



**ST. MARY'S UNIVERSITY
SCHOOL OF GRADUATE STUDIES**

**ASSESSMENT OF SERVICE QUALITY CONTROL PRACTICE OF ETHIOPIAN
MOTORIZED EQUIPMENT MAINTENANCE AND ITS IMPACT ON INTERNAL
CUSTOMER SATISFACTION:**

A CASE STUDY OF ETHIOPIAN AIRLINES, ADDIS ABABA, ETHIOPIA

BY

SILESHI SEIFU ID NO: SGS/0132/2008A

**July, 2017
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**A THESIS SUBMITTED TO ST.MARY'S UNIVERSITY, SCHOOL OF
GRADUATE STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF MASTER OF BUSINESS ADMINISTRATION
(GENERAL)**

Advisor: TEFAYE WOLDE (Ph.D.)

**July, 2017
ADDIS ABABA, ETHIOPIA**

**ST. MARY'S UNIVERSITY
SCHOOL OF GRADUATE STUDIES FACULTY OF BUSINESS**

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ENDORSEMENT

This thesis has been submitted to St. Mary's University, School of Graduate Studies for examination with my approval as a university advisor.

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Signature & Date

July, 2017

Table of Contents

ENDORSEMENT	i
Table of Contents	ii
ACKNOWLEDGEMENTS	iv
LIST OF ACRONYMS/ABBREVIATIONS.....	v
LIST OF TABLES	vi
LIST OF FIGURES.....	vii
ABSTRACT	viii
CHAPTER ONE.....	1
1. INTRODUCTION.....	1
1.1. Background of the Study	1
1.2. Background of the Organization.....	2
1.3. Statement of the Problem	3
1.4. Main research Question.....	4
1.4.1. Sub research Questions.....	4
1.5. Objectives of the Study.....	5
1.5.1. Main Objective	5
1.5.2. Specific Objective.....	5
1.6. Definition of key terms.....	5
1.7. Significance of the Study.....	6
1.8. Scope of the Study.....	6
1.9. Limitation of the Study.....	6
1.10. Organization of the Study.....	6
CHAPTER TWO.....	7
2. RELATED LITRATURE REVIEW	7
2.1. Quality Management	7
2.1.1. Quality	7
2.1.2. Quality Control	8
2.1.3. Measuring Quality Control.....	9
2.2. Maintenance Management.....	10
2.2.1. Basic Concept.....	10
2.2.2. Type of Maintenance	10
2.3. Maintenance Process of Motorized Equipment.....	12
2.3.2. Inspection	12
2.3.3. Releasing	14

2.3.4. Delivery	15
2.4. Empirical Review	16
2.5. Conceptual frame work	16
2.6. Variables.....	17
2.6.1. Dependent Variables.....	17
2.6.2. Independent variables	17
CHAPTER THREE.....	20
3. METHODS OF THE STUDY.....	20
3.1. Research Design	20
3.2. Population and Sampling.....	21
3.3. Instruments for Data Collection	22
3.4. Methods of Data Presentation, Analysis and Interpretation	22
3.4.1. Data Presentation.....	23
CHAPTER FOUR	38
4. RESULTS AND DISCUSSION.....	38
4.1. Results	38
4.2. Discussion.....	39
CHAPTER FIVE.....	45
5. SUMMARY, CONCLUSION & RECOMMENDATIONS	45
5.1. Summary of findings	45
5.2. Conclusions	47
5.3. Recommendations	47
References	49
APPEDIX	I
Questionnaire.....	I
DECLARATION.....	VIII

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Thank You!

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LIST OF ACRONYMS/ABBREVIATIONS

ADD	Addis Ababa
BD	Braked won Maintenance
CM	Corrective Maintenance
COO	Chief Operating Officer
EAL	Ethiopian Air Lines
EFM	Equipment and Facility Maintenance
ET	Ethiopian Airlines SC
GSE	Ground Support Equipment
GTV	Ground Transport Vehicles
ISO	International Organization for Standard
MNT	Maintenance
MRO	Maintenance Repair and Overhaul
PM	Preventive Maintenance
QMP	Quality Management Practice
QMS	Quality Management System
SLA	Service Level Agreement
TQM	Total Quality Management

LIST OF TABLES

Table 1	Background of the Respondents': Operators	39
Table 2	Background of the Respondents': Unit Owners	41
Table 3	Background of the Respondents': Technicians	42
Table 4	Background of the Respondents': Procurement Officers	44
Table 5	Responses for factors that negatively impact Equipment (GSE/GTV) Maintenance Service	25
Table 6	Responses for factors that affect Maintenance Quality Control practice	28
Table 7	Responses for importance of Quality Control practice.....	31
Table 8	Responses for impacts that affect on-time performance	33

LIST OF FIGURES

Figure 1 Inspection.....	13
Figure 2 Releasing.....	14
Figure 3 Delivery	15
Figure 4 Independent and Dependent variables	16

ABSTRACT

This study had been conducted in Motorized Equipment Maintenance service of Ethiopian Airlines in Addis Ababa. The main objective of the study was to examine quality control practice of the maintenance service and its impact on its internal customer satisfaction of the Motorized Equipment maintenance service. In order to accomplish this objective the researcher used both primary and secondary sources. The Primary data had been gathered through open ended and close ended questionnaire from unit owners, operators, procurement officers and technicians from maintenance section. The questioners distributed to 90 sample respondents by using proportional stratified sampling, which is favorable to get adequate and suitable data to eliminate time wastage and all questionnaires had been collected completely filled questionnaires for data analysis. The study also used secondary data that had been obtained from the department documents and others. After the data was collected, processed (i.e.-edited, coded, classified and tabulated) and analyzed in relation to each type of question. The result shows that lack of sufficient training both for operators & technicians are the major factors for quality control practice. Moreover the maintenance service quality controlling practice has impact on the internal customer perception about the maintenance service and on time performance. Therefore adequate training and awareness has to be given to operators and technicians.

Key Words: *Quality Control*

CHAPTER ONE

1. INTRODUCTION

1.1. Background of the Study

In today's dynamic & competitive business environment, Airlines need to satisfy their customers by providing safe, reliable and on time service. In order to achieve this, all the support sections, within the airline should provide on time and quality service. This study assesses the maintenance service quality practice of Motorized Equipment Maintenance of Ethiopian Airlines and its impact on internal customer satisfaction. DeAngelo (1981) introduced the quality theory model, where the control on the audit firm is divided into four factors: One controlling on the firm factors such as human resource, control process, and industry experience. The second factors refer to controlling on audit team factors such as supervision, planning, and performance the service, client experience and professionalism. Furthermore, studies by DeAngelo (1981) and Palmrose (1986) suggests that detecting the material misstatements is influenced by how well the service quality control system on the audit firm influence the audit team in performing their services.

Many studies have proven that the success of quality control was driven by high service quality (DeAngelo, 1981; Ridley, 1994; Bij and Ekert, 1999). Low control on production process or service will cause low service quality which means the detection of misstatement or product defect increased (Lian, 2001). Lian (2001) also states that the success of service quality and its impact is largely within the control of leadership. According to Ridley (1994), quality control and quality service interact with each other. The success of service quality was driven by the high quality control on product or services.

Ethiopian maintenance section currently gives both, breakdown as well as preventive maintenance service to large amount of units that the company possesses. Currently, there are a total of **772** units which supports the operation directly and indirectly. The section is responsible in providing on-time maintenance service regardless of the allocated resources like, time, manpower, parts, location and training. (Accessed from EAL Logbook)

Units come for maintenance due to various reasons; mainly, for preventive maintenance and as a breakdown maintenance due to inappropriate handling of the units while operating and failure to bring the units timely for their scheduled maintenance.

According to inspection section a lot of units comes for maintenance each year as result of inappropriate handling of the units at rush times. This leads to high maintenance cost including manpower and spare parts purchase.

Once, the unit fails and grounded, depending on the type of the damage, it may require parts purchase which Ethiopian buys from foreign countries paying hard currency.

1.2. Background of the Organization

Ethiopian Airlines, one of the fastest growing airlines, is the leading African airline that connects Africa to the rest of the world. Ethiopian airlines satisfy its human resource needs; Catering, Air craft maintenance as well as Ground Handling service and related maintenance within the structured and self-contained Aviation Groups, i.e. Aviation Academy, MRO Service, ET Catering, ADD Hub Operations, and Ground Handling, Equipment & Facility Maintenance. (www.ethiopianairlines.com, 2017).

Owner of modern and technologically advanced latest Aircraft fleets, Ethiopian, also uses latest Motorized equipment ranging from small vehicles to huge units functioning at the airside to support the operation.

Under the top administration of Company's COO, Motorized Equipment Maintenance facility is a division which is administered by a Director and Manager to give maintenance service to all company's motorized equipment.

The Motorized Equipment maintenance section was formed back in 1950s and started its operation with the then available few units, mainly performing breakdown maintenance service. (Accessed from EAL Logbook)

Through time following increasing number of units, the section started providing both preventive and breakdown maintenance service with structured sub divisions, namely: Ground Support Equipment (GSE) and Ground Transport Vehicles (GTV).

Ground Support Equipment covers the largest in size and sophisticated in design units which are mostly attached to the Flight Operation. While the Ground Transport Vehicles covers automobiles, minibuses, medium buses, station wagons, trucks, buses and ramp buses which are used to transport employees, passengers as well as materials. (Accessed from EAL Equipment registry)

1.3. Statement of the Problem

Within the hasty operational environment of Ethiopian Airlines, different sectors strive to contribute to the success of company's set strategic goal. One sector alone can't achieve its goal without the cooperation of the other sector. This is tied to target which is measured by the level of service quality that one department offers to the other.

Our understanding of the word quality service can be associated with achieving or exceeding expectations, meeting requirements that the customer had not actually stipulated, but once offered becomes the expectation of everyone.

Through different times, different researchers have examined about service quality control and its impact on customers satisfaction.

In some industries, Quality service, availability and ability to deliver are the most important competitive advantages (Bowersox et.al. 2007; Pfohl 1990). This includes:

- Adequate availability of stocks
- On-time delivery of goods ordered by customers in order to be competitive in terms of delivery times

Ethiopian maintenance section of the motorized equipment which is directly related and dependent on all logistical activities that are being rendered by other division is a well-organized section in providing maintenance service to all GSE and GTV equipment having its own certain shortcomings.

In a growing number of industries, availability and high speed provision of spare parts are important arguments for purchasing and sales. Some companies, such as the manufacturers of Ground Support Equipment, generate their profits mainly by spare parts and after-sales services.

If after-sales service is integrative part of selling, it should be organized and performed in responsibility of the sales department. Otherwise, after-sales services, spare part distribution and the logistics of repair shops are tasks of company logistics. They must often meet special requirements, such as high availability and extremely short replenishment times (Ihde B., Lucas G., Merkel H., Neubauer H. (1984): Ersatzteilogistik, hussverlag, M`unchen,).

As clearly shown on each previous study, the drive for quality control is many. For some, it was a high quality service itself, for others it was customers' previous experience and on some cases through time improved high quality control on products or services itself. This leads us to conclude that each previous study has its own interpretation for the drive for service quality control and the impact it has on customer satisfaction. But this doesn't mean that the result of a certain study conducted on one service providing industry is similar all the time or from country to country.

Thus, the study on Ethiopian Motorized Equipment facility which receives each day on average 35 equipment for maintenance service quality could vary at any point of future studies, being each study relevant for the improvement of the area.

1.4. Main research Question

The main research question of this study is assessing how service quality controlling practice affect the provision of sustainable maintenance service by Ethiopian Motorized Maintenance Section which results ultimate internal customer satisfaction?

1.4.1. Sub research Questions

In the sub research questions, the following are discussed:

- What are the main factors that hinder quality maintenance service?
- What kinds of problems are observed in the provision of quality maintenance service?
- What type of measures could be taken in order to overcome these problems?

1.5. Objectives of the Study

1.5.1. Main Objective

The main objective of this study is to assess the Service Quality control Practice made by Ethiopian Motorized Equipment maintenance inspection section and its impact on internal customer satisfaction in line with on-time performance.

1.5.2. Specific Objective

The specific objectives of this study are to:-

- Examine methods of improving currently existing service situation from logistical point of view.
- Identify factors hindering an integrated maintenance service to achieve on-time performance which result in customer satisfaction.
- Recommend possible implications of system redesigning for better maintenance service.
- Identify improvement opportunities to increase on-time performance

1.6. Definition of key terms

Quality: The ability of a service or a product to consistently meet or exceed customer's expectation. (Stevenson, 2005)

Service: Something that is done to or for a customer. (Stevenson, 2005)

Ethiopian: Ethiopian Airlines S.C

Ground Support Equipment (GTV): Is a term used to describe machineries used to support flight operation. This includes Pushback truck, passenger steps, Ground Power unit, and Different types of Trucks.

