EFFECT OF E-PROCUREMENT PRACTICES ON MRO PERFORMANCE OF ETHIOPIAN AIRLINES GROUP

By:

SHEWARGA AYALEW

A THESIS SUBMITTED TO THE ADDIS ABABA UNIVERSITY SCHOOL OF COMMERCE FOR THE PARTIAL FULFILLMENT OF THE DEGREE OF MASTERS OF ART IN LOGISTICS AND SUPPLY CHAIN MANAGEMENT

Adviser: Mengistu Bogale (PhD)

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Approved by a board of examiners and advisor:

Mengistu Bogale (PhD)	_____	_____
Advisor	Signature	Date
Busha Temesgen (PhD)	_____	_____
Internal examiner	Signature	Date
Yehualashet Demeke (PhD)	_____	_____
External examiner	Signature	Date

DECLARATION

I hereby declare that this thesis entitled: Effect of e-procurement practices on MRO performance of Ethiopian airlines group which is submitted by me for the partial fulfillment of the degree of masters of art in Logistics and Supply Chain Management to the Addis Ababa university school of commerce is my own original work and has not been submitted earlier either to Addis Ababa university or to any other institution for the fulfillment of the requirement for any course of study. I also declare that no chapter of this manuscript in completely or in partial is lifted and incorporated in this report from any earlier work done by others or me.

Name: Shewarga Ayalew

Enrolment number: GSE/5251/10

Date: July 2020

Addis Ababa, Ethiopia

Signature:_____

CERTIFICATE

This is to certify that this thesis is prepared by Shewarga Ayalew a student of masters of art in logistics and supply chain management had been working under my supervision and guidance for his project entitled: Effect of e-procurement practices on MRO performance of Ethiopian airlines group. He is submitting his genuine and original work and complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

Advisory: Mengistu Bogale (PhD)

Date: July 2020

Addis Ababa, Ethiopia

Signature: _____

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ABSTRACT

The adoption of electronic-procurement platforms enables the organization to improve its operational performance. However, the advantage of e-procurement has varied depending on the implementation context. The title of this study was Effect of electronic-procurement practices on MRO performance of the Ethiopian airlines group. The objective of this study was to assess the link between electronic-procurement practices and Ethiopian airlines group maintenance, repair and overhaul operational performance in terms of cost, quality and delivery. In this study, the MRO performance in terms of cost, quality and delivery are the dependent variables and E-procurement practices consists electronic-sourcing, electronic-tendering, electronic-ordering, electronic-invoicing and electronic-payment formed as the independent variables. The scope of the study was limited on Ethiopian Airlines Group Maintenance, Repair and Overhaul Addis Ababa Ethiopia. The study used descriptive and explanatory research designs. Both Qualitative and quantitative approach have been used in this study. Regarding sample size, 125 respondents have been approached from the total number of 293 populations. Primary data was used, the data was gathered through questionnaire surveys and semi-structured interview. Descriptive statics (such as mean, percentage and standard division) and inferential statics (such as multiple linear regression and diagnostic tests analysis) have been used and for the inferential statics STATA14 software had been used. Content validity has been addressed through the review of literature and adapted instruments used in previous studies. Pilot test and Cronbach's alpha statistics have been conducted for reliability test. The result shown that electronic Sourcing, electronic ordering, electronic invoicing and electronic payment have been adopted by the Ethiopian maintenance, repair and overhaul to a small extent but the result shown no extent for electronic tendering. Further the result shown that the thirteen among fifteen developed hypotheses were supported by the study. The study recommends the Ethiopian airlines group Maintenance, repair and overhaul to invest more in electronic-procurement and to make amendment on the procurement policy and producers of the organization so as to conceder electronic-procurement. Moreover, the study recommends for further research assessing the effect of E- procurement practices on the operational performance in other case organization by including other operational performance indicators.

Key words: *E-procurement, Maintenance, Repair and Overhaul (MRO) and Operation, performance.*

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ACRONYMS AND ABBREVIATIONS

AMT: Aircraft Maintenance

B2B: Business to business

CSCMP: Council of Supply Chain Management Professionals

E- Invoicing: Electronic Invoicing

E- Ordering: Electronic Ordering

E-Payment: Electronic Payment

E- Sourcing: Electronic Sourcing

E- Tendering: Electronic Tendering: E-

Procurement: Electronic procurement

Ethiopian: Ethiopian Airlines Group

MRO: Maintenance Repair and Overhaul

OEM: Original Equipment Manufacturer

OTP: On Time Performance

P&SCM: Procurement and Supply Chain Management

SCM: Supply Chain Management

TAT: Time around time

CHAPTER ONE
INTRODUCTION

In this chapter background of the study, statement of the problem, objectives of the study, research questions, significance of the study, and scope of the study, definition of key terms, schedule and budge of the study have been covered.

1.1 BACKGROUND OF THE STUDY

Pires and Stanton (2005) defined Procurement as it is actually a support activity in the supply chain for the purchase of inputs for all parts of the value chain while anticipating requirements, moving supplies to the organization, sourcing and obtaining supplies, and monitoring the status of supplies as current assets. As per Rahim (2008), Procurement is considered as a tremendously important and expensive business activity for the organizations because organizations spend a huge amount of their operational budget on purchasing goods and services.

Maintenance Repair and Overhaul procurement in the aviation industry is required for scheduled and preventative maintenance against any mechanical, technical and electrical failure to ensure safety and airworthiness of aircraft. According to Lancioni et al. (2000), as procurement engages huge amounts of cash flows in the business so any improvement in procurement process can help to cut down costs incurred in selection of the preferred suppliers, shorten lead-time, increase the value gained in terms of price and quality, lower transaction cost, and consequently will significantly influence supply chain management.

E-procurement appeared as an internet-based technology that revolutionizes the purchasing process of an organization by bringing automation into a labor-intensive atmosphere so as to eradicate the problems faced in traditional procurement processes. E-procurement is an electronic platform where procurement activities are conducted between different parties involving electronic communication mediums like internet, email, phone, and fax. According to Davila et al. (2003), E-procurement technology supports the acquisition of goods over the internet through engaging E-procurement software, business-to-business market exchanges and purchasing consortia. In addition, ass per Vaidya et al. (2004), E-procurement is a tool that enables procurement activities such as sourcing, receipting, commissioning, ordering and making payment. According to Puschmann and Alt, (2005), the diffusion of E-procurement systems in

the late 1990's has created potential for reorganizing the Maintenance, repair and overhaul supply chain. Also, as per Thomson and Singh (2001), E-procurement improves the efficiency in business-to-business environment by increasing purchase volume, improving logistics and delivery, reducing costs, providing a wider range of supplier selection, bringing better quality, reducing paperwork, and lowering administrative costs. In addition, according to Teo *et al*., (2009), E-procurement systems provide the flexibility of directly accessing the supplier system to confirm technical specification and description of products, availability of stock, creating electronic requisition, price, catalogue, sending purchase orders to suppliers, which eliminate paper-based time consuming cumbersome procedures. E-procurement initiates the acquisition of resources, especially MRO items that help in significant improved effectiveness and cost savings (Gunasekaran et al., 2009).

1.2 BACK GROUND OF THE ORGANIZATION

Ethiopian Airlines Group is referred to as Ethiopian is Ethiopia's flag carrier, which is completely owned by the Ethiopian government. It was founded on the December 21, 1945 and commenced operations on the April of 8, 1946 and expanding to international flights in the 1951. During the past seventy plus years, it has become one of the continent's leading carriers, incomparable in Africa for efficiency, operational success and in turning profits for almost all the years of its existence (Ethiopian Fact Sheet, 2018).

Ethiopian has a designated section called Procurement and Supply Chain Management (P&SCM) Division, which provides services to a companywide under a matrix organizational structure administratively under the Chief financial officer (CFO) and functionally under the Managing Director of Maintenance Repair and Overhaul (MRO). It is charged with the responsibility of maintaining and operating an efficient and effective Supply chain. The supply chain division handles both direct and indirect procurement.

In Ethiopian P&SCM division performances planning, Sourcing, request for quotation (RFQ), proposal evaluation, supplier election, signing contract, receive invoicing, facilitate Payment, warehousing, contract administration, customer database management and logistics management.

The main strategic goal of Ethiopian MRO is to provide full airframe MRO services to all aircraft models operated by Ethiopian and other operators in terms of a best turnaround time and quality maintenance service.

