones in order for them to have the best operational performance that is sustainable. Management should allocate more resources to the maintenance functions so as to improve on their operational performance. The study contributes useful information to organizational leaders and managers in the aviation industry that will provide a basis for policy framework to improve on the maintenance operations in their firms.

5.4 Recommendations

The ground flight handling firms should focus on innovators and developing the overall business strategy that is powered by new technology to enhance their competitive advantage in the industry. The innovative additional maintenance strategies will eliminate unnecessary costs, accelerating financial returns and streamlining operational performance to the global standards.

In order to ensure that consistent efficient operational performance is achieved is by management of respective firms allocate sufficient resources in ground flight

maintenance functions so as to boost operations. Purchasing of new and modern equipment should be done and train employees on their use sufficiently. Also provide the employees with proper remuneration to boost their morale and in the long run operational performance will be guaranteed at a significant percentage. Moreover, more emphasis should be put in place in adopting new technological innovations in ground handling matters that help improve on efficiency and save on costs for the firm. Information gathering and processing should also be improved so as to allow instant communication during working hours to avoid delays and help in eliminating wastes and spearheading world class operational performance.

5.5 Limitations of the Study

The major limitation of this study is the fact that data was only collected to firms that are based in Nairobi only. It is therefore significant to collect data in other firms outside Nairobi. The respondents were also reluctant to fill in the questionnaires for fear of unknown people while others had busy schedules to attend to the questionnaires.

5.6 Suggestions for Further Research

The topic of study was concerned with firms in Nairobi County only. However, the same topic can be addressed in different context of devolved units. Further research should be done in determining the influence of maintenance strategies on operational performance of ground flight handling maintenance firms in other

counties in Kenya. This will help create a comparison of study findings to establish if the same findings can be achieved and if not the disparities and circumstances.

Furthermore, future researchers should do the same study with conditions of technological techniques used in ground handling tasks and how they relate to operational performance. This should go hand in hand with the involvement of other stakeholders as respondents in the study such as airlines and customers/consumers of ground handling services.

REFERENCES

Aberdeen Group,(2006).*Collaborative Assets Maintenance Strategies: Redefining the roles of product manufacturers and operators in the Service Chain.*

Ahmed, S. & Hassan M. H. J. (n.d).*Action Plans for implementation of total productive maintenance.*

Ahmed, S. R., Karuddi, I. Azid&Almanar I. (2011).“*Maintenance management decision model on preventive maintenance on production equipment)*”, Journal on industrial engineering 7 (13), 22 – 34 spring 2011.

Al-Turki, U. (2011). *“A framework for strategic planning in maintenance”*. Journal of Quality in Maintenance Engineering, 17(2), 150–162. doi:10.

AmikGarg, S.G. Deshmukh, (2006) "Maintenance management: literature review and directions", Journal of Quality in Maintenance Engineering, Vol. 12 Issue: 3, pp.205-238.

Ashraf W. Labib, (2004) "A decision analysis model for maintenance policy selection using a CMMS", Journal of Quality in Maintenance Engineering, Vol. 10 Issue: 3, pp.191-202

B.S. Dhillon (2002). *Engineering maintenance modern approach.*

Bestfield, D.H., Bestfield, C., Bestfield, G.H. (2013), *Total productive maintenance*, 2nd Edition.

Bore C. K. (2008), “*Analysis of management methods and application to maintenance of geothermal plants*”.

Certan, O., and Koren (2014).M*anufacturing capacity planning strategies*.Journal of operations management, Vol. 8, 15.

C.W. Gits, (1994) "Structuring Maintenance Control Systems", International Journal of Operations & Production Management, Vol. 14 Issue: 7, pp.5-17

Daya, M., Duffuaa, S.O., Raouf, A, Knezeri, J. (2009), *Handbook of maintenance management and engineering.*

David, Alexander &Amedeo (2017). *Managing capacity in an environment t of constrained resources.*International journal of operations management

Drucker, Peter F., *Management Challenges for the 21st century (New York: Harper Business,1999).*

Eti M. C., Ogati, S. O. T. &Probert, S. D. (2006). "*Development and Implementation of preventive – maintenance practices in Nigerian Industries*", Applied energy volume 83, issue 10, October 2006, pages 1163 – 1179