Ground Transport Vehicles (GSE): Is a term used to describe vehicles that the company uses to transport employees from their residence to work and vice versa. This includes Automobile, Land cruiser, and Coaster and City buses.

Airside: the part of an airport used by aircraft for loading and unloading and takeoffs and landings (Dictionary.com)

Units: Technical term for Equipment

1.7. Significance of the Study

The researcher believes that after the successful accomplishment of this study it may contribute somehow for indicating problems associated with quality control practices of the maintenance section.

Hence, the study enables the section to have a better understanding of the existing situation and device a reliable maintenance system that enables it to enhance its service. Moreover, the results of this study will serve as a stepping-stone for further detailed study on the subject.

1.8. Scope of the Study

This study was conducted on a Motorized Equipment Maintenance service of Ethiopian Airlines which is found in Addis Ababa, Ethiopia. It doesn't include Domestic or Regional Station Equipment Maintenance. The study has focused on the Quality control practices of the maintenance service.

1.9. Limitation of the Study

Due to time and budget constraint in the course of the study, the researcher could not undertake in depth study and analysis.

1.10. Organization of the Study

The study has five chapters. The first chapter is the introduction part that included the background of the study, statement of the problem, objective of the study, significance of the study, scope of the study and the research methodology. The second chapter dealt with related literature review and conceptual frame work of the study area. The third chapter is about methods of the study. The data collected are presented, analyzed and interpreted in the fourth chapter of the study. The last chapter covers the summary of the study.

CHAPTER TWO

2. RELATED LITERATURE REVIEW

Quality, maintenance and Service are the main topics of the literature review. This literature review is conducted to enable the researcher to understand the concepts of quality in maintenance service. They were intended to permit the researcher to recognize and cover the objectives and establish a base for an overall understanding and identifying of the quality control of maintenance service in Ethiopian.

2.1. Quality Management

2.1.1. Quality

Different meaning could be attached to the word quality under different circumstances. The word quality does not mean the quality of manufactured product only. It may refer to the quality of the process (i.e., men, material, and machines) and even that of management. Where the quality manufactured product referred as or defined as “Quality of product as the degree in which it fulfills the requirement of the customer. It is not absolute but it judged or realized by comparing it with some standards”. (S. ANIL & N. SURESH, 2008)

Quality can be defined as fulfilling specification or customer requirement, without any defect. A product is said to be high in quality if it is functioning as expected and reliable. Quality control refers to actions to ensure that produced items are fulfilling the highest possible quality. Most of tools and techniques to control quality are statistical techniques. Quality control techniques can be classified into three; Basic, Intermediate, and Advance level, but there is no consensus among researchers in the classification. (Hairulliza et al, 2011)

Also Quality has been defined in different ways by a number of intellectuals, as per their role and specialty. Some of the definitions of Quality are:

- ✚ Fitness for purpose (Defoe & Juran, 2010)
- ✚ the degree of excellence of something (The Oxford Dictionary)

- ✚ The totality of features and characteristics that bear on the ability of product or service to satisfy a given need (British Standard 4778, 1991)
- ✚ Total composite product and service characteristics of marketing, engineering, manufacturing, and maintenance through which the product and service will meet the expectations of customer (Feigenbaum, 1961)
- ✚ Conformance to requirement (Crosby, 1979)
- ✚ Quality is a dynamic state associated with products, services, people, process, and environment that meets or exceeds expectations and helps produce superior value (Goetsch & Davis, 2010)

Quality has become, for most of today's companies, a strategy for success, growth and competitiveness. Furthermore, the continuous increasing levels of automation and manufacturing process complexity has moved the production processes from the worker's hands to machines, requiring paying more attention to monitoring aspects, maintenance, quality control and production costs reduction. (Arnaud Lesage, 2012)

2.1.2. Quality Control

The purpose of quality control is to assure that processes are performing in an acceptable manner. Companies accomplish this by monitoring process output using statistical techniques. Quality control is a process that measures output against to the standard, and acts when output doesn't meet standards. If the results are acceptable, no further action is required; unacceptable results call for corrective action (Stevenson, 2005).

Quality controlling can be made in two stages of production. According to Stevenson (2005) a control which intended to assure quality that relies primarily on inspection of previously produced items is referred to as acceptance sampling. The other quality control effort which occurs during production is referred to as statistical process control

Techniques and methods for checking the quality of materials and the building of houses, temples, monuments and roads have been used over the centuries. For example, the ancient Egyptians had to make and use precise measurements and adopt very high standards of work in order to build the Pyramids. (HELM, 2004)

2.1.3. Measuring Quality Control

According to Deming, (2008), a number of quality methodologies, programs, and standards for measuring quality have developed and are used, to varying degrees, in industry to present. These include:

Total Quality Management (TQM): TQM is a people-focused management system that focuses on increasing customer satisfaction while continually reducing costs. Although it uses scientific methods for assessing quality and associated costs and constraints and implementing improvement, it takes a total systems approach in which all functions, processes, and departments across the organization, and all employees at all levels, are integral to ensuring success in the manufacture of products or delivery of services. TQM stresses learning and adaptation to continual change as essential to achieving this success.

Six Sigma: The term Six Sigma was coined by Motorola as its methodology for improving business processes by minimizing defects and refers to the statistical measurement indicating there are only 3.4 defects out of every 1 million opportunities to produce a defect, or virtually zero. It is an organizational approach where companies make decisions based on data, seek roots of problems, define defects based on customer requirements, and track leading indicators of problems to prevent them from happening.

Lean Production: Lean production refers to the continuous flow of products or services to the customer at the moment it is needed and to the customer's specifications. It focuses on increasing productivity and quality while reducing inventory and shortening lead time from floor to customer. Its principles include workplace safety, order, and cleanliness; just-in-time production; built-in Six Sigma quality; empowered teams; visual management to track performance and provide immediate feedback on a daily or even hourly basis; and continual pursuit of perfection.

International Standards Organization Quality Management Standards: The International Standards Organization (ISO) has developed a series of quality management standards that support the quality philosophy. Specifically, it has developed a set of five such standards, ISO 9000–9004. The American National Standards Institute (ANSI) and the American Society for Quality Control (ASQC) developed the ANSI/ASQC Q9000–Q9004. In addition, specific standards also exist for automotive, aerospace, and

telecommunications industries and for environment management. These standards have been revised over the years, and organizations must continually address these revisions. Organizations competing in the global market must achieve the quality levels dictated by these standards.

2.2. Maintenance Management

2.2.1. Basic Concept

Maintenance is a routine and recurring activity of keeping a particular machine at its normal operating condition so that it can deliver its expected performance or service without causing any loose of time on account of accidental damage or breakdown.

Past and current maintenance practices in both the private and Government sectors would imply that maintenance is the actions associated with equipment repair after it is broken. The dictionary defines maintenance as “the work of keeping something in proper condition, upkeep.” This would imply that maintenance should be actions taken to prevent a device or component from failing or to repair normal equipment degradation experienced with the operation of the device to keep it in proper working order. Data obtained in many studies over the past decade indicates that most private and Government facilities do not expend the necessary resources to maintain equipment in proper working order. They wait for equipment failure to occur and then take whatever actions are necessary to repair or replace the equipment. Nothing lasts forever and all equipment has associated with it some predefined life expectancy or operational life (S. ANIL & N. SURESH, 2008)

2.2.2. Type of Maintenance

According to S. Anil & N. suresh (2008) there are four types of maintenance: Breakdown (Reactive) maintenance, Preventive maintenance, Predictive maintenance and Reliability centered maintenance

2.2.2.1. Breakdown (Reactive) Maintenance

Breakdown maintenance is basically the ‘run it till it breaks’ maintenance mode. No actions or efforts are taken to maintain the equipment as the designer originally intended to ensure design life is reached. Studies as recent indicate that, this is still the predominant mode of maintenance.

2.2.2.2. Predictive Maintenance

Preventive maintenance can be defined as, “Actions performed on a time or machine-run-based schedule that detect, preclude, or mitigate degradation of a component or system with the aim of sustaining or extending its useful life through controlling degradation to an acceptable level.”

Preventive maintenance is a means to increase the reliability of their equipment. By simply expending the necessary resources to conduct maintenance activities intended by the equipment designer, equipment life is extended and its reliability is increased.

2.2.2.3. Corrective Maintenance

Predictive maintenance can be defined as “Measurements that detect the onset of a degradation mechanism, thereby allowing causal stressors to be eliminated or controlled prior to any significant deterioration in the component physical state. Results indicate current and future functional capability”.

Basically, predictive maintenance differs from preventive maintenance by basing maintenance need on the actual condition of the machine rather than on some preset schedule. Preventive maintenance is time-based. Activities such as changing lubricant are based on time, like calendar time or equipment run time. For example, most people change the oil in their vehicles every 3,000 to 5,000 miles travelled. This is effectively basing the oil change needs on equipment run time.

2.2.2.4. Reliability centered maintenance

The reliability of a system/product depends on many factors. So, we should concentrate at the grassroots level to improve product’s reliability.

Some of the ways of improving systems reliability are listed below:

- Improved design of components
- Simplification of product structure
- Usage of better production equipment
- Better quality standards
- Better testing standards
- Sufficient number of standby units

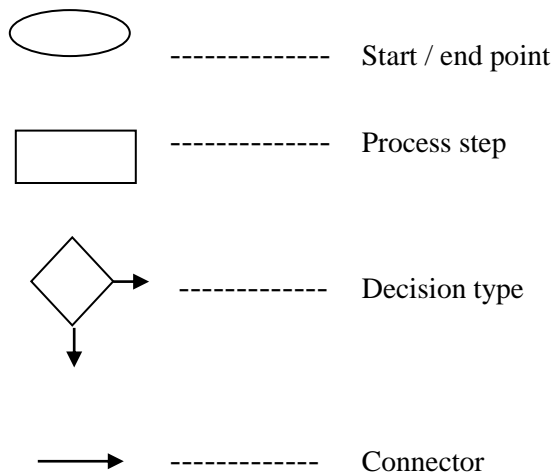
- Usage of preventive maintenance if necessary at appropriate time.

Conceptual review

Here the researcher has tried to indicate list of major processes and their gaps that are challenging overall on-time performance improvement.

2.3. Maintenance Process of Motorized Equipment

2.3.1. Symbols used in the flow chart



2.3.2. Inspection

Being part of the Motorized Equipment division, Inspection section performs different types of activities; Insurance, license issuance, Vehicle and equipment data keeping, maintenance scheduling, follow-up on scheduled maintenance, inspecting units received for maintenance and etc...

From the above mentioned activities, the researcher has stressed on the Inspection Process of the section.

User bring units, which needs any repair work, then the Inspection section assigned inspector to check wheatear the unit is brought for scheduled MNT or Breakdown MNT. If the unit is brought for breakdown MNT, Inspector accepts user compliant, inspects over all condition of the unit. Based on the compliant received and status of the unit, inspector creates and releases work order to the concerned MNT section, then thy handovers the unit to the concerned MNT section. If unit is brought for schedule MNT or preventive MNT,

Inspector checks the schedule of the unit, If it is on schedule, inspector creates and releases work order to the concerned MNT section, If it is not on schedule, inspector informs the user to return the unit and to bring it again on its schedule date.

The below diagrams shows the process flow of inspection and the gap observed.