1.3 STATEMENT OF THE PROBLEM

Ethiopian obtains materials and services which are necessary, either for its regular operations or to accomplish its short and long run plans through purchasing from both domestic and international markets. The materials which are purchased include a wide range of supplies which worth millions of dollars. Today, purchasing is recognized as having an overwhelming impact on the bottom line of the organization. Purchasing is becoming a core competency of the firm, finding and developing suppliers and bringing in expertise that is highly valued by the organization (CSCMP CSCMP and Wendy Tate ,2014). Wrong purchasing practice costs too much because there are several considerations that a buyer makes in purchasing. If the procurement department is inefficient in its acquisition of goods and services or even works, other departments especially users will be affected. The same is true for Ethiopian.

According to Ethiopian MRO 2019 annual performance evaluation report, it has been mentioned that Ethiopian MRO has faced with deferent problems. Among those the following problems are listed as a major: extension of aircraft maintenance schedules, long turnaround time (TAT) of component maintenances, long lead-time to receive product or service, too much late core return fee, on-time part availability issue, long payment process, past due payment penalty, wrong payment and losing potential suppliers and customers, no adequate supplier database, long bidding and sourcing processes.

Even though a number of research have been conducted in Ethiopian especially in P&SCM and MRO performance, still the aforementioned problems exist. This is therefore; to address the gap this study focused on the practices of e-procurement and its effect on the Ethiopian MRO performance.

1.4 RESEARCH QUESTIONS

The intention of this study is to provide the best possible answers to the following questions:

1. How E-procurement is being practiced in Ethiopian Airlines Group?
2. How E-Sourcing affects Ethiopian MRO performance in terms of cost, quality and delivery?
3. How E-Tendering affects Ethiopian MRO performance in terms of cost, quality and delivery?
4. How E-Ordering affects Ethiopian MRO performance in terms of cost, quality and delivery?
5. How E-Invoicing affects Ethiopian MRO performance in terms of cost, quality and delivery?
6. How E-Payment affects Ethiopian MRO performance in terms of cost, quality and delivery?

1.5 RESEARCH OBJECTIVES

1.5.1 General Objective

The general objective of the study is to assess the link between E-Procurement practices and the Ethiopian Airlines MRO performance.

1.5.2 Specific Objectives

1. To assess the E-procurement practices of the Ethiopian Airlines Group.
2. To examine the effect of E-Sourcing practices on the Ethiopian MRO performance in terms of cost, quality and delivery.
3. To examine the effect of E-Tendering practices on the Ethiopian MRO performance in terms of cost, quality and delivery.
4. To examine the effect of E-Ordering practices on the Ethiopian MRO performance in terms of cost, quality and delivery.
5. To examine the effect of E-Invoicing practices on the Ethiopian MRO performance in terms of cost, quality and delivery.
6. To examine the effect of E-Payment practices on the Ethiopian MRO performance in terms of cost, quality and delivery.

1.6 SIGNIFICANCE OF THE STUDY

This study will provide helpful information to various stakeholders and mainly the Ethiopian MRO to understand the effects of E-procurement practices. The findings from the study may particularly be useful in providing additional knowledge to existing and future organizations to understand about E-procurement practice in case of Aviation industry. Largely, this study will enrich the existing literature and serve as an avenue for further studies by forming a strong and rich source of information substantive publication in academia.

1.7 SCOPE OF THE STUDY

The study not considered non-aircraft related procurements, operational disruptions caused by non-avoidable factors such as natural disaster, strike actions, civil unrest and other causes not related to procurement activates under a normal circumstance.

In this research, among many E-procurement types only the most common E-procurement types were covered. Those are E Sourcing, E-Tendering, E-Ordering, E-Invoicing and E-Payment. Regarding the MRO performance measurement parameter in this study only Cost, Quality and Delivery dimensions were covered. This study also limited on Ethiopian MRO and P&SCM division Addis Ababa, Ethiopia.

1.8 LIMITATION OF THE STUDY

The study focused on Ethiopian MRO, hence the findings are limited to the case organization. The study also focused on E-Sourcing, E-Tendering, E-Ordering, E-Invoicing and E-Payment as the indicators of e-procurement practice hence the findings are based on those considered indicators within the context of Ethiopian MRO. In addition, other organizations would also use e-procurement platforms and therefore they are not limited to aviation MRO only. However, the findings of this study are only limited to the Ethiopian MRO and may not be generalized to other organization or sectors.

1.9 DEFINITION OF KEY TERMS

1. Procurement: Procurement refers to all activities involved in obtaining items from a supplier Example; purchasing, transporting and warehousing the items. According to Nevalainen, A., (2001) from the strategic perspective, the procurement include the entire operations pertaining to requisitioning, transportation, warehousing, and in bound receiving process.
2. E-Procurement: According to Lysons, K. and Farrington, B. (2006), the Chartered Institute of purchasing and supplies (CIPS) defines e-Procurement as the combined use of information and communication technology through electronic means to enhance external and internal purchasing and supply management processes.

3. E-Sourcing: This involves buyers searching for suppliers using internet technology (Knudsen, 2003)
4. E-Tendering: A procedure of supplier or contractor selection in order to find a competent supplier using internet based ICT infrastructures or on the basis of electronic transaction through the internet and is expected to reduce face to face transaction as well as collusion (Vaidya et al., 2006)
5. E-Ordering: Kim J. and Shunk D. (2003) argues that E-ordering is the process of creating and approving purchasing requisition, placing purchase orders as well as receiving goods and services ordered, by using a software system based on internet technology which greatly improves the supply chain performance.
6. E-Invoicing: this is the document that defines and ultimately leads to payment. E-procurement should be capable of accepting and processing electronic invoices for those suppliers who do not have systems that automatically generate electronic invoice; besides, it should provide an easy means of online creation either through a supplier portal or document scanning (Brun, 2007).
7. E-Payment: It is a monetary transaction between the buyer and seller by use of electronic system to perform transactions including payment, internet payment, E-cards, PC Banking and E-cash in the supply chain (Munyao and Moronge, 2018).
8. Supply Chain Management: It can be defined as a global network of organizations that cooperate to improve the flows of material and information between suppliers and customers at the lowest cost and the highest speed (King'ori Margaret Wangui, 2013).
9. Maintenance Repair and Overhaul: according to Vieira, Loures (2016)**,** MRO could be defined as all actions that have the objective of retaining or restoring an item in or to a state in which it can be perform its required function. Also, as per Al-kaabi, Potter et al. (2007), the aviation MRO engineering could be defined such the arm of the aviation industry responsible for the retaining or restoring aircraft parts to a state in which they can perform the required design applications.
10. Operational performance; it is the process of aligning units of business in an institution to enhance the combine working in order to attain major or business goals (Sudarsana, Sivarami and Mohan, 2015).

1.10 ORGANIZATION OF THE STUDY

The thesis has been organized in five chapters. Chapter one contains the introduction part which deals with background of the study, statement of the problem, research questions, research objectives, significance of the study, scope of the study, limitations of the study and definition of key terms. Chapter two deals about the review of related literature consisting of conceptual, theoretical, empirical and identified literature gaps and conceptual framework. In chapter three research methodology parts which means the research approach, research design and sampling techniques employed were discussed. Chapter four is about data presentation, analysis and interpretation. Finally, in chapter five summary of findings, conclusion and recommendations have been included.

CHAPTER TWO

RELATED LITERATURE REVIEW

INTRODUCTION

This chapter covers related literature review. In specific, the chapter discusses the theoretical related literature review, related empirical literature review, research gab and conceptual framework of the study.

2.1 THEORETICAL LITERATURE REVIEW

Procurement is the act of acquiring, buying goods, services or works from an external source, often via a tendering or bid process (Laffont, Jean-Jacques; Tirole, Jean, 1993). It consists of all the activities required for obtaining items from a supplier to the warehouse. Traditionally, firms use paper based system to procure materials and services by searching from paper based catalogue provided by suppliers through telephone and fax. The traditional material procurement process involves generation, copying and transfer of many paper documents (Heng Li, Cao, J.N., Daniel, C., & Miroslaw, S. 2002).

2.1.1 The Concepts of E-procurement

According to Chopra, et al., (2001), the E-Procurement is business-to-business purchasing practices that utilized electronic commerce (E-commerce) to identify potential sources of supply, to purchase goods and service, to transfer payment and to interact with suppliers. Neef, D., (2001) considered an E-Procurement is an important step forward in the development of the enterprise, where the E-Procurement is a process of connecting customer to business partners. Croom, S. & Brandon, J. A., (2004) defined an E-Procurement as the use of internet based integrated information and communication technologies to hold out individual or all stages of the procurement method together with negotiation, search, sourcing, receipt, ordering, and post-purchase review. E- Procurement connects a vast network of business that helps business people to search necessary information and contact people in a convenient way.