FidaAfiouni (2007). *Human resource management and knowledge management pages124-130.*

Goyal, R.K, Maheswari, K. (2013).*International Journal of advanced research in engineering andapplied science* ISSN: 2278 – 6252 vol. 2/No.1

Gregory, W. (2015).*Planning capacity*.Operations management journal

Haroun, A. E. &Duffuaa S. O. *(2008)*. *Maintenance organization*

J. Barney (1991), *Firm resources &sustained competitive advantage pages 99-120.*

Jay B. Barney (2000).*Firm resources and sustained competitive advantage pages 203-227.*

Maggard, Bill David M. Production and inventory management journal; Alexandria vol 33,iss 4,fourth quarter 1992).

Maina,M., Muya.J.(2014).*Strategic capacity planning and impact on performance*. Unpublished MBA project submitted to JKUAT.

Mugenda M. O. & Mugenda A. (2003).*Research Methods: Qualitative and Quantitative Approaches*, Acts Press, Nairobi

Mulama, O.A (2012), *Logistic outsourcing practices and performance of large manufacturing firms in Nairobi, Kenya*, (unpublished MBA project), University of Nairobi

Mutia D., J. Kihiu&Maranga, S. (2012). "*Maintenance management of hospital equipment; A case study for public hospitals in Kenya. Proceedings of the 2012 mechanical engineering conference on sustainable research and innovation",* volume 4, May 2012

Neely, A. (2012).*Resources planning in operations*: Journal of operations management vol. 33.

Ottavio,T., Verdatt,O., &Morty,J. (2017). *Aggregate capacity planning*.Journal of operations management.

Parida, A. &Kumar Uday, (2006). *Development and Implementation of Maintenance Performance Measurement Systems; Issues and Challenges.* Division of Operation and Maintenance Engineering. Lulea University of Technology. WCEAM Paper 127.

Sinder B. (2010); *the forth plant maintenance Revolution*; 2011 issue of Inspectioneering Journal.

Starr. (2000). *A structured approach to the selection of condition of condition based maintenance* A G Starr University of Huddersfield, UK, (435), 2–4.

Visser J K, *Maintenance Management: An Appraisal of Current Strategies*, ICOMS 98, Paper 031, 1998.

Younnis, M. (2014).*Capacity constraints management and operational performance of the petroleum firms in Kenya*. Unpublished MBA project submitted to The University of Nairobi.

APPENDICES

APPENDIX I: QUESTIONNAIRE

Kindly note that the questionnaire is designed to gather information for academic purpose only and information given will be treated with a lot of confidence.

Kindly give answers in the spaces provided by either ticking (√) in the box provided or writing in the space provided.

Section A: Background information

1. What is your designation in the organization: ……

2. What is your gender? Female [ ] Male [ ]

3. What is the highest level of education you have attained?

    a. Craft certificate level or equivalent [ ]

    b. Diploma level or equivalent [ ]

    c. Degree level or equivalent [ ]

2. Length of continuous service with the organization? …….

3. For how long has your company been operation? ……...

Section B: Ground Flight Handling Maintenance Strategies used in Kenyan firms

Please indicate by ticking (√) in the appropriate box how frequently your company uses maintenance strategies listed in the table below on the scale of 1 to 5, **where 1= no extent, 2 = small extent, 3 = moderate extent, 4 = great extent, 5 = very great extent.**

Answer the questions by ticking (√) in the box

	Maintenance strategies	**1**	**2**	**3**	**4**	**5**
1.	Maintenance activities are carried out by a works orders					
2.	People through their actions affect maintenance activities					
3.	Large proportion of monthly maintenance hours available are used in reactive emergency maintenance.					
4.	Lack of basic machine operations skills affect maintenance activities.					
5.	Lack of expertise training skills affect maintenance activities					
6.	Equipment's are run to fail					
7.	Work orders are planned (labor, materials, checklists etc) before the outage.					
8.	Monthly total available maintenance hours are dedicated to planned reactive maintenance.					