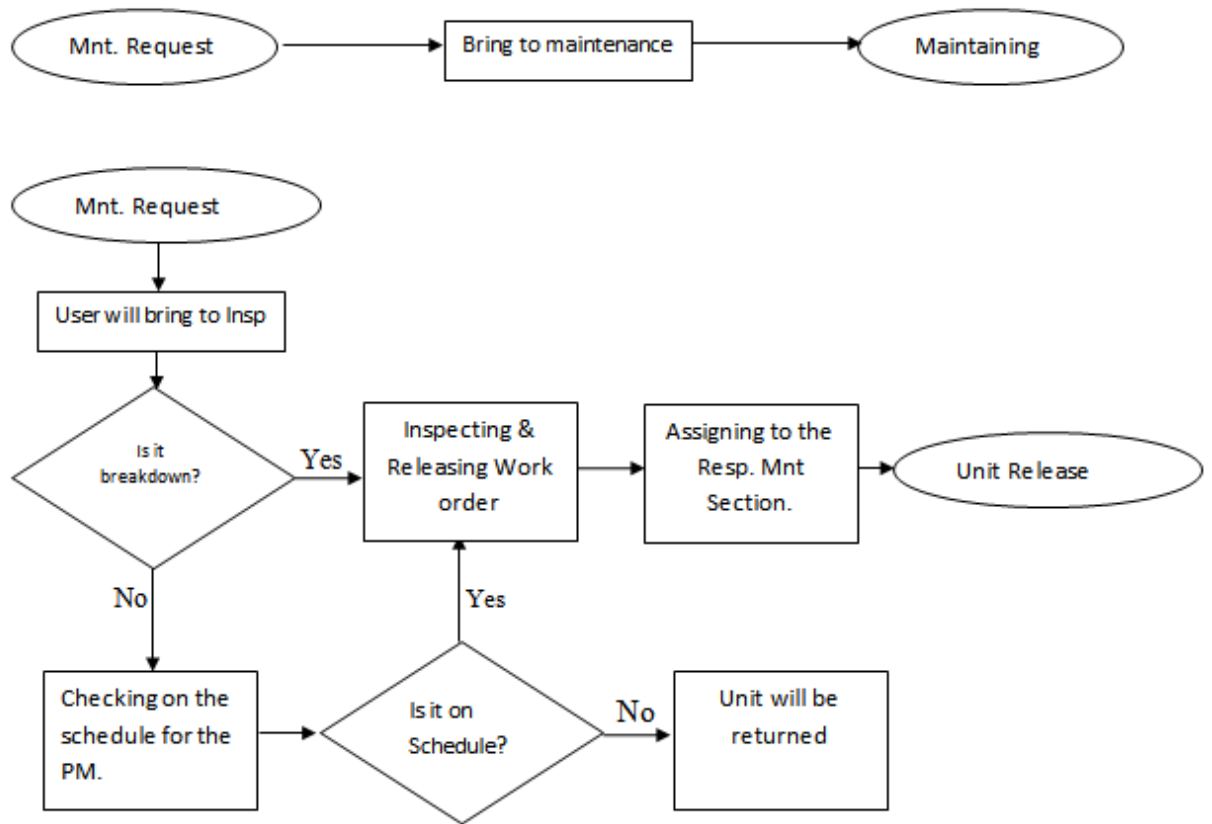


Figure 1 Inspection (Accessed from EAL Maintenance Logbook)

2.3.3. Releasing

Upon completing the necessary maintenance work, the MNT section informs inspection section that the repair work is completed. Inspectors checks using check list whether the maintenance is carried out as per the order or not. If the unit is repaired as per the order and all necessary expenses are properly captured, then user will be informed to collect the unit. If not it will be returned to MNT section.

If there is a remark on the unit, Unit is returned to the concerned MNT section for a rework

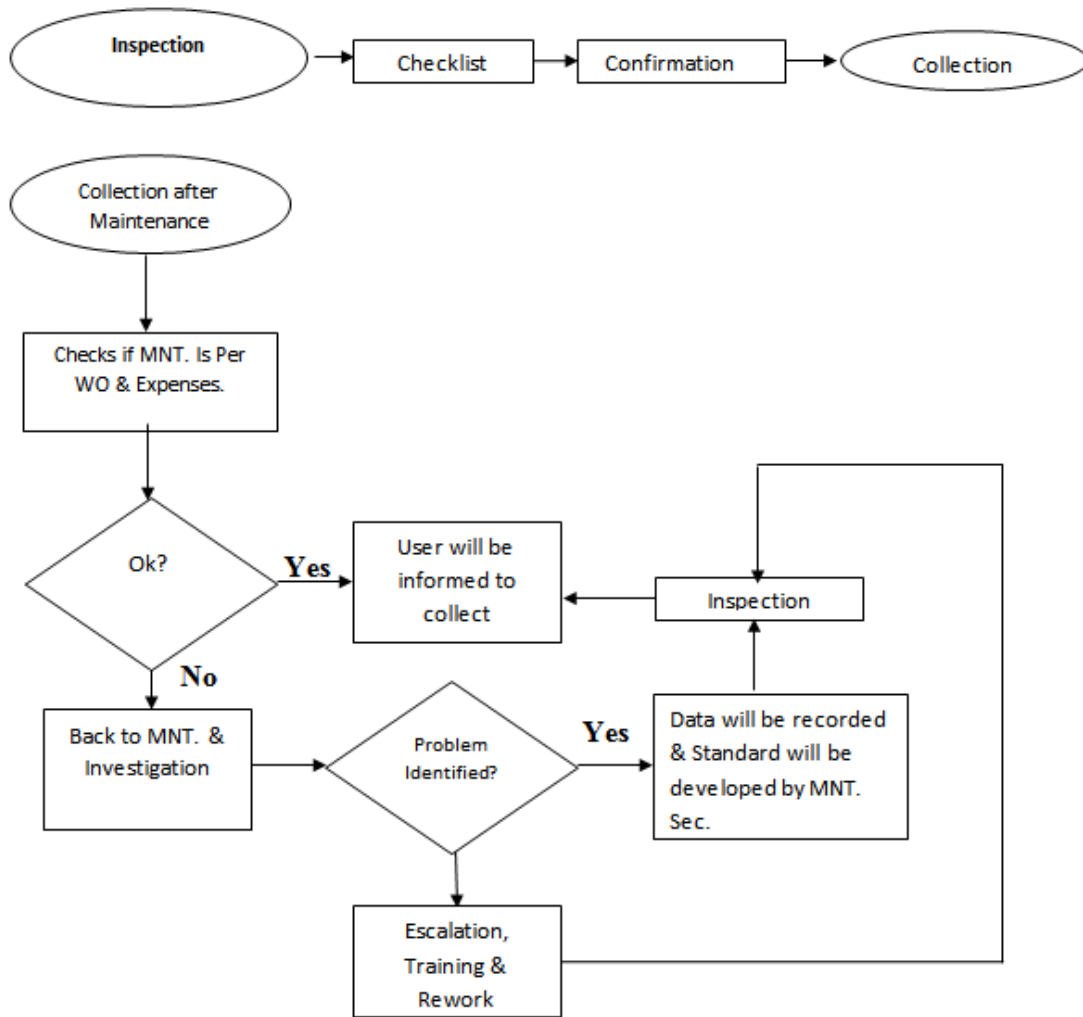


Figure 2 Releasing (Accessed from EAL Maintenance Logbook)

2.3.4. Delivery

After the inspection work has been completed, inspectors transfer the unit to the user department. Then users confirm that the task is performed as per the stated remark or not with the relevant associated costs. If the unit is repaired as per the order and all necessary expenses are properly captured, then users will accept and return the unit to operation. If not it will be returned to Inspection section. Then the necessary corrective action would be taken as per the user feedback.

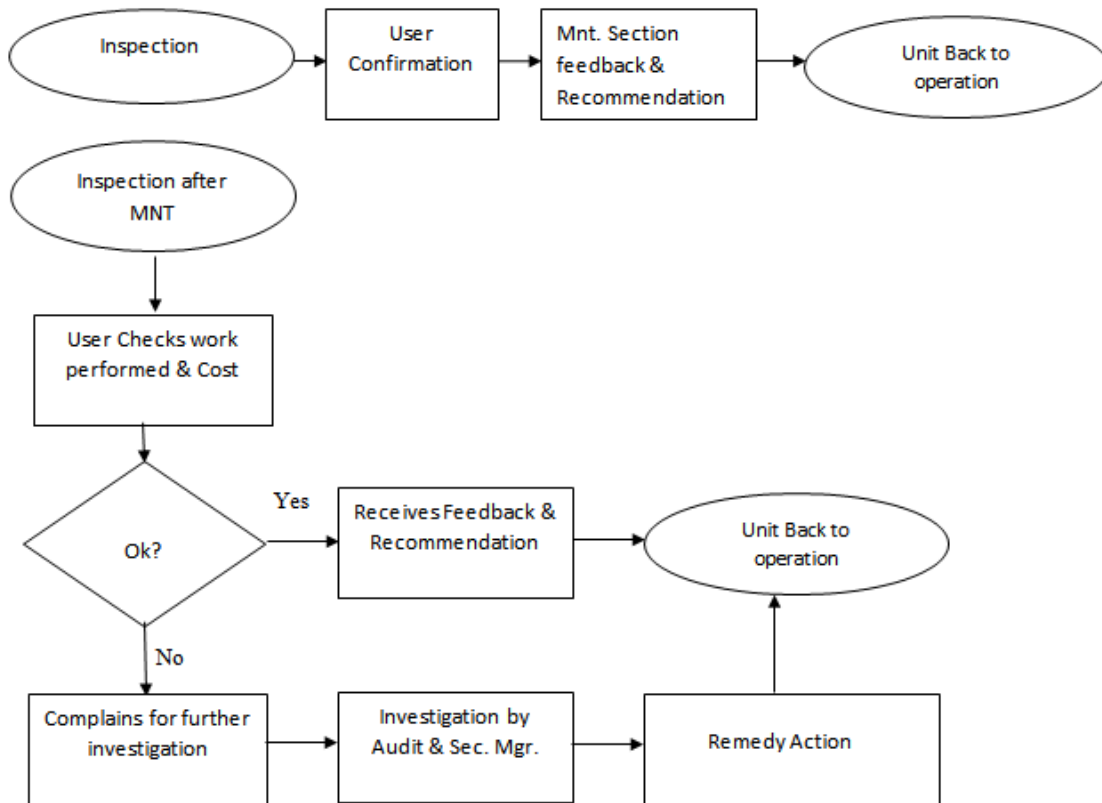


Figure 3 Delivery (Accessed from EAL Maintenance Logbook)

2.4. Empirical Review

Several studies have several definitions of service quality. Lewis and Booms (1983) defined service quality as a measure of how well the service level delivered matches customer expectations. Delivering quality service means conforming to customers' expectations on a consistent basis. However, Parasuraman et al. (1985) argue that most researchers and managers of service firms agree that service quality involves a comparison of expectations with performance.

Gronroos (1984) proposes that there are two types of service quality, technical and functional quality. Technical quality involves what the customer is actually receiving from the service. The customer can often measure the service outcome in an objective manner. Functional quality is the manner in which the service is delivered which refers to the interaction between service provider and recipient of a service. The conceptual model of service quality developed by Gronroos (1984) is the first one which the purpose is to increase understanding of customers' service quality perceptions and the factors that influence those perceptions.

Parasuraman et al. (1985) developed another model for service quality known as SERVQUAL. This model provides a technology for measuring and managing service quality which attempts to prove the salient activities of the service organization that influence the perception of quality.

2.5. Conceptual frame work

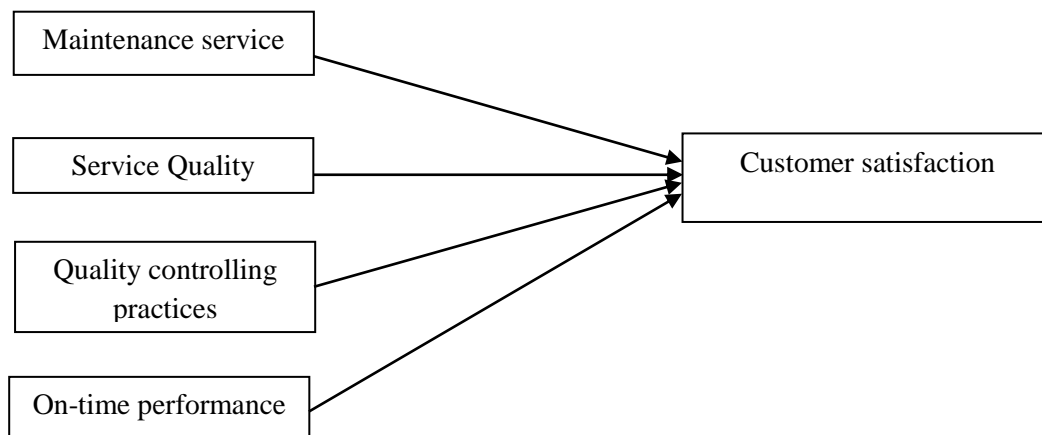


Figure 4 Independent and Dependent variables

2.6. Variables

The quantitative phase has four independent variables, namely Maintenance service, Service quality, Quality control practices and On-time performance. The dependent variable of the study was internal customers' satisfaction. The control variables for the study included number of units, operation seasonality, and other departments of the enterprise. The effects of these control variables had measured and properly controlled for.

2.6.1. Dependent Variables

Here, we will have Customer satisfaction as a dependent variable.

Customer satisfaction is a personal feeling of either pleasure or disappointment resulting from the evaluation of services provided by an organization to an individual in relation to expectations. Service providers frequently place a higher priority on customer satisfaction, because it has been seen as a prerequisite to customer retention. As a positive outcome of marketing activities, high customer satisfaction leads to repeat visitation to stores, repeat product purchases, and word-of-mouth promotion to friends while low customer satisfaction has been associated with complaining behavior (IPEDR vol.11, 2011). The dependent variable in this study was operationalized in terms of items that measure the customers' satisfaction with respect to customers' expectation about the service and actual service delivery of the maintenance section.