2.1.1.1 E- Sourcing

It is the process that identifies new suppliers for a specific purchasing category which can be achieved by utilizing the Internet technology as usual the internet itself. A purchaser can, by identifying new suppliers, maximize the competitiveness during the process of tendering in the case of this procurement category. In addition, the supply risk associated with this category can be decrease through E-sourcing (Kraljic 1983). E- Sourcing has become a key procurement tool, allowing companies to connect, screen and shortlist suppliers, irrespective of whether they are present at the same location or at the same time often allowing category managers to secure better outcomes than from traditional negotiations. According to the Chartered Institute of Procurement and Supply (CIPS), The reasons why E-sourcing has become so prevalent, is that, as in many other areas of online activity, the Internet brings suppliers and provider closer together, facilitating reduced costs, better communication and a more efficient process. Traditional geographical limitations are no longer present in E-sourcing since sending and receiving E-mail and other information from the World Wide Web is fast and efficient. With E-sourcing, organizations are able to increase the sources of their potential suppliers at no cost as they do not only depend on those vendors and suppliers they can physically visit their premises since they interact online and they are able to get whatever information that they need with the pressing of a button of their computers. They can source for their inputs from any part of the world in the comfort of their offices. They interact via the internet and partner with suppliers and buyers online, and this enhances their operations (Dinda, 2010).

2.1.1.2 E- Tendering

It is the process of sending request for information (RFI) and request for proposal (RFP) to suppliers and obtaining the suppliers' response, through Internet technology. E- Tendering is sometimes also supporting the analysis and comparison of responses. However, the point shall be noted that E-tendering is not used to close the deal with a supplier. It is the process of conducting the full procurement cycle on the internet including submission of price bids in a way that ensures effectiveness, economy and speed of internet is well harnessed. This leads to better tracking of order placed ,as it is easy to keep track of orders and also make correction in case of any errors for the previous orders placed. Currently organizations are practicing E-tendering as one of the mechanisms to cut costs. Through E-tendering the organization generates wealth through electronics business (Amit and Zott, 2001). The use of E-tendering in the purchasing process has

several advantages. The screening and selection of qualified suppliers is automated reducing the lead-time, price, improving flexibility, quality among others (Okubo Kevin Namatsi., 2014).

2.1.1.3 E-Ordering

It is defined as a formal electronic request for product or for services which is inclusive of all the phases from need identification, purchasing, payment for the services or goods received to after sales services including management of the contract and supplier (Ibem and Laryea, 2015). It is the process of creating and approving procurement requisitions, placing orders, receiving goods and services ordered. It is underpinned by automation of the E-procurement cycle, integrating the functional procedures and the management of purchase (Barngetunty and Kimutai, 2015).

2.1.1.4 E-Invoicing

It refers to the delivery of bill and related information by an enterprise to its clients using electronic communication and more so the internet. Electronic data interchange (EDI) was initially implemented between businesses only. Later, the internet was employed to transmit E-invoices between individuals, businesses, and government, becoming the backbone for E-commerce. It is a kind of information system service that gathers transaction information and transmits it through a network (Hernandez-Ortega, 2011). In this era of E-business, it plays a critical role in maintaining business information throughout the supply chain (Chang et al., 2013). Electronic data interchange(EDI) was initially implemented between businesses only. Later, the internet was employed to transmit E-invoices between individuals, businesses and government. E-invoicing offers many benefits: significant cost reduction, process simplification, reduced payment time, greater security of data, as well as numerous environmental benefits. This is confirmed by enterprises and public authorities which already use it (Lian et al., 2014).

2.1.1.5 E-Payment

It is a form of financial commitment that involves the buyer and sellers facilitated transactions through the use of electronics platforms. It is a monetary transaction between the buyer and seller by use of electronic system to perform transactions including payment, internet payment, E-cards, PC Banking and E-cash in the supply chain (Munyao and Moronge, 2018).

2.1.2 The Concepts of Organizational Operational performances

Operational performance refers to aspects of an organizations process which can be quantified. It includes variables such production or service reliability and defect rates, cycle time, on time delivery, cost of quality and scrap reduction, productivity, and inventory management (Voss et al., 2012). Performance measurement is a key function in organization, Performance measurers provide real added value, with feedback into the decision process and analysis of structural issues. Performance measures are in effect alternative risk controllers able to protect the firm from effects of failing to meet client expectations (Bacon, 2008).

2.1.3 Operational Performance indicators

There are several points to note about the performance objectives. The first is that they are all multidimensional. Quality is not simply a reference to conformance to specification, but also encompasses a variety of other dimensions like performance, features, reliability, technical durability, serviceability, aesthetics, perceived quality and value for money (Garvin, 1987; Schonberger, 1990; Neely and Wilson, 1992).

A performance indicator is a value or process to measure output and outcome, or, with respect to a goal, course and tempo. In aviation, the purpose of performance indicators is to provide aviation managers with a tool for improving the effectiveness and efficiency of the processes involved with safely delivering aircraft services. In addition, performance measurement can provide “leading indicators” so that actions can be taken early on in any one of the work processes to improve the product and provide information needed by senior managers to support aviation program goals. (U.S. Department of Energy Washington, D.C. 20585)

2.2 REVIEW OF EMPIRICAL STUDIES

2.2.1 Practices of E-Procurement

Black, P. et al, (2005) stated that electronic tendering is an electronic version of traditional tendering process. It converts traditional acquisition, purchase of goods and services, supply of goods and services into the Electronic process such as E-tendering, E-awarding, E-auction, E-sourcing, by using Internet. E-tendering is basically an expression used to describe the dissemination and receipt of tender information, indication of interest in tendering, receipt of tender documents, submission of tender sum and final selection of successful tender for contracts via the internet.

E-procurement practices refer to the use of computer-internet based system to carry out individual or groups of the procurement process, including search, sourcing, negotiation, ordering, receipt, and post-purchase review (Asumba, 2010). Krawiec (2010) described three types of e-procurement practices systems which are buyer e-procurement practices systems; seller e-procurement practices systems; and online intermediaries. However, according to Barasa, Namusonge and Fredrick (2017) study, E-sourcing, E-tendering, E-ordering, E-invoicing, and E-payment are the most common E-procurement practices.

2.2.2 The Effect of E-Procurement on Organizational Performance

According to Min and Galle (2003), the main benefits of E-procurement are: Cost savings and subsequent increase in return-on-investment, Upgrade of store network productivity by giving on going information with respect to item accessibility, stock level, shipment status, generation prerequisites, Assistance of collective arranging among store network accomplices by sharing information on request figures and generation plans that direct production network exercises.

The adoption of Web-based E-procurement system in the B2B purchasing transaction allows firms to reduce transaction costs, improve internal procurement process efficiency, and increase collaboration with suppliers (Barbieri and Zanoni, 2005). Davila et al. (2003) thought that implementing E-procurement the firm could shorten the order fulfillment cycle time, lower inventory levels and the price paid for goods, and reduce administrative costs of procurement. Eakin (2003) argued that the benefits of E-Procurement can be classified to hard benefits (such as

price savings and process cost reductions), soft benefits (such as individual time freed up through more efficient processes), and intangible benefits (such as cultural change, financial approval for all spending, and high visibility of supplier performance). Presutti (2003) found E-procurement system could bring benefits to the company such as reducing time to- market cycles, reducing material and transactions costs, and reducing stock levels. Chaffey (2004) argued that the benefits of E-procurement include reduced purchasing cycle time and cost, enhanced budgetary control, elimination of administrative errors, increasing buyers' productivity, and lowering prices through product standardization and consolidation of buys, improving the payment process, and improving information management. Implementing Web-based E-procurement system not only could make the operational processes of the buyer organization more effective but also could make the order fulfillment process of the supplier organization more efficient and improve partner relationship management.

E-procurement refers to the purchase of goods and services for organizations through the internet (Cullen, 2007). Van Weele (2005) present E-procurement can reduce quality costs by making sure that selected suppliers deliver a product of service that does not exceed extensive equality control. E-Procurement can also reduce quality costs by making sure that the components bought do not load to complaints on the user department or final product to the customer. The key features of E- procurement approaches enable users to find an item in an electronic catalog, create a requisition, route the order requisition for approval, created transmit the order to vendors, and also help to automate the invoicing and payment process (Berger & Zeng,2006).

Efficiency measures the usage of resources during a process in an organization. E- Procurement impacts this dimension allowing the employees to achieve reliable result compared to traditional paper-based procedure, but using less time, and energy (Chan et al., 2007). Effectiveness involves comparing goals and results of the organization. Furthermore, for organization to minimize disputes, appeals and clarification requests from the suppliers, E-procurement plays a key role.