9.	Monthly total available maintenance hours are dedicated to predictive maintenance.					
10.	Un willingness by management to commit resources affects maintenance activities.					
11.	Failures in machines are detected before the machines fail.					
12.	Work allocated to the maintenance team on a daily basis is preventive maintenance.					
13.	Financial aspects constrain your maintenance activities					
14.	Maintenance personnel spend free time on plant housekeeping.					
15.	Most monthly work orders are reworked.					
16.	Workers attend training in a year.					
17.	Use contractors dependent on the total maintenance work load.					

Section C: Maintenance challenges in Ground Flight Handling Firms in Kenya

Kindly indicate the level of agreement with the statement below regarding challenges facing maintenance activities in your company on the scale of 1-5, **where: 1= strongly disagree, 2=disagree, 3=not sure, 4=agree, 5=strongly agree**

Answer the questions by ticking (√) in the box.

	Maintenance challenges	**1**	**2**	**3**	**4**	**5**
1.	Lack of basic machine operation skills affects maintenance activities.					
2.	Lack of basic technical training skills affects maintenance activities					
3.	Lack of expertise training skills affects maintenance activities					
4.	Tools and equipment's used in maintenance activities affect maintenance activities.					
5.	Lack of tools affects maintenance activities.					
6.	Outdated technology affect maintenance					
7.	Financial aspects constrain your maintenance activities					
8.	Uncontrolled maintenance costs affect maintenance activities.					
9.	Inadequate maintenance budget affects maintenance activities.					
10.	Unwillingness by management to commit resources affects maintenance activities.					
11.	Management systems have no effect maintenance activities					
12.	Maintenance leadership can fail maintenance activities.					

13.	Procurement of maintenance spares is a challenge in maintenance activities.					
14.	Inability to plan has no effect in maintenance activities.					
15.	Procurement of maintenance machines is a challenge in maintenance activities.					
16.	Inability to design change has no effect in maintenance activities.					
17.	Inability to repair machines in time has no effect in maintenance activities.					

SECTION D: Relationship between Maintenance Strategies and Operational Performance

Indicate the extent to which the organization has performed for each of the following organizational operational performance parameters. Please tick where appropriate (use the scale of: **1-No extent, 2-Small extent, 3-Moderate extent, 4-Large extent, 5-Very large extent).**

Organizational Operational Performance Parameter	**1**	**2**	**3**	**4**	**5**
Reliability					
Availability					
Serviceability					
Efficiency					
Safety					
Cost					

APPENDIX II

REGISTERED GROUND HANDLING FIRMS IN KENYA

No.	Registered Ground Handling firms in Kenya
1.	Africa Flight services-AFS
2.	AN-Aviation Services Co
3.	Aurora Aviation
4.	Bidair Services
5.	Expedair
6.	Euro craft Agencies Ltd
7.	Jamco Airport Services
8.	Kenya Aerotech Ltd
9.	Kenya Airfreight Handling Ltd (KAHL)
10.	Kenya Airways
11.	Siginon Freight Ltd
12.	Supreme Aviation
13.	Swissport Kenya
14.	Swissport Cargo services
15.	Tradewinds Aviation Services
16.	Transglobal Cargo Centre Ltd

Source: Airline update Directory, (2017).

UNIVERSITY OF NAIROBI
SCHOOL OF BUSINESS

Telephone: 020-2059162
Telegrams: "Varsity", Nairobi
Telex: 22095 Varsity

P.O. Box 30197
Nairobi, Kenya

DATE 09/11/2017

TO WHOM IT MAY CONCERN

The bearer of this letter MIKE NJUNJA MUGOH

Registration No D61/74692/2014

is a bona fide continuing student in the Master of Business Administration (MBA) degree program in this University.

He/she is required to submit as part of his/her coursework assessment a research project report on a management problem. We would like the students to do their projects on real problems affecting firms in Kenya. We would, therefore, appreciate your assistance to enable him/her collect data in your organization.

The results of the report will be used solely for academic purposes and a copy of the same will be availed to the interviewed organizations on request.

Thank you.

UNIVERSITY OF NAIROBI
SCHOOL OF BUSINESS
09 NOV 2017
P.O. Box 30197 - 00100, NAIROBI

PATRICK NYABUTO
SENIOR ADMINISTRATIVE ASSISTANT
SCHOOL OF BUSINESS