2.6.2. Independent variables

The maintenance service, service quality, its quality controlling practices and on-time performance will be the four independent variables we will have and focus on.

2.6.2.1.Independent Variable-1 Service

A service is any activity or benefit that one party can offer to another that is essentially intangible and does not result in the ownership of anything. Its product might not tie to a physical product (Kotler and Bloom, 1984). In this study the first independent variable, service, was operationalized with items relating to the major causes of problems the units might face on operation and operators and units owners opinion about the maintenance service.

2.6.2.2. Independent Variable-2 Quality

Quality is an elusive and indistinct construct. Often mistaken for adjectives like “goodness, or luxury, or shininess, or weight” (Crosby, 1979). Quality and its requirements are not easily articulated by consumers (Takeuchi and Quelch, 1983). While the substance and determinants (1.Design 2.Conformance 3.Ease of use 4. Service after delivery) of quality may be undefined, its importance to firms and consumers are unequivocal. Research has demonstrated the strategic benefits of quality in contributing to market share and return on investment (Anderson and Zeithaml, 1984) as well as in lowering manufacturing costs and improving productivity (Garvin, 1983). The second independent variable, quality control practices, was operationalized with items relating to inspectors opinion about the rate of the service quality, importance of changes on the service area, any occurrence of problem regarding with the service and its cause, victim of the problem and its severity, motivation of the maintenance section in order to assure quality, unit vulnerability to failure and its persistency and the like.

2.6.2.3. Independent Variable-3 Quality control practices

The purpose of quality control is to assure that processes are performing in an acceptable manner. Companies accomplish this by monitoring process output using statistical techniques. Quality control is a process that measures output relative to a standard, and acts when output doesn't meet standards. If the results are acceptable, no further action is required; unacceptable results call for corrective action (Stevenson, 2005).

Quality controlling can be made in two stages of production. According to Stevenson (2005) a control which intended to assure quality that relies primarily on inspection of previously produced items is referred to as acceptance sampling. The other quality control effort which occurs during production is referred to as statistical process control.

2.6.2.4. Independent Variable-4 On-time performance

Customer satisfaction is a personal feeling of either pleasure or disappointment resulting from the evaluation of services provided by an organization to an individual in relation to expectations. Service providers frequently place a higher priority on customer satisfaction, because it has been seen as a prerequisite to customer retention. As a positive outcome of marketing activities, high customer satisfaction leads to repeat visitation to stores, repeat

product purchases, and word-of-mouth promotion to friends while low customer satisfaction has been associated with complaining behavior (IPEDR, 2011).

A great deal of marketing research has examined the determinants of consumer judgments of quality and satisfaction with products and services (Boulding, W., A. Kalra, R. Staelin and V.A. Zeithaml, 1993). The determinants are design, conformance, ease of use, and after service delivery.

A satisfied customer often stays loyal longer, and is likely to support the firm in future. Customer satisfaction can be conceptualized as either transaction-specific satisfaction or cumulative satisfaction. Transaction-specific satisfaction is a customer's evaluation of her or his experience and reactions to a specific company encounter. Cumulative satisfaction refers to customers overall evaluation of patronage experience from inception to date (IPEDR, 2011).

The satisfaction judgment has typically been conceptualized as the product of a disconfirmation process, whereby a consumer compares actual performance with expectations on relevant attributes.

CHAPTER THREE

3. METHODS OF THE STUDY

3.1. Research Design

This study has used a mixed methods design, which is defined as a procedure for collecting, analyzing and mixing of both quantitative and qualitative data at some stage of the research process within a single study, to understand a research problem more completely (Creswell and Clark, 2007; Creswell, Clark, Gutmann, and Hanson, 2003). The rationale for mixing is that neither quantitative nor qualitative methods are sufficient by themselves to capture the complex details of management research that asks a large variety of questions, draws on numerous theoretical paradigms from a range of disciplines, and involves multiple level of analysis (Currall and Towler, 2003).

In a mixed method approach, the researcher builds the knowledge on pragmatic grounds (Creswell, 2003; Maxcy, 2003) asserting truth is “what works”. The researcher choose approaches, as well as variables and units of analysis, which are most appropriate for finding an answer to their research question (Tashakkori and Teddlie, 1998). Pragmatic logic of inquiry includes the use of induction, deduction, and abduction. A major tenet of pragmatism is that quantitative and qualitative methods are compatible. Thus, both numerical and text data, collected sequentially or concurrently, can help better understand the research problem.

This study had used a sequential explanatory mixed methods design, consisting of two distinct phases. In the first phase, the quantitative, numeric, data were collected using a questionnaire survey and the data were subjected to a descriptive analysis. In the second phase, a qualitative study was used to collect text data through document analysis, participant and non-participant observation. The rationale for this approach is that the quantitative data and results provide a general picture of the research problem, while the qualitative data and its analysis will refine and explain those statistical results in more depth.

The procedures for this sequential explanatory mixed methods study design gave the priority to the quantitative phase (QUAN → Qual), because the study primarily focused on verifying prescriptions of the quality control theories by empirically robust conclusion

from data gathered from a survey that afford the systematic interpretation of results (facts) across large samples. A smaller qualitative component has followed next in the sequence focusing on in-depth explanations of the quantitative results by exploring the data obtained from enterprise document analysis, participant and non-participant observation. The quantitative and qualitative methods were integrated at the beginning of the qualitative phase. The results of the two phases were also integrated during the discussion of the outcomes of the whole study.

3.2. Population and Sampling

The proportional stratified random sampling technique having its own advantage of accuracy over sample of distorted population was used.

Justification for using proportional stratified sampling

- It enables to represent not only the overall population, but also key subgroups of the population, especially small minority groups.
- Stratified random sampling has more statistical precision than simple random sampling, if the strata or groups are homogeneous. If they are, we expect the variability within groups to be lower than the variability for the population as a whole. Stratified sampling capitalizes on that fact.

The total population **N** (272) was classified in to four groups: Operators, who account 107 (**N₁**), 67 unit owners (**N₂**), 13 Procurement Officers (**N₃**) and Technicians who accounts 85 (**N₄**). The determined sample size (**n**) of our study was 90. From each stratum, sample size of (**n**). To draw **n** from total population size of **N** this is divided in to four stratum,

$$N = \sum_{i=1}^k N_i$$

N: Population size **k**: Number of strata

N_i: No. of sampling units in **ith** strata

For strata with **N₁** = 107, we have **p₁** = 107/272 hence **n₁** = **n*****p₁** = 90(107/272) = 36

For strata with **N₂** = 67, we have **p₂** =67/272 and hence **n₂** = **n*****p₂** = 90(67/272) = 22

For strata with **N₃** = 13 we have **p₃** = 13/272 and hence **n₃** = **n*****p₃** = 90(13/272) = 4

For strata with **N₄** = 85 we have **p₄** = 85/272 and hence **n₄** = **n*****p₄** = 90(85/272) = 28

Therefor the sample size **n** was: **n**=**N₁**+**N₂**+**N₃**+**N₄** = 36+22+4+28 = 90

3.3. Instruments for Data Collection

The instruments employed to collect the data for the study was one type of questionnaire designed by the researcher. The major common content sections in the instrument included: cover letter with general information of the respondents, and questions about service-related, Maintenance Related, service quality-related, logistical activities-related and customers' satisfaction from the service-related questions.

The questionnaire was divided into five sections. The first section measured respondent's background information, the second perception of Maintenance service. The third section dealt with the determinant factors of quality control practice of the maintenance service. The fourth section measures importance of quality control practice and lastly the fifth dealt with impact of on-time performance and customer's satisfaction. Additionally, the researcher has incorporated another type of question which consist items relating to service quality-related questions and logistical activities-related questions. "Yes" or "No" was an option provided for the attributes and for some question further explanation was requested.

Some respondents were not clear with the idea of what the researcher was intending to do or has been doing. So, an attempt has been made to make some clarification about the aim of the questionnaire. The researcher has tried to explain orally in addition to incorporating it in the introduction section of the questionnaire that the aim of the research is to assess service quality control practice of Ethiopian motorized equipment maintenance and its impact on internal customer satisfaction in order to provide quality service and satisfy the needs of its internal customers.

3.4. Methods of Data Presentation, Analysis and Interpretation

In this chapter the researcher has tried to present, analyze and interpret data in order to examine the quality control practices of Ethiopian Motorized Equipment Maintenance Section. The study has used both quantitative and qualitative data. Regarding the quantitative data collection method, questionnaire consisting of both open and close ended were prepared in English. The questionnaires were translated into Amharic to collect information from respondents and distributed to sample members. Document analysis and participant and non- participant observation were parts of the qualitative data.

The question of how quality controls practices contribute to the provision of quality maintenance service had been answered based on the analysis of the data obtained from the sample respondents.

In order to do so, the researcher had adopted a mixed type of research approach. The population of the study comprised the enterprise workers. A Sample of 90 respondents consisting of 36 operator, 22 unit owners, 28 technicians and 4 procurement officers were selected by stratified random sampling technique. Data were presented for the first phase in tables and had been interpreted with descriptive analysis. For the second phase of the study, dominate themes had been identified and a thorough analysis of each theme was made.

3.4.1. Data Presentation

After the data have been gathered, the information was edited, tabulated, interpreted, and analyzed using percentage and numerical values. Finally possible conclusions were drawn and recommendations have been given based on the analyzed data. The primary technique of data analysis used for this first phase was descriptive statistics such as percentages and numeric values.

3.4.2. Data Analysis

After the data had been gathered, the information was edited, tabulated and then interpreted using percentage and numerical values. This section includes the analysis of the characteristics of the sample respondents; the analysis of the data provided by Unit owners, Operators, Technicians and Procurement officers regarding maintenance service, maintenance quality control, importance of quality control and on-time performance.

The questionnaire distributed for respondents was designed having emphasis on three basic issues.

- Service: here, the intention was to know how much they are dedicated to their work for an integrated maintenance service delivery and how they perceive the service they render to customers and how the customers really respond to it.
- Quality: how much did they contribute for the quality of the service had been tried to be assess here.

- On-time performance: Contribution of cross functional as well as interdepartmental sections integration towards on-time performance enhancement.

Phase I Quantitative

The independent variables to be studied here are service and quality control practice while the dependent variable is customers' satisfaction.

The background of respondents is presented below. A total sample of 90 respondents consisting of 36 operator, 22 unit owners, 28 technicians and 4 procurement officers were taken and all sample members have filled the questionnaires carefully and returned.

Table 1 Responses for factors that negatively impact Equipment (GSE/GTV) Maintenance Service

No.	Questions	Str. Agree	Agree	Undecided	Disagree	Str. Disagree	Total
1	Less awareness about Equipment handling - Operators						
	Frequency	40	42	1	5	2	90
	Percentage	44%	47%	1%	6%	2%	100%
2	Lack of proper follow-up on Equipment's Preventive or Scheduled maintenance-Users						
	Frequency	31	40	1	15	3	90
	Percentage	34%	44%	1%	17%	3%	100%
3	Failure to use equipment's Operating manual-Operators						
	Frequency	42	36	4	6	2	90
	Percentage	47%	40%	4%	7%	2%	100%
4	State or condition of units while coming for Maintenance-Level of Breakdown/Damage						
	Frequency	24	45	15	4	2	90
	Percentage	27%	50%	17%	4%	2%	100%
5	Existence of unskilled or unqualified operators						
	Frequency	38	32	3	15	2	90
	Percentage	42%	36%	3%	17%	2%	100%
6	Lack of Latest tools and advanced maintenance system-Technicians						
	Frequency	44	30	8	7	1	90
	Percentage	49%	33%	9%	8%	1%	100%
7	Improper transportation system of unserviceable Equipment						
	Frequency	21	47	9	10	3	90
	Percentage	23%	52%	10%	11%	3%	100%
8	Lack of skilled Technicians						
	Frequency	30	34	5	16	5	90
	Percentage	33%	38%	6%	18%	6%	100%
9	Lack of suitable work environment						
	Frequency	48	31	2	7	2	90
	Percentage	53%	34%	2%	8%	2%	100%
10	Misuse of Equipment						
	Frequency	30	32	8	13	7	90
	Percentage	33%	36%	9%	14%	8%	100%

Source: Own Survey

- Looking at the first question provided to all respondents about lack of awareness on equipment handling being major factor which negatively impacts maintenance service, we have 44% of respondents who strongly agrees, 47% who fairly agrees, 1% undecided, 6% who disagrees and finally 2% who strongly disagree with the idea of poor awareness about equipment handling negatively impacting the maintenance service. From this, we can conclude that awareness about equipment handling is helpful for smooth and efficient maintenance service.