According to Agnes Okwar Waganda (2018) study, E-tendering, E-invoicing and E-sourcing are statistically significant and influences performance of UN Agencies in Nairobi. In addition, E-procurement has a significant effect on the organizational performance of the UN agencies in Nairobi and that there is a positive and significant relationship between E-procurement and organizational performance.

Many researchers stated the benefits of e-procurement that are categorized and presented in Table 2.1 below.

Table 2. 1: E-procurement benefits summary

Potential Benefits Of E-Procurement	**Literature Supporting**
Reduce order cycle times	Min&Galle, 2003; Tatsis et al., 2006; Gunesekaran&Ngai, 2008; Panayiotou etal., 2004; Liu et al., 2011; Davila et al., 2003; Mettler&Rohner, 2009; Roche,2001 ;
Simplify purchase payment	Min&Galle, 2003;
Expand supplier bases	Min&Galle, 2003; Moon, 2005;
Reduce paperwork	Min&Galle, 2003; Gunesekaran&Ngai, 2008; Davila et al., 2003; Mettler&Rohner, 2009; Roche, 2001;
Eliminate order errors	Min&Galle, 2003; Mettler&Rohner, 2009; Zheng et al., 2006; Davila et al., 2003; Gebauer&Segev, 2001;
Inventory reduction	Min&Galle, 2003; Tatsis et al., 2006; Panayiotou et al., 2004; Zheng et al., 2006; Ageshin, 2001; Liu et al., 2011; Mettler&Rohner, 2009; Roche, 2001;
Productivity and/or service improvement	Gunasekaran et al., 2009; Moon, 2005; Panayiotou et al., 2004; Ageshin, 2001; Muffatto&Payaro, 2004
Save time	Moon, 2005; Mettler&Rohner, 2009; Gunasekaran&Ngai, 2008; Kim&Shunk, 2004; Gebauer&Segev, 2001;
Reduce cost	Moon, 2005; Tatsis et al., 2006; Mettler & Rohner, 2009; Smith & Correa, 2005; Gunesekaran & Ngai, 2008; Panayiotou et al., 2004; Zheng et al., 2006; Kim & Shunk, 2004; Ageshin, 2001; Liu et al., 2011; Davila et al., 2003; Mettler&Rohner, 2009
Allowing the purchasing department to concentrate on more strategic tasks	Gebauer&Segev, 2001;

Source: Adopted from Hatice Calipinar & Mehmet Soysal,(2012).

2.2.2.1 The Effects of E-Sourcing on operational Performance

The key advantages of E-sourcing include improved flexibility to make decision and reduce the prices (Corina, 2011). It is mostly applied during the stage of coming up with specifications and gives the firm improved competitiveness and more savings on cost incurred (Barngetuny and Kimutai, 2015). The benefits of E-sourcing include streamlining the sourcing process, reducing prices by maximizing supplier competition, and creating a repository for sourcing information (Chan and Chin, 2007). Johnson et al. (2007) presented findings that E-business technologies targeted at reducing dyadic coordination costs were found to lead to improved financial performance. E-procurement helped to establish common processes, to convert from transactions to strategic activities and to save spending (Smart, 2010). According to Agnes Okwar Waganda (2018) study, It is also recommended that UN Agencies in Nairobi should adopt the use of E-sourcing to enable them expand sourcing scope and hence attract more competent people to offer them effective, efficient and competitive services.

Following the aforementioned effects of E-sourcing and the E-procurement benefits summary listed in Table 2.1, the below three hypotheses are developed.

H 1: E-sourcing positively and significantly affects the Ethiopian MRO performance in terms of cost.

H 2: E-sourcing positively and significantly affects the Ethiopian MRO performance in terms of quality.

H 3: E-sourcing positively and significantly affects the Ethiopian MRO performance in terms of delivery.

2.2.2.2 The Effects of E-Tendering on operational Performance

It is the procedure of electronic request transmission through the internet so as to perform operations related to procurement (Munyao and Moronge, 2018). E-tendering is a procedure in E-procurement applied in supplier selection in order to find a competent supplier using internet based information and communication technology infrastructures or on the basis of electronic transaction through the internet. It is expected to reduce face-to-face transaction as well as collusion (Vaidya, et al., 2006; Walker& Harland 2008). Through E-tendering, the process of supplier or contractor selection is considered a suitable mechanism to select a proper contractor fairly, efficiently and productively (Betts et al., 2006; Oyediran & Akintola 2011). De Boer et al.

(2002) hypothesized that E-tendering helps firms reduce the cost of stablishing specifications, choosing suppliers, negotiating conditions and contracting. De Boer et al .(2002) expected that E-tendering will have an impact on purchasing cost only indirectly, as firms are able to consider more alternatives over time.

Following the aforementioned effects of E-tendering and the E-procurement benefits summary listed in Table 2.1, the following three hypotheses are developed.

H 4: E-tendering positively and significantly affects the Ethiopian MRO performance in terms of cost.

H 5: E-tendering positively and significantly affects the Ethiopian MRO performance in terms of quality.

H 6: E-tendering positively and significantly affects the Ethiopian MRO performance in terms of delivery.

2.2.2.3 The Effects of E- Ordering on operational Performance

It has contributed to great savings in basic procurement costs incurred by various firms worldwide and thus technology use is a key strategy for many firms (Munyao and Moronge, 2018). Kim (2002) argues that E-ordering is the process of creating and approving purchasing requisition, placing purchase orders as well as receiving goods and services ordered, by using a software system based on internet technology which greatly improves the supply chain performance. Petersen (2005) asserted that online ordering system is an E-commerce function where a company allows customers to order products or services via their website. Since the internet is booming, having an online ordering system can boost sales to some extent as it eases customers to place an order for the company's services. People can place orders from their home as long as they have a computer/laptop with internet connection thus improved supply chain performance.

Following the aforementioned effects of E-ordering and the E-procurement benefits summary listed in Table 2.1, the below three hypotheses are developed.

H 7: E-ordering positively and significantly affects the Ethiopian MRO performance in terms of cost.

H 8: E-ordering positively and significantly affects the Ethiopian MRO performance in terms of quality.

H 9: E-ordering positively and significantly affects the Ethiopian MRO performance in terms of delivery.

2.2.2.4 The Effects of E-invoicing on Operational Performance

It offers lots of advantage; great cost reduction, the process also made simple, reduce time for making payment, great data security and also a lots of environmental benefit (Nafula & Namusonge , 2017). Invoicing generally involves the process of creating and sending out invoices for work that has been completed. It is an itemized bill for goods sold or services provided, containing individual prices, the total charge, and the terms (Hernandez-Ortega, 2011). E-invoicing refers to the sending and receiving of invoices by electronic means. E-invoicing has been recognized as one of the most important sources of profitability increases in organizations (Brun,2007). In this era of E-business, it plays a critical role in maintaining business information throughout the supply chain (Chang et al.,2013).

Following the aforementioned effects of E-invoicing and the E-procurement benefits listed in Table 2.1, the below three hypotheses are developed.

H10: E-invoicing positively and significantly affects the Ethiopian MRO performance in terms of cost.

H 11: E-invoicing positively and significantly affects the Ethiopian MRO performance in terms of quality.

H 12: E-invoicing positively and significantly affects the Ethiopian MRO performance in terms of delivery.

2.2.2.5 The Effect of E-Payment on Operational Performance

It minimizes the real distance between the participants and makes the world appear as a small village with ease of access. The use of E-payment is influenced by its ability to introduce value in a quick, efficient and effective manner (Singh &Punia, 2011).

Following the aforementioned effects of E-payment and the E-procurement benefits listed in Table 2.1, the below three hypotheses are developed.

H 13: E-payment positively and significantly affects the Ethiopian MRO performance in terms of cost.

H 14: E-payment positively and significantly affects the Ethiopian MRO performance in terms of quality.

H 15: E-payment positively and significantly affects the Ethiopian MRO performance in terms of delivery.

2.2.2.6 Operational Performance Indicators

In order to get and keep competitive advantage over other market players in the same industry the manufacturing organizations and service providers must produce the quality products and services at lower cost with rapidly increasing variety.

Operational performance is measured using various approaches and dimensions including issues of performance to schedule, preventive maintenance, productivity measures, lead-time measures, quality measures, inventory measures, utilization, time, speed, cost, efficiency and effectiveness (Birech, 2011). Hayes and Wheelwright (1984) suggested that companies compete in the marketplace by virtue of one or more of the following competitive priorities: Quality, Lead-time, Cost and Flexibility. Whilst volatility in MRO market is present, also as important is the unpredictability inherent in the nature of MRO operations leading to stochastic tasks and this requires that the production system is flexible to meet customer demands without compromising on the other aspect of its competitive priorities which are cost, quality and delivery (Aitken et al., 2002).

Cost**:** Neely and Platts (2005) has identified the manufacturing cost, value added cost, selling price, running cost and services cost as the measures of the cost performance.

Quality**:** Quality is the degree to which a commodity meets the requirements of the customer at the start of its life. (ISO 9000)

Delivery**:** White (1996) has proposed the perceived relative reliability, reliability relative to competitors, percentage on-time delivery, due date adherence, percentage increase in portion of delivery promises met. Percentage of orders with incorrect amount, schedule attainment, average delay, percentage reduction in lead time per product line, percentage improvements in output, percentage reduction in purchasing lead time and percentage reduction in average service turnaround per warranty claim as the measures of the delivery reliability.

2.3 IDENTIFIED LITERATURE GAP

There are a lot of research have been conducted in the same case organization/ Ethiopian but they have not focused on E- procurement practice and its effect on the operational performance. The followings are the studs which were conducted in the Ethiopian. Asrat Adamu (2017) examined the role of strategic sourcing in operational performance of the organization and concluded that rationalization of supply base highly affects the operational performance of ET-MRO and followed by supplier relationships management, supply chain improvement, and contract management at the end. Daniel Baye (2017) examined the effects of inventory management practices on organizations operational performances and revealed that organization has good infrastructure, IT technology and have support from the management. However, demand uncertainty, inefficient internal process and Lack of awareness are the challenges in implementing the inventory management practice in ET. Fasil Birru (2017) examined the effect of strategic sourcing practice on operational efficiency and concluded that in order to overcome and be competent on the existing market leadership challenge that Ethiopian is facing, working on and improving the level of strategic sourcing practice will enable the Airline to improve its internal operational efficiency and can be able to achieve its plan. Million Wondimu (2017) examined the role of maintenance repair overhaul supply chain management in an operational and organizational performance and revealed that SCM practice in ET-MRO facility affect both operational and SCM related organizational performances. Samuel Temesgen (2017) examined the effects of sourcing strategy on outbound logistics performance and concluded that due to the misalignment between sourcing and outbound logistics sections, the later sections performance is highly affected and sequentially resulting in Ethiopian paying 450,000 USD every year in the form of late return penalty. Andinet Girma (2018) examined the role of maintenance, repair and overhaul supply chain integration and inventory management in flight dispatch reliability and revealed that internal integration among MRO functions and external integration with suppliers are vital for the overall performance of Ethiopian MRO division and thereby improving flight dispatch reliability. In addition, currently the level of integration between component maintenance and line maintenance, schedule base maintenance and line maintenance needs high attention. Charenet Tesema (2018) examined the role of achieving competitive excellence operating system implementation on company's internal supply chain integration and concluded that the study signified a better understanding on the roles of Achieving Competitive Excellency (ACE) operating tools on the company's internal supply chain integration. In addition, according to the Federal Public Procurement & Property Administration Agency, Ethiopia (2018) E-procurement

has never been implemented in Ethiopian public procurement as a country level. Furthermore, E-Procurement related literatures those have been previously conducted were reviewed. Among those; Teo and Lai (2009) who examined E-procurement practices and financial performance but the study did not address operational performance. Purchase and Dooley (2010) who focused on E-procurement adoption but the study did not incorporate aspects of operational performance. Smart (2010) examined the effect of E-procurement on the supply market and (Mikalef et al, 2013) studied procurement alignment on SCM performance. Matunga, Nyanamba and Okibo (2013) who examined E-procurement practice and effective procurement in communal health center and not on Airlines. Avedi (2016) who studied E-procurement on organizational performance and not operational performance and airlines. Munmun Basak and Indranil Guha (2016) Examined achieving E-procurement benefits in an aviation MRO environment and encouraged MRO businesses to adopt E-procurement to a large extent and also suggested for further research to extended to other business domain and more complex environment to enhance performance through E-procurement. Masheti (2016) focused on E-procurement practice and operational performance of pharmaceutical firms while Odero and Ayub (2017) concentrated on procurement performance of communal sugar firms. Munyao and Moronge (2018) focused on E-procurement practices in the procurement departments of public universities and not on Airlines industries. Michael Musyoki (2018) examined the effect of E-procurement practices on the operational performances of manufacturing firms not on Aviation industry.

However, as it has been mentioned in the statement of the problem there are actual problems related with procurement activates such as long sourcing and bidding process, too much past due payment penalty fees and wrong payment, long maintenance schedule and turnaround time, losing potential suppliers.

This is therefore, since there is no conducted study regarding E-procurement practice in Ethiopian airline MRO and problems related with procurement activates exist, this study focused on the practices of e-procurement and its effect on the Ethiopian airlines group MRO operational performance.

2.4 CONCEPTUAL FRAMEWORK OF THE STUDY

Based on the reviewed theoretical and empirical literature, the researcher has adapted that E-Tendering, E-Ordering, E-invoicing, E-Sourcing, E-Payment as an independent variable and the three important operational metrics for the aviation MRO which are cost, quality and delivery are used as a dependent variable.

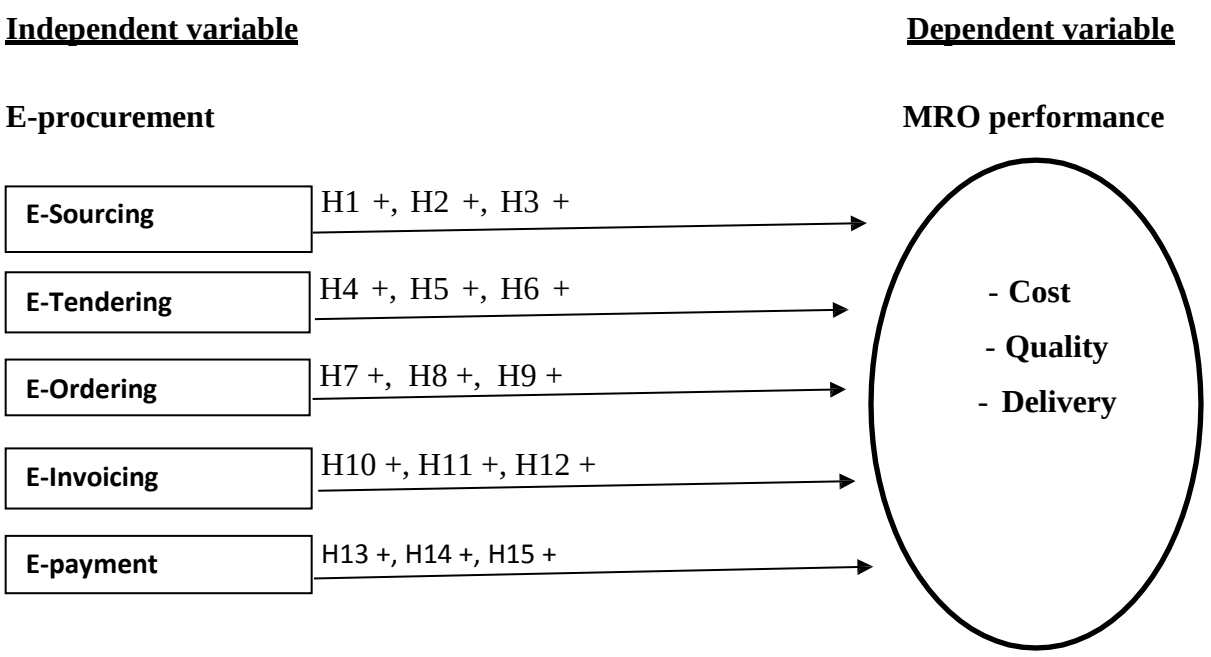


Figure 2.2: The conceptual framework has been adapted from Michael Musyoki (2018)

CHAPTER THREE
METHODS OF THE STUDY
INTRODUCTION

This chapter presents the research design and method of the study. The specific items covered in this chapter are research design, population and sample of the study, data collection methods and analysis, data presentation methods, reliability analysis and diagnostic tests.

3.1 RESEARCH DESIGN

Research design is the plan and structure of investigation conceived to obtain answers to research questions that includes an outline of the research work from hypothesis, methods and procedures for collecting and analyzing data and presenting the results in a form that can be understood by all (Mugenda, O.M. and Mugenda, A.G. 2003). When the focus is on cause-effect relationships, the study can be explanatory explaining which causes produce which effects (Yin, 1994). In this study, both descriptive and explanatory research design have been used**.**

3.2 RESEARCH APPROACH

Based on the data research can be designed qualitative, quantitative and mixed research (Matiwos E, Berhanu D & Abdurezak M, 2014). Qualitative research is an approach for exploring and understanding the meaning individuals or groups ascribe to a social or human problem. Quantitative research is an approach for testing objective theories by examining the relationship among variables. Mixed methods research is an approach to inquiry involving collecting both quantitative and qualitative data, integrating the two forms of data, and using distinct designs that may involve philosophical assumptions and theoretical frame works. In this study, both qualitative and quantitative approach have been applied.