- We have 34% of respondents who strongly agree that lack of proper follow-up on equipment's preventive or scheduled maintenance, while 44% of respondents which accounts largest amount of respondents fairly agrees, 1% undecided, 17% Disagreeing and finally 3% of respondents who strongly disagree that lack of proper follow-up on equipment's preventive or scheduled maintenance does not negatively impact the maintenance service. The less number of respondents who disagrees with the ideas tells us that, failing to bring equipment for necessary maintenance per the schedule negatively impacts the maintenance service.
- Respondents who account 47% strongly agree that failure to use equipment operating manual negatively impacts the maintenance service. 40% respondents fairly agree with the idea. We have 4% undecided respondents, 7% fairly disagreeing and 2% strongly disagreeing respondents. Here also, the less the number of respondents who disagree with the idea tells us that failure to follow-up equipment's maintenance schedule negatively impacts the maintenance service making the section performance out of plan and schedule.
- Again, compared to number of respondents who disagree with the idea of state or condition of units coming for maintenance negatively impacting the maintenance service, respondents who account 27% and 50% agreeing with the idea tells us level of the break-down or damage of the unit negatively impacts the maintenance service.
- Above half of respondents who accounts 42% and 36% strongly agreeing and fairly agreeing respectively with the idea of existence of unskilled or unqualified operators tells us it negatively impacts the maintenance service. 19% of respondents who disagrees with the idea have explained as currently trained operators are being recruited.
- With regard to lack of latest tools and advanced maintenance system, 49% and 33% of respondents strongly agree and agree respectively. While, 9% of them are undecided and 7% disagreeing and only 1% who strongly disagree. Those respondents who do not agree with the idea have explained as there are sufficient tools and advanced maintenance system. Having a look at the majority of the respondents, it is possible to conclude that lack of latest tools and advanced maintenance system negatively impacts the maintenance service.
- Respondents who agree that improper transportation of unserviceable equipment for maintenance negatively impacting the maintenance service accounts 23% for strongly

agree, 52% for agree. We have 10% undecided, 11% who disagree and 3% who strongly disagree and they have claimed as equipment are being transported properly. But, the largest figure of respondents agreeing with the idea tells us that improper transportation of units for maintenance is negatively impacting the maintenance service.

- Lack of skilled technicians was also one of the major factors strongly agreed by 33% of the respondents and 38% agreed for negatively impacting the maintenance service, while 6% are undecided, 18% disagreeing and 6% strongly disagreeing with the idea and explained as most of technicians are trained and skilled. But, the largest figure tells us though, technicians are trained, they are not skilled.
- Almost all respondents agree that lack of suitable work environment is negatively impacting the maintenance service. To put it in figure, 53% of respondents strongly agree, 34% agree, 2% undecided, 8% who disagree and lastly 2% who strongly disagree. The data clearly shows that lack of suitable work environment negatively impacts the maintenance service.
- Misuse of equipment being the other factor negatively impacting the maintenance service was strongly agreed by 33%, agree by 36%, 9% undecided, and 14% disagree and 8% strongly disagree. Respondents who disagreed with this idea have explained as equipments are being deployed for the intended purpose of use while the majority of respondents agree that equipments are not used for the intended purpose.
- The other point which was listed as a factor which negatively impacts the maintenance service was lack of well-designed maintenance plan. 24% of respondents strongly agree, 33% agree, 14% and 8% of them are disagreeing and strongly disagreeing respectively. This shows that lack of well-designed maintenance plan somehow negatively impacts the maintenance service as agreed by majority of the respondents.

Table 2 Responses for factors that affect Maintenance Quality Control practice

No.	Questions	Str. Agree	Agree	Undecided	Disagree	Str. Disagree	Total
1	Lack of required training						
	Frequency	49	30	3	5	3	90
	Percentage	54%	33%	3%	6%	3%	100%
2	Unavailability of proper Maintenance Manuals & Parts catalogue						
	Frequency	25	31	15	14	5	90
	Percentage	28%	34%	17%	16%	6%	100%
3	Failure to use equipment's maintenance manual						
	Frequency	24	34	15	16	1	90
	Percentage	27%	38%	17%	18%	1%	100%
4	Availability of spare parts when needed						
	Frequency	25	42	2	13	8	90
	Percentage	28%	47%	2%	14%	9%	100%
5	Make and model of the Equipment (Type and variety)						
	Frequency	24	50	7	6	3	90
	Percentage	27%	56%	8%	7%	3%	100%
6	Inadequate inspection while equipment delivery and takeover						
	Frequency	51	30	4	4	1	90
	Percentage	57%	33%	4%	4%	1%	100%
7	Spare parts quality						
	Frequency	29	23	10	24	4	90
	Percentage	32%	26%	11%	27%	4%	100%
8	Unit's condition & the extent of Damage/Failure/Misuse						
	Frequency	29	44	13	4	0	90
	Percentage	32%	49%	14%	4%	0%	100%
9	Urgency of the equipment needed for the operation (Short Maintenance time frame)						
	Frequency	36	44	2	6	2	90
	Percentage	40%	49%	2%	7%	2%	100%
10	Skill level of the Technicians						
	Frequency	37	31	4	16	2	90
	Percentage	41%	34%	4%	18%	2%	100%

- The first question provided to all respondents regarding the determinant factors which affect Maintenance Quality Control practice in Equipment Maintenance is about lack of required training, we have 54% of respondents who strongly agrees, 33% who fairly agrees, 3% undecided, 6% who disagrees and finally 3% who strongly disagree with the

idea of Lack of required training in maintenance service. From this, we can conclude that having the required training is very important for effective and efficient maintenance service.

- We have 28% of respondents who strongly agree that unavailability of proper Maintenance Manuals & Parts catalogue, while 34% of respondents which accounts largest amount of respondents fairly agrees, 17% undecided, 16% disagreeing and finally 3% of respondents who strongly disagree. From this we can conclude that unavailability of proper Maintenance Manuals & Parts catalogue is a determinant factor for quality control practice.
- Respondents who account 27% strongly agree that Failure to use equipment's maintenance manual is factor of determinant factors which affect Maintenance Quality Control practice. 38% respondents fairly agree with the idea. We have 17% undecided respondents, 18% fairly disagreeing and 1% strongly disagreeing respondents.
- Availability of Spare Parts when needed was the other question provided in order to measure its impact maintenance quality controlling practice and 28% of respondents strongly agree with the idea. We have also 47% respondents who fairly agree, 2% undecided. 14% disagreeing and 9% who strongly disagrees. Having a look at the figures we can conclude that availability of spare parts when needed enhances the maintenance section performance in which time will be saved and quality inspection time also will be per the schedule.
- We have around 27% of respondents who strongly agree that make and model of equipment will affect the maintenance quality controlling practice and 56% who fairly agrees, 8% undecided, 7% who disagree and 3% who strongly disagrees with the idea. This leads us to a conclusion whereby the knowledge of inspectors about newly coming units is important in order to perform effective maintenance quality checking.
- The largest figure 57% respondents strongly agreed up on inadequate inspection while new equipment being delivered and take over made by inspection. The second largest respondents who fairly agrees with the point are 33%, 4% undecided, 4 disagreeing and 1% who strongly disagree. This shows that, while receiving new equipment, the inspection section should have full know-how about the equipment so later maintenance activities can be easily checked.
- Since inspectors have no knowledge about spare parts quality, it highly affects the

maintenance quality controlling process. There were 32% respondents who strongly agree with this idea and 26% who fairly agrees, 11% Undecided, 27% who disagree and 4% who strongly disagree. Those respondents who disagree with the idea of spare parts quality have explained their reason not to agree as spare parts should be purchased per the standard set by the maintenance section. Procurement officers have replied as purchase of non-genuine spare parts is not acceptable.

- Though the inspection section make thorough check on units coming for inspection, sometimes it is difficult to address the level of damage that a unit has unless dismantled. This makes the maintenance quality time taking and causes delay in releasing the unit for operation after inspection. That is why 32% and 49% respondents strongly and fairly agreed to the point respectively while 14% are undecided and 4% disagree.
- If a certain unit came for maintenance and it is urgently needed, it makes it difficult to perform effective maintenance quality check. We have 40% and 49% respondents who strongly agree and fairly agree with the idea, while 2% of respondents are undecided, 7% disagreeing and 2% strongly disagreeing.
- If technicians are not well skilled, it makes it difficult to inspectors to examine and understood the maintenance job done. We have 41% and 34% respondents who agree that level of skill of technicians affect the maintenance quality control as a result of poor explanation about the job done. We have 4% respondents undecided, 18% disagree and explained that it is not up to the technicians to explain what has been done while it is up to the technician to make brief explanation about the maintenance done, 2% strongly disagreeing.

Table 3 Responses for importance of Quality Control practice

No.	Questions	Str. Agree	Agree	Undecided	Disagree	Str. Disagree	Total
1	Quality control improves performance of Maintenance Sections						
	Frequency	60	27	2	1	0	90
	Percentage	67%	30%	2%	1%	0%	100%
2	Quality control enhances in decreasing breakdown of units after maintenance						
	Frequency	60	26	0	3	1	90
	Percentage	67%	29%	0%	3%	1%	100%
3	Quality control affects maintenance cost of company						
	Frequency	40	20	9	15	6	90
	Percentage	44%	22%	10%	17%	7%	100%
4	Quality control improves proper delivery of units after & before maintenance						
	Frequency	62	28	0	0	0	90
	Percentage	69%	31%	0%	0%	0%	100%
5	Quality control differentiates severity of equipment damages						
	Frequency	54	31	5	0	0	90
	Percentage	60%	34%	6%	0%	0%	100%
6	Quality control should facilitate the on-time release of equipment with the minimum amount of time						
	Frequency	49	28	4	8	1	90
	Percentage	54%	31%	4%	9%	1%	100%
7	Quality control offers information about state of unit damage and the maintenance levels						
	Frequency	52	29	5	4	0	90
	Percentage	58%	32%	6%	4%	0%	100%
8	Quality control will ensure maintenance service processes can be performed at the lowest possible cost and time						
	Frequency	47	33	2	8	0	90
	Percentage	52%	37%	2%	9%	0%	100%
9	Quality control enables the maintenance section to comply regulatory requirements						
	Frequency	43	40	5	2	0	90
	Percentage	48%	44%	6%	2%	0%	100%
10	Quality control reduces the number of reworks or Premature failures						
	Frequency	61	23	3	2	1	90
	Percentage	68%	26%	3%	2%	1%	100%

- Respondents who strongly agree with importance of quality control accounts 67% and 30% fairly agreeing. Almost all respondents agree that quality control is important in order to improve maintenance section's performance.

- We have again 67% respondents who strongly agree and 29% who fairly agree with the idea of maintenance quality control enhances in decreasing the breakdown of units after maintenance. This implies that, after a certain maintenance activity, the inspection section performing proper maintenance quality check reduces the possibility of same unit failing and coming back to maintenance within short period of time.
- Around 44% of respondents strongly agree that quality control affects maintenance cost of the company while 22% fairly agree as well. We have 10% undecided, 17% disagreeing and 7% strongly disagreeing respondents. Those respondents who agrees that quality control affects maintenance cost of the company have explained that, in order to complete maintenance activity within the given timetable by the inspection section, they tend to rob parts from another similar unit, overlooks minor problems which later causes severe damage on the unit, gives go-ahead to procurement officers for expensive spare part due to short lead-time and etc.
- Majority of respondents who account 69% strongly agrees that, quality control improves proper delivery of units after & before maintenance. The second largest number of respondents accounting 31% also agrees with same idea.
- Here we have 60% of respondents who strongly agree, 34% who fairly agrees and 6% undecided with the idea of quality control differentiates severity of equipment damage.
- Almost all we can say, respondents who accounts 54% and 31% strongly and fairly agrees that quality control facilitates on-time release of equipment with the minimum amount of time.
- Quality control offering information about state of unit damage and the required level of maintenance is agreed by 58% strongly, 32% fairly, 6% undecided, and 4% disagreeing. From this we can understand that, quality control is important in-order to get sufficient information about the unit and hint about the maintenance type required.
- We have 52% and 37% of respondents who strongly and fairly agrees with quality control ensuring maintenance service process being performed at the lowest possible cost and time.
- Almost all respondents, 48% and 44% strongly and fairly agrees with Quality control enabling the maintenance section to comply with regulatory body requirements in terms of safety and environmental health.
- The idea of quality control reducing number of reworks or premature failure is agreed

by 68% strongly and 26% fairly. This idea having large number of respondents tells us that quality control is important for reliable maintenance work.