3.3 POPULATION AND SAMPLING DESIGN

3.3.1. Population

A population is defined as a complete set of individual cases or objects with some common observable characteristics (Mugenda, O.M. and Mugenda, A.G 2012). This study focused on Ethiopian MRO division management members (Managers and Directors), all Procurement and Supply Chain Management (P&SCM) team and Finance (Manager Payables Control and Disbursement) team. Since other employees of MRO are dedicated only on a day-to-day task-level activates and they are unable to evaluate the overall performance of Ethiopian MRO and procurement practice. Whereas, The P&SCM team members have the expertise and exposure about the procurement practice and it makes them the right sources of the research. In addition, the Finance (Manager Payables Control and Disbursement) have more exposure regarding the payment process of MRO related purchases. In addition, MRO division Managers and Directors have detail exposure about procurement practice and MRO performance since they have a bird view on the MRO performance and procurement practices as well as they have a day-to-day communication with procurement team and engaged in bid and sourcing activates as well.

According to Ethiopian Human Resource January 2020-employee record, An Ethiopian P&SCM has 214 employees, MRO has 42 Management members (5 Directors and 37 Managers) and Finance (Manager Payables Control and Disbursement) team has 37 employees who are considered as valid target population of the study. Hence, the target population of the study is a total of 293 employees from the P&SCM, Finance and MRO (N=293).

3.3.2. Sampling design

Sampling design involves selecting some of the elements in a population from which a researcher may draw conclusions about the whole population. The sample frame of the study (list of the employees in the organizations) was obtained from the procurement and SCM department.

3.3.3. Sampling frame

The study-sampling frame is the list of the study target population, from where the study selected the sample size (Kothari, 2008). A sampling frame is the list of elements from which the sample

is actually drawn (Ngechu, 2004). The sampling frame was obtained from list of staffs from MRO, Finance and procurement and SCM departments.

3.3.4. Sampling technique

Depending on the nature of a population and the information desired through sampling from it, there are many ways in which the sample may be drawn (Schreuder et al., 1993). Select the respondents who have direct exposure and more concern with Procurement, payment and MRO helped to get supportive data for this research.

In this study, simple random sampling from probability sampling design was used specifically by using the random number table for the prepared questioner but nun probability sampling design specifically purposive sampling was applied for the semi-structured interview questions.

3.3.5. Sample size

The Taro Yamane's (1967) sampling formula was used to determine the sample size for the study at 10% acceptable error.

n = N / [1+N (e) ^2]

Where: n = sample size

N = population size (the universe)

e = level of precision /sampling error (usually .10, .05 and .01 acceptable error)

^ = raised to the power of

Accordingly, from the total 293 populations the researcher approached 125 respondents.

Table 3. 1: Sample Size Determination

Departments	**Population**	**Sample**
P& SCM	214	68
MRO Managers and Directors	42	30
Manager Payables Control and Disbursement	37	27
Total	293	125

Source: Ethiopian HR employee record (January 2020)

3.4 DATA COLLECTION METHOD

The procedure used to collect data was influenced by the research instruments used (Kombo& Tromp, 2006). The task of data collection begins after research problem and research design have been defined (Kothari, 2004). In this study, only primary data was gathered.

The data has been gathered through two major ways (Questionnaire Surveys and Semi-Structured Interview). Semi-structured interview has been conducted with three (3) directors under MRO including P&SCM director. Therefore, among the total 125 sample size three (3) respondents had been interviewed and the remaining 122 respondents has been approached to fill the questionnaire survey which has been distributed at their working offices. The drop-and- pick- later method was used.

3.5 DATA ANALYSIS METHODS

The purpose of data analysis was to prepare raw data for presentation and statistical inference (Kombo& Tromp, 2006). Data for this study has been analyzed by using both descriptive statics (such as mean and standard deviation) and inferential statistics (such as multiple liner regression and diagnostic tests by using the software called STATA-14).

3.6 RELIABILITY AND VALIDITY TEST

3.6.1 Validity

Bryman & Bell (2007) defined validity as how much any measuring instrument measures what it is intended to measure. They also suggest that the important issue of measurement validity relates to whether measures of concepts really measure the concept or not. There are several ways of establishing validity such as content validity; convergent validity concurrent; predictive validity; construct validity; and convergent validity.

This study addressed the content validity through the review of literature and adapted instruments used in previous studies of Aitken et al., (2002), Barasa, Namusonge &Fredrick, (2017) and Michael Musyokl Kiusya , (2018).

3.6.2 Reliability Test

Reliability refers to the consistency of scores obtained by the same individuals when re-examined with the same test on different occasion, or with different sets of equivalent times, or under other variable examining condition. (Anastasi, 1982)

In this study, the questioner had been tested by pilot test prior to distributing the survey to the actual survey participants to ensure its reliability. In addition, the reliability has been tested by using Cronbach's alpha statistics and the result presented in table 3.3 below.

A commonly accepted rule of thumb for describing internal consistency using Cronbach's alpha is as follows (George and Mallery, 2003).

Table 3. 2: Cronbach's alpha statistics rule

Cronbach's alpha	**Internal Consistency**
$\alpha \geq 0.9$	Excellent
$0.8 \leq \alpha \leq 0.9$	Good
$0.7 \leq \alpha \leq 0.8$	Acceptable
$0.6 \leq \alpha \leq 0.7$	Questionable
$0.5 \leq \alpha \leq 0.6$	Poor
$\alpha \leq 0.5$	Unacceptable

Source: George and Mallery, (2003)

The below table 3.3 Shows that Cronbach alpha figures of 0.7253, 0.9130, 0.8750, 0.8416, 0.8734, 0.7609, 0.7372, 0.8923 and 0.9259 are greater than the recommended threshold of 0.7. This indicated that the questioner was reliable.

Table 3. 3: Reliability test result

Variable	**Cronbach Alpha**	**Number of items**
E-Sourcing	0.7253	5
E-Tendering	0.9130	6
E-Ordering	0.8750	7
E-Invoicing	0.8416	5
E-Payment	0.8734	4
Cost	0.7609	6
Quality	0.7372	5
Delivery	0.8923	5
Overall	**0.9259**	**43**

Source: Research data (2020)

3.7 ETHICAL CONSIDERATION

Considering the relevance of ethics in research work, ethical issues shall be considered. To this effect, the researcher let the respondent knew that the questioner is only for academic purpose and it is highly confidential. In addition, the questioner has been filled based on the respondents' willingness. The analysis has been done based on the explicit response of the participants.

3.8 DIAGNOSTIC TESTS

Diagnostic tests are tested and presented here below. The following diagnostic tests result shows that the data does not violate assumptions of regression analysis. The data which was used to test the diagnostic and regression analysis was summarized and presented as Annex II.

3.8.1. Normality Test

Normality test has been conducted by using Shapiro-Wilk test and the result shows that the P values of X1, X2, X3, X4 and X5 were 0.52219, 0.53372, 0.06427, 0.14289 and 0.12250 that are greater than 0.05 and it indicates that the data is normally distributed.

Table 3. 4: Normality test

Shapiro-Wilk W test for normal data

Variable	Obs	W	V	z	Prob>z
X1	103	0.98848	0.975	-0.056	0.52219
X2	103	0.98863	0.963	-0.085	0.53372
X3	103	0.97658	1.982	1.520	0.06427
X4	103	0.98090	1.617	1.067	0.14289
X5	103	0.98006	1.687	1.163	0.12250

Where;

X1= E-Sourcing

X2= E- Tendering

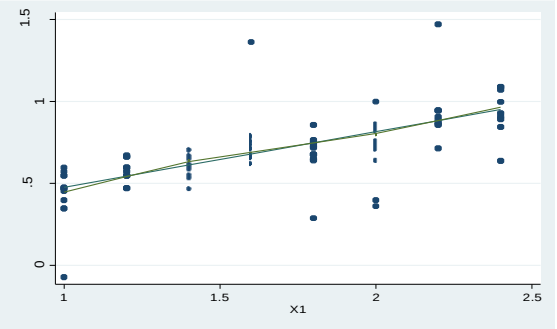
X3= E- Ordering

X4= E-Invoicing

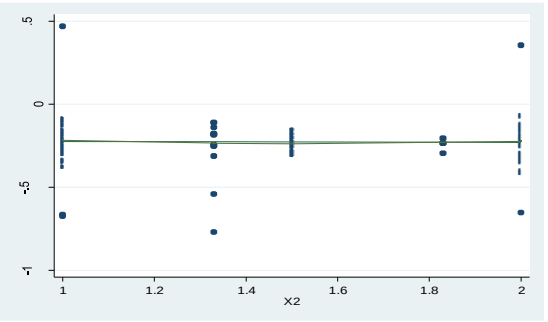
X5= E-Payment

3.8.2. Linearity Test

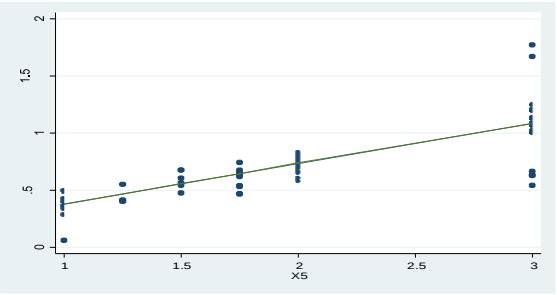
Linearity has been tested by using acprplot graph and the result are shown in the below plot. As per the result, in the following plot the smoothed line is closely to the ordinary regression line. This is therefore, there is no nonlinearity problem.



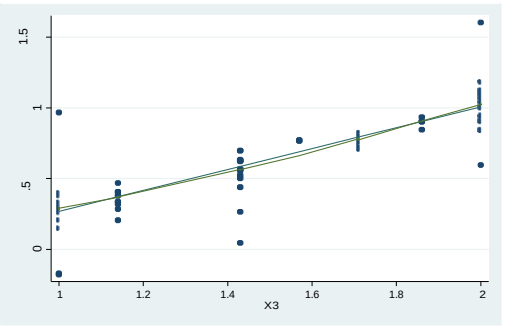
Plot 1: E-Sourcing



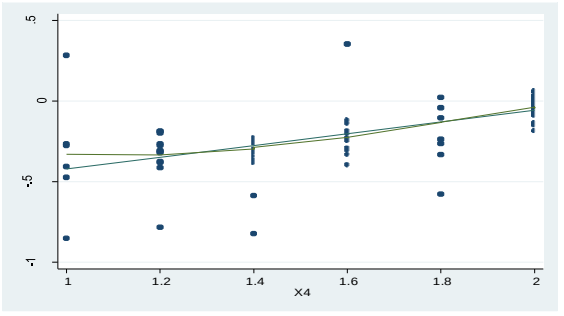
Plot 2: E-Tendering



Plot 5: E-Payment



Plot 3: E-Ordering



Plot 4: E-Invoicing

Where; X1: E – Sourcing

X2: E – Tendering

X3: E – Ordering

X4: E – Invoicing

X5: E – Payment

3.8.3. Multicollinearity Test

As per the variance inflation factor (VIF) findings in table 4.14, all the VIF values are less than 10. It indicates that there is no multicollinearity problem. Which means in this study, the assumption of multicollinearity has not been violated.

Table 3. 5**: Multi-collinearity Test**

Variable	VIF	1/VIF
X3	8.82	0.113424
X2	8.79	0.113779
X4	1.21	0.828080
X1	1.14	0.875449
X5	1.11	0.899007
Mean VIF	4.21	

3.8.4. Heteroscedasticity Test

The White tests have been used to test heteroscedasticities and results presented in the table tables 4.15, 4.16, and 4.17 below. According to the findings listed in the test result the P-value for the models (0.0131, 0.000 and 0.0035), all are less than from the significant level of 0.05. It shows that there is no heteroscedastic problem.

3.8.4.1. White test for E-procurement practices and cost

Table 3. 6: White test for E-procurement practices and cost

White's test for Ho: homoskedasticity
against Ha: unrestricted heteroskedasticity

chi2(20) = 36.5
Prob > chi2 = 0.013

Cameron & Trivedi's decomposition of IM-test

Source	chi2	df	p
Heteroskedasticity	36.58	20	0.0131
Skewness	8.27	5	0.1421
Kurtosis	1.55	1	0.2130
Total	46.40	26	0.0082

3.8.4.2. White test for E-procurement practices and quality

Table 3. 7: White test for E-procurement practices and quality

White's test for Ho: homoskedasticity
against Ha: unrestricted heteroskedasticity

chi2(20) = 56.44
Prob > chi2 = 0.0000

Cameron & Trivedi's decomposition of IM-test

Source	chi2	df	p
Heteroskedasticity	56.44	20	0.0000
Skewness	1.39	5	0.9258
Kurtosis	4.70	1	0.0302
Total	62.53	26	0.0001

3.8.4.3. White test for E-procurement practices with delivery

Table 3. 8**:** White test for E-procurement practices and delivery

White's test for Ho: homoskedasticity
against Ha: unrestricted heteroskedasticity

chi2(20) = 41.25
Prob > chi2 = 0.0035

Cameron & Trivedi's decomposition of IM-test

Source	chi2	df	p
Heteroskedasticity	41.25	20	0.0035
Skewness	13.84	5	0.0167
Kurtosis	1.08	1	0.2990
Total	56.17	26	0.0005

CHAPTER FOUR
DATA ANALYSIS, RESULT AND DISCUSSIONS
INTRODUCTION

This chapter discusses data collection and data analysis of the study. It carefully presents the result of the response rate, demographic analysis and descriptive statics on E-procurement practices and MRO performances. The chapter further gives results of the regression analysis and finally the interpretation of the study results.

4.1 DATA PRESENTATION AND ANALYSIS

The assessment of this study is based on the sample of 122 respondents for the questioner survey. The researcher was able to collect only 103 completely filled questionnaires but the remaining 19 respondents were unable to fill the questioner. In addition, an interview was conducted with three (3) management staffs those are; Dir. Procurement and supply chain management, Dir. Component maintenance and Dir. Engine Maintenance. This is therefore, the study managed to have 84.43% response rate and this was sufficient for the study.

4.2 DEMOGRAPHY CHARACTERISTIC

This section discusses the demographic characteristics of the respondents. This includes the gender, age, experience and level of education.

4.2.1. Gender of the respondents

Table 4.1: Gender

Gender	**Frequency**	**Percent**
Male	71	68.93
Female	32	31.07
Total	**103**	**100**

Source: Research data (2020)

The gender results on table 4.1. Show that 68.93 % of the respondents were male while 31.07% of the respondents were female. The result indicates that most of the respondents were male.

4.2.2. Age of the respondents

Table 4.2: Ages

Age	**Frequency**	**Percent**
From 21 to 29	61	59.22
From 30 to 39	23	22.33
From 40 to 49	16	15.53
From 50 to 59	3	2.91
Total	**103**	**100.00**

Source: Research data (2020)

The age results on table 4.2. Show that 59.22% of the respondents were from 21 to 29 years, 22.33% of the respondents were from 30 to 39 years, 15.53 % of the respondents were from 40 to 49 years and the remaining 2.91% of the respondents were from 50 to 59 years. The result indicates that most of the respondents were found from 21 to 29 years old.

4.2.3. Work experience of the respondent

Table 4.3: Work Experience

Work experience	**Frequency**	**Percent**
Less than or equal to 5 years	43	41.75
Between 6 to 10 years	24	23.30
Between 11 to 15 years	16	15.53
Between 16 to 19 years	11	10.68
20 and Above years	9	8.74
Total	**103**	**100.00**

Source: Research data (2020)

The work Experience results on table 4.3. show that 41.75% of the respondents were Less than or equal to 5 years, 23.30% of the respondents were Between 6 to 10 years, 15.53 % of the respondents were Between 11 to 15 years, 10.68 % of the respondent were Between 16 to 19 years and the remaining 8.74% of the respondents were 20 and above years. The result indicates that the great number of respondents (58.25%) were above six years of working experience. It indicates that the respondents were seniors and they had a good level of understanding and provided reliable response for the questioner.

4.2.4. Education level of the respondents

Table 4. 4: Education level

level of Education	**Frequency**	**Percent**
Masters	16	15.53
Bachelors	83	80.58
Diploma	4	3.88
Total	**103**	**100.00**

Source: Research data (2020)

The Education level results on table 4.4. show that 15.53% of the respondents were master, 80.58% of the respondents were bachelors and the remaining 3.88% of the respondents were diploma. The result indicates that greater than 95% of the respondents had good level of education. It indicates that the respondents had a good level of understanding and provided reliable response for the questioner.

4.3 EXTENT OF ADOPTION OF E-PROCUREMENT PRACTICES

One of the objective of the study was to assess the E-procurement (E-Sourcing, E-Tendering, E-Ordering, E-Invoicing and E-Payment) practices of the Ethiopian Airlines Group. The respondents were required to indicate on a Likert scale of 1-5 where: 1= No extent, 2= Small extent, 3= Moderate extent, 4= Large extent and 5= very large extent.