Table 4 Responses for impacts that affect on-time performance

No.	Questions	Str. Agree	Agree	Undecided	Disagree	Str. Disagree	Total
1	Delay in delivery of spare parts both, stock and expense						
	Frequency	53	29	0	8	0	90
	Percentage	59%	32%	0%	9%	0%	100%
2	Lack of coordination between cross functional sections (SLA compliance)						
	Frequency	45	41	2	2	0	90
	Percentage	50%	46%	2%	2%	0%	100%
3	Presence of other non-related activities, assignments, meetings, etc						
	Frequency	25	35	10	18	2	90
	Percentage	28%	39%	11%	20%	2%	100%
4	Unplanned or Emergency maintenances						
	Frequency	41	41	4	4	0	90
	Percentage	46%	46%	4%	4%	0%	100%
5	Number of Senior Technicians who can handle tasks by themselves						
	Frequency	40	35	7	8	0	90
	Percentage	44%	39%	8%	9%	0%	100%
6	Lack of proper maintenance standards and Procedures						
	Frequency	40	34	7	8	1	90
	Percentage	44%	38%	8%	9%	1%	100%
7	Unavailability of necessary maintenance tools						
	Frequency	38	33	5	11	3	90
	Percentage	42%	37%	6%	12%	3%	100%
8	Unavailability of sufficient working space						
	Frequency	53	28	3	5	1	90
	Percentage	59%	31%	3%	6%	1%	100%
9	Lack of coordination between interdepartmental sections						
	Frequency	42	33	8	5	2	90
	Percentage	47%	37%	9%	6%	2%	100%
10	Unavailability of Equipment for maintenance on time, as per the plan						
	Frequency	34	37	4	10	5	90
	Percentage	38%	41%	4%	11%	6%	100%

- Respondents who strongly and fairly agreed with delay in delivery of spare parts both, stock and expense impacting on-time performance of the maintenance section accounts 59% and 32% respectively.
- Almost all respondents agreed that lack of coordination between cross functional section impacts on-time performance of the section. To show same in figure, 50% strongly agreed, 46% fairly agreed, 2% undecided, and 2% disagreed.
- Impact of other non-maintenance activities like meetings and other assignments on the on-time performance of the section was strongly agreed by 28% strongly, 39% fairly, 11% undecided, and 20% disagreed claiming that both meetings and other assignments helps the section to work on improving its performance.
- There are 46% respondents who strongly agreed, 46% fairly agreed that unplanned or emergency maintenance requests impact the on-time performance of the section. While 4% of respondents are undecided and disagreed respectively. From this we can conclude that, unplanned or emergency maintenance requests will fail the section to go out of schedule.
- Majority of respondents agree that number of senior technicians who can handle tasks by themselves determine the on-time performance of the section. We have 44% and 39% respondents who strongly and fairly agreed, 8% and 9% who undecided and disagreed respectively. This entails that; the ability of senior technicians handling tasks solely will enable the section to increase its on-time performance.
- Lack of proper maintenance standards and procedures has impact on-time performance of the section. Same has been reflected by number of respondents who strongly agree 44%, fairly agreed 38%, 8% undecided, 9% disagreed and 1% strongly disagreed.
- Unavailability of necessary maintenance tools having impact on the on-time performance of the section was agreed by 42% of respondents strongly, 37% agree, 6% undecided, 12% disagree and 3% strongly disagreed.
- Unavailability of sufficient working space was the other factor that has been strongly agreed by 59%, 31% agree, 3% undecided, 6% disagree and 1% strongly disagree having impact on the on-time performance of the section.

- Lack of coordination between interdepartmental sections was the other factor that impacts on-time performance of the section. We have 47% of respondents who strongly agree, 37% agree, 9% undecided, 6% disagree and 2% strongly disagree respondents.
- User departments' failure to bring equipment for maintenance per the schedule also is the other factor that impact on-time performance of the section. We have 38% of respondents who strongly agree, 41% agree, 4% undecided, 11% disagree and 6% strongly disagree respondents.

Phase II Qualitative

The qualitative phase of the study was based on secondary sources of data which included document analysis and participant and non-participant observation.

Here the main objective of the study was examining the quality control practices. The only reason that the researcher intended to use this phase of the study was for triangulation purpose and elaboration of some necessary information which might not be answered clearly through the questionnaires.

From what the researchers observed and the analysis they conducted on the section documents, the researcher has tried to analyze and interpret the data using thematic analysis. The following, Maintenance Service Quality, Maintenance Quality Control, Logistical Activities and Customers Satisfaction themes were identified

Maintenance Service Quality

On May 03/05/2017 the researcher have had a visit to all interdepartmental sections.

The maintenance area consists of four inter departmental sections; namely Engine shop, Electric shop, Body Shop and Mechanical shop.

Depending on the nature of the required maintenance, the inspection section assigns tasks to each department. Almost all types of maintenance activities need interference of each section.

Logistical Activities

The primary value of logistics is to accommodate customer requirements in a cost-effective manner.

Service reliability in logistics is very essential. The combined attributes of logistics concerns a firm's ability to perform all order-related activities, as well as provide customers with critical information regarding logistical operations and status.

The costs of capital, warehousing, protection, deterioration, loss, insurance, package, and administration make stocks expensive, but from what researcher observed the good part of EAL was the procurement and warehousing system. Maintenance section has signed service level agreement with the procurement and supply chain management section mainly, focusing on purchase of spare parts and stock.

EAL has a well full-fledged service of warehousing for the maintenance. All necessary and fast moving items are kept in stock so whenever the maintenance guys are in need can issue and use.

Though, both, the purchase and warehousing system is encouraging, most of the maintenance sections heard complaining about out of stock situations, longer lead-time and quality of spare parts.

The researcher had went to procurement and tried to look at the standard operating procedure of warehouse as well as procurement policy.

Procurement section is not allowed to purchase poor quality items per policy. Before initiating any purchase, has to consider the following three basic things

- Price: where three competitive prices should be evaluated
- Quality: Genuine part manufacturers should be supplying
- Lead-time: need to discuss with maintenance section about the urgency and from warehouse about available quantity in stock.

Customers Satisfaction

Customer satisfaction has long been a fundamental concept in marketing and business strategy.

Customer service is a wide concept that varies from organization to organization; any organization has its own policy and view toward customer service. Moreover, it means different things to the parties associated with any business transaction. Good service increases customer satisfaction

Bowersox and Closs (2002) “In building a customer satisfaction program, however, the first question that must be answered is what it means to say that a customer is satisfied?”

The simplest and most widely accepted method of defining customer satisfaction is known as **expectancy disconfirmation.**”

Simply stated, if a customer's expectations of a supplier's performance are met or exceeded, the customer will be satisfied. Conversely, if perceived performance is less than what the customer expected, then the customer is dissatisfied.

Though the maintenance section is dedicated for provision of quality maintenance service in order to satisfy its internal customers, as from what the researcher observed customers are still not satisfied with the maintenance service. Those factors mentioned in the service quality section of this phase analysis have a great contribution for this.

What do customers expect?

Customers expect from the maintenance section a well-organized and facilitated on-time maintenance service.

How do customers form these expectations?

Customers form this expectation from two major perspectives; the nature of the operation that demands high movement of equipment and the service level agreement that the each customers signed with the maintenance section.

Why does the maintenance section fail to satisfy customers, and why is it perceived as providing poor maintenance quality by internal customers?

Because of lack of integration among interdepartmental and cross functional sections, lack of required training, skill level of the technicians, lack of well-designed maintenance plan, and number of senior technicians who can handle tasks by themselves.

CHAPTER FOUR

4. RESULTS AND DISCUSSION

The result part highlights the short and précised findings of the study. The discussion part discusses the findings of the analyzed and interpreted data from both the quantitative and qualitative phases.

4.1. Results

- Operators do not have sufficient awareness about equipment handling.
- Number of trained operators is limited.
- Equipment are not being deployed for the intended purpose of use which later cause severe damage on the unit and makes the maintenance service complex.
- Number of trained operators and technicians is limited.
- Proper Maintenance Manuals & Parts catalogue is not available.
- Availability of spare parts when needed is important to enhance the maintenance section performance in which time will be saved and quality inspection time also will be per the schedule.
- Knowledge of inspectors about newly coming units is important in order to perform effective maintenance quality checking.
- Inspection section is not performing proper maintenance quality check which later causes quick unit fail and coming back to maintenance within short period of time.
- Quality control is important in-order to get sufficient information about the unit and hint about the maintenance type required.
- Quality control is important for reliable maintenance work.
- Unplanned or emergency maintenance requests are affecting the section performance enforcing them to go out of schedule.
- Senior technicians are not efficient in handling tasks solely and the section is not able to increase its on-time performance.

4.2. Discussion

Personal profile of respondents

The analysis and interpretation of the data were given after the data are presented by table

Table 5 Background of the Respondents': Operators

Demographic Characteristic		Respondents	Percentage %
Sex	Male	36	100%
	Female	0	0%
	Total	36	100%
Age	18-30	8	22.3 %
	31-40	19	52.7 %
	41-50	9	25 %
	Above 50	0	-
	Total	36	100%
Position	Junior	7	19.44%
	Senior	29	81.56%
	Total	36	100%
Education Level	Bellow Diploma	19	52.78%
	Diploma	16	44.44%
	Degree	1	2.78%
	Masters	0	0%
	Above	0	0%
	Total	36	100%
Work Experience	Less than one year	1	2.78%
	1-5 Year	19	52.78%
	6-10 Year	3	8.33%
	Above 10 Year	13	36.11%
	Total	36	100 %

Source: Own Survey

As indicated in the above table, 100% (36 peoples of the respondents are male and no female operators were found.

Concerning their age, 22.3 % (8 of respondents) lies in the age 18-30 followed by the age range of 31-40 which account 52.78 % (19 respondents) and lastly respondents who account 25 % (9 respondents) are in the age group of 41- 50.

When we come to the Position status of our respondents 19.44 % (7) of them are Junior, 81.56% (29) of them are seniors.

The educational backgrounds of respondents are, 52.78 % (19) of them below diploma. The next largest figure is respondents who are diploma holders and they account 44.44% (16) of the respondents. We have only 1 First Degree holder which accounts 2.78 % of the total respondents.

The educational background of Operators is not that much satisfactory. The Majority of all Operators are below Diploma level. They have skill which is not accompanied by knowledge, but it does not mean that they are not qualified or they are not performing their task appropriately. Instead it would be more reliable and good if it had been supported with some academics knowledge about the field.

The illiteracy of Operators does affect the maintenance service quality and it will hinder the provision of quality transport and ground service on the ramp in many ways as a result of not being able to read and understand operating manuals which later causes damage of the units to the extent where they may not be in a condition to be maintained. It will also make it hard to attend trainings when the enterprise imports new units which might be technologically advanced it would create a problem for them to adopt easily and so on problems.

2.78 % (1) respondent work experience is within the range of one year & less followed by the large figure which account 52.78 % (19) respondents whose range is between 1-5 years and, 8.33 % (3) respondents are within the range of 6-10 year and lastly employees who are above 10 Years accounts 36.11% (13).

Experience is one of the mechanism in which most organizations seek. When we came to the above data the largest portion of employees' number is covered by the least experienced operators. This will affect the encore of employees for improper handling of units as well as their contribution to the enterprise's development.

Table 6 Background of the Respondents': Unit Owners

Demographic Characteristic		Respondents	Percentage %
Sex	Male	22	100%
	Female		%
	Total	22	100%
Age	18-30	6	27.4 %
	31-40	5	22.7%
	41-50	9	40.9%
	Above	2	9%
	Total	22	100%
Position	Junior	0	%
	Senior	5	22.73%
	Management	17	77.27%
	Total	22	100%
Education Level	Bellow Diploma	1	4.6%
	Diploma	6	27.3%
	Degree	13	59.1%
	Masters	2	9.1%
	Above	0	%
	Total	22	100%
Work Experience	Less than one year	0	0%
	1-5 Year	4	18.18%
	6-10 Year	3	13.64%
	Above 10 Year	15	68.18%
	Total	22	100 %

Source: Own Survey

As indicated in the above table, 100% (22 peoples of the respondents are male with zero female respondents.

With regard to their age, 27.4% (6 of respondents) lies in the age 18-30 followed by the age range of 31- 40 which account 22.7 % (5 respondents) and respondents who account 40.9% (9 respondents) are in the age group of 41-50 and lastly respondents who account 9% (2) are above the age of 50.

When we come to the Position status of our respondents 22.73 % (5) of them are Senior, 77.27% (17) of them are Managements.

The educational backgrounds of respondents are, 4.6% (1) of them bellow diploma, 27.3% (6) Diploma and the largest figure is respondents who are Degree holders and they account

59.1% (13) of the respondents and lastly Master Degree holders 9.1% (2 respondents in number).

Coming to work experience, 18.18 % (4) respondents' work experience is within the range of 1-5 year followed by the smallest figure which account 13.64% (3) respondents whose range is 6-10 year and, 68.18% (15) respondents are above 10 Years of service.

Table 7 Background of the Respondents': Technicians

Demographic Characteristic		Respondents	Percentage %
Sex	Male	23	82.14%
	Female	5	17.86%
	Total	28	100%
Age	18-30	15	53.57%
	31-40	7	25%
	41-50	5	17.86%
	Above	1	3.57%
	Total	28	100%
Position	Junior	12	42.86%
	Senior	11	39.29%
	Management	5	17.85%
	Total	28	100%
Education Level	Bellow Diploma	1	3.58%
	Diploma	17	60.71%
	Degree	10	35.71%
	Masters	0	0%
	Above	0	0%
	Total	28	100%
Work Experience	Less than one year	5	17.86%
	1-5 Year	12	42.86%
	6-10 Year	3	10.71%
	Above 10 Year	8	28.57%
	Total	28	100 %

Source: Own Survey

As indicated in the above table, 82.14% (23 peoples of the respondents are male and 17.86% (5 respondents) are female.

Concerning their age, 53.3% (15 of respondents) lies in the age 18-30 followed by the age range of 31-40 which account 25% (7 respondents) and 17.86% (5 respondents) are in the age group of 41-50, lastly respondents who account 3.57 (1) are above age 50.

When we come to the Position status of our respondents 42.86% (12) of them are Junior, 39.29% (11) senior and 17.85% (5) of them are Managements.

The educational backgrounds of respondents are, 3.58% (1) of them bellow diploma. The next largest figure is respondents who are diploma holders and they account 60.71% (17) of the respondents and first Degree holders accounting 35.71% (10 respondents in number).

17.86% (5) respondents' work experience is within the range of one year & less followed by the second large figure which account 42.86% (12) respondents whose range is between 1-5 year and, 10.71% (3) respondents are within the range of 6-10 year and lastly employees who are above 10 Years accounts 28.57% (8).

Experience is one of the mechanism in which most organizations seek. When we came to the above data the largest portion of employees' number is covered by the least experienced/non experienced. This will affect the encore of employees for improper handling of units as well as their contribution to the enterprise's development.

Table 8 Background of the Respondents': Procurement Officers

Demographic Characteristic		Respondents	Percentage %
Sex	Male	3	75%
	Female	1	25%
	Total	4	100%
Age	18-30	4	100 %
	31-45	0	0%
	46-65	0	0%
	Above	0	0%
	Total	4	100%
Position	Junior	0	0%
	Senior	4	0%
	Management	0	100%
	Total	4	100%
Education Level	Bellow Diploma	0	0%
	Diploma	0	0%
	Degree	4	0%
	Masters	0	0%
	Above	0	0%
	Total	4	100%
Work Experience	Less than one year	0	0%
	1-5 Year	4	100%
	6-10 Year	0	0%
	Above 10 Year	0	0%
	Total	4	100 %

Source: Own Survey

As indicated in the above table, 75% (3 peoples of the respondents are male and 25% (1 respondents) are female.

Concerning their age, 100 % (4 of respondents) lies in the age range of 18-30.

When we come to the Position status of our respondents 100% (4) of them are Senior.

The educational backgrounds of respondents are, 100 % (4) of them are First Degree holders.

100% (4) respondents' work experience is within the range of 1 and five year.

CHAPTER FIVE

5. SUMMARY, CONCLUSION & RECOMMENDATIONS

In this section the researcher has tried to give conclusions of the research analysis. From the analysis and interpretation part of research it's possible to draw the following conclusions:

5.1. Summary of findings

- All respondents agree that lack of awareness on equipment handling is major factor which negatively impacts maintenance service.
- Failing to bring equipment for necessary maintenance per the schedule negatively impacts the maintenance service.
- Failure to use equipment operating manual negatively impacts the maintenance service.
- State or condition of units coming for maintenance negatively impact. Level of the break-down or damage of the unit negatively impacts the maintenance service.
- Existence of unskilled or unqualified operators negatively impacts the maintenance service.
- Lack of latest tools and advanced maintenance system negatively impacts the maintenance service.
- Improper transportation of units for maintenance is negatively impacting the maintenance service.
- Lack of skilled technicians
- Lack of suitable work environment is negatively impacting the maintenance service.
- Misuse of equipment
- Lack of well-designed maintenance plan.
- Lack of required training,
- Unavailability of proper Maintenance Manuals & Parts catalogue,
- Failure to use equipment's maintenance manual
- Unavailability of Spare Parts when needed
- Make and model of equipment will affect the maintenance quality controlling practice
- Inadequate inspection while new equipment being delivered and take over made by

inspection.

- Since inspectors have no knowledge about spare parts quality, it highly affects the maintenance quality controlling process.
- Those respondents who disagree with the idea of spare parts quality have explained their reason not to agree as spare parts should be purchased per the standard set by the maintenance section. Procurement officers have replied as purchase of non-genuine spare parts is not acceptable.
- Though the inspection section make thorough check on units coming for inspection, sometimes it is difficult to address the level of damage that a unit has unless dismantled. This makes the maintenance quality time taking and causes delay in releasing the unit for operation after inspection.
- If a certain unit came for maintenance and it is urgently needed, it makes it difficult to perform effective maintenance quality check.
- If technicians are not well skilled, it makes it difficult to inspectors to examine and understood the maintenance job done.
- Almost all respondents agree that quality control is important in order to improve maintenance section's performance.
- Maintenance quality control enhances in decreasing the breakdown of units after maintenance.
- Quality control improves proper delivery of units after & before maintenance.
- Quality control differentiates severity of equipment damage.
- Quality control facilitates on-time release of equipment with the minimum amount of time.
- Quality control offering information about state of unit damage and the required level of maintenance
- Quality control ensuring maintenance service process being performed at the lowest possible cost and time.
- Almost all respondents agree with Quality control enabling the maintenance section to comply with regulatory body requirements in terms of safety and environmental health.
- Quality control reducing number of reworks or premature
- Respondents who strongly and fairly agreed with delay in delivery of spare parts both, stock and expense

5.2. Conclusions

The major objective of this study was to assess service quality control practice of Ethiopian Motorized Equipment Maintenance and its impact on internal customer satisfaction. In order to accomplish this objective the researcher distributed 90 questionnaires to sample respondents and collected all completely filled questionnaires for data analysis.

As many sections within the company mature, competitive advantage through high quality service provision and on time performance is an increasingly important weapon for the achievement of company set goals. Quality and customer satisfaction have long been recognized as playing a crucial role for success and survival of ET. Increasing operational demand following the growth of the company is forcing sections to pay much more attention to satisfying internal customer's needs and compliance of service level agreements.

The findings indicate that the maintenance service quality controlling practice has impact on the internal customer perception about the maintenance service and on time performance.

As stated in the above paragraph, customers' satisfaction is directly related to on time performance of the section. The following are major hindrances that affect on time performance of the maintenance service.

- Lack of Operators awareness about equipment handling.
- Absence of adequate training for operators about equipment handling and operation.
- Equipment misuse.
- Lack of relevant Maintenance & Parts manual.
- On time availability of spare parts.
- Skill levels of inspectors about different equipment models. .
- Small number of senior Technicians.

5.3. Recommendations

Based on the data analysis and conclusions the researcher has given the following recommendation:-

- Adequate training and awareness has to be given for operators about equipment handling.

- Number of trained operators has to increase.
- Equipments should be deployed for the intended purpose only.
- Required training is very important for effective and efficient maintenance service.
- Availing Maintenance Manuals & Parts catalogue for all equipment type
- Spare parts required for the maintenance service should be available whenever needed. This enhances the maintenance section performance in which time will be saved and quality inspection time also will be per the schedule.
- Inspectors need to have knowledge about newly coming units in order to perform effective maintenance quality checking later times.
- The inspection section performing proper maintenance quality check reduces the possibility of same unit failing and coming back to maintenance within short period of time. Hence, consistent and thorough quality checking is needed.
- Unplanned or emergency maintenance requests shall be treated with exceptional program and inspection section has to consider same while evaluating the performance of the section.
- Coaching and empowering senior technicians is advisable so they can handle tasks solely which enables the section to increase its on-time performance.

References

- # Arnaud Lesage (2012) *Maintenance & Quality Control*
- # Bij H, Ekert JHW (1999). Interaction between production control and quality control. *Int. J. Oper. Prod. Manag.* 19(7):674-690.
- # Bowersox D., Closs D., Cooper B. (2007): *Supply Chain Logistics Management*. McGraw Hill, 2nd edition,
- # CROSBY, P. B. (1979). *Quality is free: the art of making quality certain*. New York, McGraw-Hill.
- # DeAngelo L (1981). "Auditor size and audit quality. *J. Acc. Econ.* 3:183-199.
- # Defoe, J.A. and Juran, J.M (2010) *Juran's Quality Handbook: The Complete Guide to Performance Excellence*. McGraw-Hill, New York.
- # Feigenbaum, A.V. (1991). *Total Quality Control*, McGraw-Hill, Inc., New York, NY.
- # Goetsch, David L, Stanley Davis, and David L Goetsch. (2010) *Quality Management For Organizational Excellence*. Upper Saddle River, N.J.: Prentice Hall.
- # Graeme Knowles (2011) *Quality Management*. Ventus Publishing
- # Gronroos C (1984). A service quality model and its market implications. *European J. Mark.* 18(4):36-44.
- # Hairulliza Mohamad Judi, Ruzzakiah Jenal and Devendran Genasan (2011). *Quality Control Implementation in Manufacturing Companies*
- # HELM (VERSION 1: April 8, 2004): *Workbook Level 1*
- # <http://www.ethiopianairlines.com> [Accessed 10th January, 2017]
- # http://www.iso.org/iso/iso_9000_selection_and_use-2009.pdf [Accessed 10th January, 2017]
- # <https://en.oxforddictionaries.com/definition/quality> [Accessed 10th January, 2017]
- # Ihde B., Lucas G., Merkel H., Neubauer H. (1984): *Ersatzteilogistik*, hussverlag, M'unchen,
- # Lewis RC, Booms BH (1983). *The marketing aspects of service quality*. *Emerging Perspective Service. Mark.* pp.99-107.

- ✚ Lian TKF (2001), *Determinants of total quality management (TQM) implementation and impact: A study of selected Malaysian Public Organizations*. (Doctoral dissertation, University of Georgia, USA, 2001.
- ✚ Palmrose Z (1986). *Audit fees and auditor size: further evidence*. J. Acc. Res. 24(1):97-110.
- ✚ Parasuraman A, Zeithaml VA, Berry LA (1985). "A conceptual model of service quality and its implications for future research", J. Mark. 49:41-50.
- ✚ Pfohl H.Chr. (1990) *Logistiksysteme, betriebswirtschaftliche Grundlagen*, 4.Aufl, Springer, Berlin Heidelberg New York,
- ✚ Ridley J (1994). *Does Quality Control Services? TQM Mag.* 6(6):17-18. Simunic D (1984). Auditing, consulting and auditor independence. J. Acc. Res. (Autumn) pp.679-702.
- ✚ S. ANIL & N. SURESH (2008) *PRODUCTION AND OPERATION MANAGEMENT SECOND EDITION*. Published by New Age International (P) Ltd., Publishers
- ✚ Siew-Phaik Loke, Ayankunle Adegbite Taiwo, Hanisah Mat Salim, and Alan G. Downe, *International Conference on Financial Management and Economics*, IPEDR vol.11 (2011) © (2011) IACSIT Press, Singapore
- ✚ Stevenson, W. (2005) "*Operations Management*", 8 editions. Irwin McGraw-Hill. New York,

APPEDIX

Questionnaire

St. Mary University
School of Graduate Studies
MBA Program

This questionnaire is part of a study for a *Master of Business Administration-General* at St. Mary's University School of Graduate Study. The objective of the research is to assess the Maintenance Service quality control practice of Ethiopian Motorized Equipment (GSE/GTV) Maintenance and its impact on internal customer satisfaction.

Your response will be used only for pure academic purposes. Your genuine response is significant for the success of the study. Therefore, I kindly request you to respond to each question item carefully.

Thank you in advance

1. Personal information

1.1.Name of the respondent: (Optional):

1.2.Age: 18-30 year 31-40 year
 41-50 year Above 50 year

1.3.Sex: Male Female

1.4.Profession/Position: _____

1.5.Working experience in the company:

Less than 1 year 6-10 years
1-5 years Above 10 years

1.6.Educational Background:

Below Diploma Degree
College Diploma MA

1. Research related information/ከጥናቱ ጋር የተያያዙ መረጃዎች

To what extent does the below determinant factors negatively impact Equipment (GSE/GTV) Maintenance Service? Mark (✓) on the points you agree

ከዚህ በመቀጠል የተዘረዘሩት ዋና ዋና ሁኔታዎች የማሽኖች(GSE/GTV) ጥገና አገልግሎቱን ያውኩታል ብለው ያስባሉ? በሚስማሙበት ቦታ(✓) ምልክት ያርጉ

No	Equipment (GSE/GTV) Maintenance Service የማሽኖች ጥገና አገልግሎት	Mark(✓)				
		Strongly Agree በጣም እስማማለው	Agree እስማማለው	Undecided አልወሰንኩም	Disagree አልስማማም	Strongly Disagree በጣም አልስማማም
1	Less awareness about Equipment handling ስለማሽኖች አያያዝ በቂ ግንዛቤ አለመኖር					
2	Lack of proper follow-up on Equipment's Preventive or Scheduled maintenance ማሽኖችን በተገቢው ጊዜ ተከታትሎ ለቅድመ ጥገና አለማምጣት					
3	Failure to use equipment's Operating manual የማሽኖችን የአጠቃቀም መመሪያ አለመከተል					
4	State or conditions of units while coming for Maintenance (cleanness, damages, etc) ማሽኖች ለጥገና ሲመጡ ያላቸው ነባራዊ ሁኔታ (ንፅህናቸው፣የብልሽታቸው መጠን...)					
5	Existence of unskilled or unqualified operators ያልሰለጠኑ ወይም ብቁ ያልሆኑ የማሽን አንቀሳቃሽ ባለሙያዎች መኖር					
6	Lack of Latest tools and advanced maintenance system ዘመናዊ የጥገና መሳሪያዎችና የአሰራር ሰርዓት አለመኖር					
7	Improper transportation system of unserviceable Equipment የተበላሹ ማሽኖች ለጠገና ሲመጡ ባልተገባ ሁኔታ ማጓጓዝ					
8	Lack of skilled Technicians የሰለጠኑ የጥገና ባለሙያዎች አለመኖር					
9	Lack of suitable work environment የተመቻቸ የሰራ ቦታ አለመኖር					
10	Misuse of Equipment ማሽኖችን ላልተገባ ጥቅም ማዋል					

Does the below determinant factors affect Maintenance Quality Control practice in Equipment Maintenance? Mark (✓) on the points you agree

ከዚህ ቀጥሎ የተዘረዘሩትን መሰረታዊ ነገሮች ለጥገና አገልግሎት የሚደረገውን የጥራት ቁጥጥር ያውኩታል ብለው ያስባሉ? በሚስማሙበት ቦታ (✓) ምልክት ያርጉ

No	Maintenance Quality Control የጥገና አገልግሎት ጥራት ቁጥጥር	Mark(✓)				
		Strongly Agree በጣም እስማማለው	Agree እስማማለው	Undecided አልወሰነኩም	Disagree አልስማማም	Strongly Disagree በጣም አልስማማም
1	Lack of required training አስፈላጊ የሆኑ ስልጠናዎች አለመኖር					
2	Unavailability of proper Maintenance Manuals & Parts Catalogue የጥገናና የመለዋወጫ እቃዎች መመሪያ/ማውጫ መዝገብ አለመኖር					
3	Failure to use equipment's maintenance manual የማሸኛችን የጥገና መመሪያዎች አለመከተል					
4	Availability of spare parts when needed የመለዋወጫ እቃዎች በበቂ ሁኔታ አለመኖር					
5	Make and model of the Equipment (Type and variety) የማሸኛች ስራትና አይነት መለያየት					
6	Inadequate inspection while equipment delivery and takeover በማሸኛች ቅበላ እና ማስረከብ ወቅት በቂ ምርመራ አለመኖር					
7	Spare parts quality የመለዋወጫ እቃዎች ጥራት					
8	Unit's condition & the extent of Damage/Failure/Misuse ማሸኛች ለጥገና ሲመጡ ያላቸው ነባራዊ ሁኔታ (ዓደጋ/ብልሽት/አግባብ ያልሆነ አጠቃቀም)					
9	Urgency of the equipment needed for the operation (Short Maintenance time frame) ማሸኛችን ባስቸካይ ለአገልግሎት መፈለግ (አጭር የጥገና ጊዜ ገደብ)					
10	Skill level of the Technicians የጥገና ባለሙያዎች የሙያ ብቃት					

How do you think Quality Control practice is so important in Equipment maintenance?

Mark (✓) on the points you agree

የጥራት ቁጥጥርን አስፈላጊነቱን እንዴት ይገመገሙታል? በሚስማሙበት ቦታ (✓) ምልክት ያርጉ

No	The importance of Quality Control for Equipment Maintenance የጥራት ቁጥጥር አስፈላጊነት	Mark(✓)				
		Strongly Agree በጣም እስማማለው	Agree እስማማለው	Undecided አልወሰንኩም	Disagree አልስማማም	Strongly Disagree በጣም አልስማማም
1	Quality control improves performance of Maintenance Sections የጥራት ቁጥጥር ትግበራ የጥገና ክፍሉን አቅም ያሻሽላል					
2	Quality control enhances in decreasing breakdown of units after maintenance የጥራት ቁጥጥር ትግበራ ማሸኖች ከጥገና በሁዋላ የሚደርስባቸውን ብልሽት ይቀንሳል					
3	Quality control affects maintenance cost of company የጥራት ቁጥጥር ትግበራ የደርጅቱን የጥገና ዋጋ ላይ ተፅዕኖ ያደርጋል					
4	Quality control improves proper delivery of units after & before maintenance የጥራት ቁጥጥር ትግበራ ማሸኖች ከጥገና በሁዋላ እና በፊት ላላቸው ርክክብ ያሻሽላል					
5	Quality control differentiates severity of equipment damages የጥራት ቁጥጥር ትግበራ የማሸኖችን የብልሽት ሁኔታ ለመለየት ይረዳል					
6	Quality control should facilitate the on-time release of equipment with the minimum amount of time የጥራት ቁጥጥር ትግበራ የማሸኖችን የጥገና ጊዜ ሊያሳጥርና ወደ አገልግሎት በቶሎ እንዲመለሱ ሊረዳ ይገባል					
7	Quality control offers information about state of unit damage and the maintenance levels የጥራት ቁጥጥር ትግበራ የማሸኖችን ነባራዊ ሁኔታ መረጃ እንዲሁም የብልሽታቸውን መጠን ለመረዳት ያስችላል					
8	Quality control will ensure maintenance service processes can be performed at the lowest possible cost and time የጥራት ቁጥጥር ትግበራ የጥገና አገልግሎቱ በአነስተኛ ዋጋና አሰራር እንዲከናወን ይረዳል					
9	Quality control enables the maintenance section to comply regulatory requirements የጥራት ቁጥጥር ትግበራ የጥገና ክፍሉ የተቆጣጣሪ አካላት ለሚያቀርቡት መጠይቆች ትግበራ ያግዛል					
10	Quality control reduces the number of reworks or Premature failures የጥራት ቁጥጥር ትግበራ እማያዳግም የጥገና አገልግሎት እንዲኖር ለማድረግ ያስችላል					

To what extent does the below major factors negatively impact on-time performance of Equipment (GSE/GTV) maintenance? Mark (✓) on the points you agree

ከዚህ በመቀጠል የተዘረዘሩት ዋና ዋና ሁኔታዎች የጥገና አገልግሎቱ በታቀደለት የጊዜ ገደብ እንዳይካሄድ ያግዳሉ ብለው ያስባሉ? በሚስማሙበት ቦታ(✓) ምልክት ያርጉ

No	On-time performance in Motorized Equipment Maintenance የጥገና አገልግሎት በታቀደለት የጊዜ ገደብ ማካሄድ	Mark(✓)				
		Strongly Agree በጣም እስማማለው	Agree እስማማለው	Undecided አልወሰንኩም	Disagree አልስማማም	Strongly Disagree በጣም አልስማማም
1	Delay in delivery of spare parts both, stock and expense የመላዋወጫ ዕቃዎች አቅርቦት መዘግየት					
2	Lack of coordination between cross functional sections (SLA compliance) ተደጋጋፊ ክፍሎች ያላቸው ቅንጅት ማነስ (የአገልግሎት አሰጣጥ ስምምነት ትግበራ)					
3	Presence of other non-related activities, assignments, meetings, etc ሌሎች ከሥራው ጋር ተያያዥ ያልሆኑ ስራዎች፣ ትዛዞች፣ ስብሰባዎች፣ የመሳሰሉት መኖር					
4	Unplanned or Emergency maintenances እቅድ ውስጥ ያልተካተቱ አስቸኳይ ጥገናዎች መብዛት					
5	Number of Senior Technicians who can handle tasks by themselves እራሳቸውን ችሎው የሚሰሩ ከፍተኛ ባለሙያዎች ቁጥር ማነስ					
6	Lack of proper maintenance standards and Procedures በቂ የሆነ የጥገና መለኪያና የአሥራር ደንብ አለመኖር					
7	Unavailability of necessary maintenance tools አስፈላጊ የጥገና መሳሪያዎች አቅርቦት አለመኖር					
8	Unavailability of sufficient working space በቂ የመስሪያ ቦታ አለመኖር					
9	Lack of coordination between interdepartmental sections የተጓዳኝ ክፍሎች ትብብር ማነስ					
10	Unavailability of Equipment for maintenance on time, as per the plan ማሸኛች ለጥገና በተያዘላቸው ዕቅድ መሰረት በጊዜው አለመገኘት					

Do you believe Quality control practice have impact on the performance of Maintenance service?

የጥራት ቁጥጥር ትግበራ በጥገና አገልግሎት አቅም ላይ ተፅዕኖ አለው ብለው ያምናሉ?

A. Yes/አዎ

B. No/አይ

If your answer is yes, please list down some of the impacts of Quality control practice on the performance of Maintenance Service (Mandatory)

ከላይ ለተጠቀሰው ጥያቄ ምላሽዎ አዎን ከሆነ ተፅዕኖዎቹን ይዘርዝሩ

Do you agree that Ethiopian Airlines incur different exaggerated costs when maintaining Equipment?

የ ኢአመ ለጥገና አገልግሎት የተጋነነ አላስፈላጊ ወጪ ያወጣል ብለው ያስባሉ?

A. Yes/አዎ

B. No/አይ

If your answer is yes for the above question what are those resources incurred when maintaining Equipment.

ከላይ ለተጠቀሰው ጥያቄ ምላሽዎ አዎን ከሆነ ይዘርዝሩ

Please list down the importance and major impact of quality control practice in maintenance performance of Equipment Maintenance

እባክዎን የጥገና አገልግሎት ቁጥጥር አስፈላጊነትና ተያያዥ ተፅዕኖዎቹን ይዘርዝሩ

Importance/አስፈላጊነት

Impact/ተጽዕኖ

Does Ethiopian Airlines use some course of actions to minimize improper handling of units in the organization?

የማሸናፊዎችን አጠቃቀም ቁጥጥር በተመለከተ የኢ.አ.መ. የሚያደርጋቸው ተግባራት አሉ ብለው ያስባሉ

A. Yes/አዎ

B. No/አይ

If your answer is yes for the above question please list down the action can be taken to minimize improper handling of units in the organization.

ከላይ ለተጠቀሰው ጥያቄ ምላሽዎ አዎን ከሆነ የቁጥጥር ተግባራቶቹን ይዘርዝሩ

What are the major causes for equipment failure and how is their maintenance handled?

ለማሸናፊ መበላሸት በዋናነት የሚጠቀሱ መንስኤዎች ምን ምን ናቸው? የጥገና ሂደቱስ?

Causes:/መንስኤዎች

Maintenance handling/የጥገና ሂደት

If you have anything to add, comment, suggest, question, or criticizes about the questioner and the issues rose on the topic, please write below

ስለ መጠይቁ የሚጨምሩት፣ የሚሰጡት አስተያየት፣ ተያያዥ ጥያቄ ካለዎት እባክዎን ይግለጹ።

Thank You!!!

አመሰግናለሁ!!!

DECLARATION

I, the undersigned, declare that this thesis is my original work, prepared under the guidance of Dr. TESHAYE WOLDE. All sources of material used for the thesis have been duly acknowledged. I further confirm that the thesis has not been submitted either in part or in full to any other higher learning institutions for the purpose of earning any degree.

Sileshi Seifu

Name

St. Mary's University, Addis Ababa

Signature

July, 2017