However, the computed mean scores were interpreted using the key stated in table 4.5 below:

Table 4. 5:Interpretation Scale

Scale	**Interpretation**
1.00-1.4999	No extent
1.50-2.4999	Small extent
2.50-3.4999	Moderate extent
3.50-4.4999	Large extent
4.50-5.000	Very large extent

Source: Samuel Kinyanjui (2017)

4.3.1. E-Sourcing

The adoption of E-sourcing practice has been analyzed and the result are displayed in table 4.6 below.

Table 4. 6: E-Sourcing practice

Statement	**Mean**	**St. deviation**
The organization has vendor management platform	1.398058	0.5484346
The organization has a list of pre-qualified suppliers who have online access	1.679612	0.6137891
The organization uses online search engines/part locators	2.563107	0.903912
The organization receive online notifications from different Suppliers	1.514563	0.5577278
The organization uses an E-sourcing Software	1.213592	0.4118463
Overall mean	**1.6737864**	

Source: Research data (2020)

Table 4.6 result shows that the organization uses online search engines/part locators to a moderate extent as indicated by the mean values of 2.563107. Further, the result shows that the organization has a list of pre-qualified suppliers who have online access and receive online notifications from different suppliers to a small extent as indicated by the mean values of 1.679612 and 1.514563 respectively. However, the result shows that no extent for vendor management platform and E-sourcing Software as indicated by the mean values of 1.398058 and 1.213592 respectively. The overall mean of 1.6737864 indicates that e-sourcing was adopted by the organization to a small extent.

In addition, according to the conducted interview analysis result it has been stated that there is no adopted vendor management platform and E-sourcing software by the organization. Further, the respondent pointed out that notifications from manufacturers and service providers with their yearly seals catalogue price and part upgrade information had been receipt and it helps the organization to plan and act accordingly.

4.3.2. E-Tendering

The adoption of E-Tendering practice has been analyzed and the result are displayed in table 4.7 below.

Table 4. 7: E- Tendering practice

Statement	**Mean**	**St. deviation**
The organization prepares and publishes tenders online	1.475728	0.5018526
The organization has data management software	1.485437	0.5022318
The organization does online screening and selections of supplier	1.466019	0.5012833
The organization has an internet based system that keeps historical bid submissions	1.330097	0.4725473
The organization has online contract signature and documentation	1.407767	0.4938225
The organization does online supplier performance assessment	1.495146	0.5024213
Overall mean	**1.443366**	

Source: Research data (2020)

As per the analysis result indicated in table 4.7 above, the organization was not preparing and publishing tenders online, had not data management software, had not online screening and

selections of supplier, had no an internet based system that keeps historical bid submissions, had no online contract signature and documentation and online supplier performance assessment, as indicated by the mean values of 1.475728, 1.485437, 1.466019, 1.330097, 1.407767 and 1.495146 respectively. The overall mean of 1.443366 indicates that the adoption of E-tendering practice by the organization is no extent.

Besides, as per the conducted interview, it has been mentioned that the organization had not been screening online and publish tenders online. In addition, it has been explained that the organization procurement policy and procedures not considered e-procurement especially E-tendering. As per the Ethiopian airlines group procurement policy, online bidding and tendering is not allowed. As a result, each single bid project has been completed within a minimum of four months and it is a challenges for the MRO operation.

4.3.3. E-ordering

The adoption of E-ordering practice has been analyzed and the result are displayed in table 4.8 below.

Table 4. 8: E-ordering practices

Statement	**Mean**	**St. deviation**
The organization uses an online order management system	1.330097	0.4725473
The organization has online suppliers stock information	1.563107	0.498427
The organization has online order information history	1.563107	0.498427
The organization has online inspection-receiving platform	1.475728	0.5018526
The organization has automated inventory monitoring system	1.902913	0.7607345
The organization allows suppliers to have real time online access to its stock information	1.271845	0.4470859
The organization has online claiming process for defected parts/shipment	1.436893	0.498427
Overall mean	**1.506241**	

Source: Research data (2020)

Table 4.8. indicates that the organization has automated inventory monitoring system, has online order information history and online suppliers stock information to a small extent as indicated by the mean values of 1.902913, 1.563107and 1.563107 respectively. However, the result shows that no extent for the online order management system, online inspection-receiving platform, real time online access to its stock information and online claiming process for defected parts/shipment as indicated by the mean values of 1.330097, 1.475728, 1.271845 and 1.436893 respectively. The overall mean of 1.506241 indicates that e-ordering is adopted by the organization to a small extent.

As per the interview questions result, it has been discussed that E- ordering practice is being improved due to the fact that Ethiopian airlines group has adopted paperless. In addition, it facilitates and improves the approvals process.

4.3.4. E-Invoicing

The adoption of E-invoicing practice has been analyzed and the result are displayed in table 4.9 below.

Table 4. 9: E-invoicing practice

Statements	**Mean**	**St. deviation**
The organization is currently using automatic overdue invoice Reminder	1.417476	0.4955542
The organization is currently using online invoice processing	1.436893	0.498427
The organization is currently accessing its supplier's invoice Online	1.475728	0.5018526
The organization has the invoice verification software	1.466019	0.5012833
The organization has centralized and common platform to receive invoices	2.456311	0.7109328
Overall mean	**1.650485**	

Source: Research data (2020)

Table 4.9 shows that the organization has receiving invoice standard format to a small extent as indicated by the mean value of 2.456311. However, the result shows no extent for using automatic overdue invoice reminder, online invoice processing, accessing its supplier's invoice online and having invoice verification software as indicated by the mean values of 1.417476, 1.436893,

1.475728 and 1.466019 respectively. The overall mean of 1.650485 indicates that e- invoicing is adopted by the organization to a small extent.

Further, as per the interview result, the invoices are being received through soft copy via email and the approval is through system /workflow and it helps the organization to minimize approval time and minimize re-works. However, it has been stated that there is no automatic overdue invoice remainder and invoice verification softer.

4.3.5. E-payment

The adoption of E-payment practice has been analyzed and the result are displayed in table 4.10 below.

Table 4. 10: E-payment practice

Statements	**Mean**	**St. deviation**
The organization ensures that suppliers have access to their online supply account 24/7	1.660194	0.4759593
The organization uses online bank/wire transfers to make Payments	2.31068	0.7279992
The organization is currently using online payment notification	2.378641	1.164142
The organization has a centralized electronic data retaining Platform	1.970874	0.809942
Overall mean	**2.080097**	

Source: Research data (2020)

Table 4.10 result shows that the organization used online payment notification, used online bank/wire transfers to make payments, had a centralized electronic data retaining and ensures that suppliers have access to their online supply account 24/7 to a small extent as indicated by the mean values of 2.378641, 2.31068, 1.970874 and 1.660194 respectively. The overall mean of 2.080097 indicates that e-payment is adopted by the organization to a small extent.

As per the interview, it has been recognized that the organization is making payment through wire transfer. However, the online payment-retaining platform had not been applied for all new and long-term partners.

4.3.6. Summary of adoption of E-procurement

The adoption of e-procurement practice analysis result has been summarized and depicted by table 4.11 below.

Table 4. 11: The summary of adoptions of e-procurement practices

E-procurement practices	**Mean**	**Rank**
E-Sourcing	1.673786	2
E-Tendering	1.443366	5
E-Ordering	1.506241	4
E-Invoicing	1.650485	3
E-Payment	2.080097	1
Overall mean for E-procurement	**1.670795**	

Source: Research data (2020)

The result on table 4.11. shows that E-sourcing, E-ordering, E-invoicing and E-Payment were adopted by the Ethiopian airlines group to a small extent as indicated by the mean values of 1.673786, 1.506241, 1.650485 and 2.080097 respectively. However, the result shows that no extent for E- tendering as indicated by the mean values of 1.443366. Further, the result shows that the organization adopted E-procurement to a small extent as it indicated the overall mean value of 1.670795**.**

According to the interview analysis result, the organization has improved the approval process since it is applying paperless. In addition, using online search engines/part locators, receiving online notifications from different suppliers, having online suppliers stock information and having online order information history are recognized as a good E-procurement practice of the organization and it helped the organization to reduce cost, improve part availability and reduce incompliance. However, it has been explained that the organization procurement policy and procedures not considered E-tendering. In addition, the organization had not adopted vender management platform and automatic overdue invoice remainder.

4.4 OPERATIONAL PERFORMANCE

The other objectives of the study were to determine the effects of e-procurement (E-sourcing, E-tendering, E-ordering, E-invoicing and E-payment) practices on the Ethiopian MRO operational performance. The effects have been analyzed on the regression analysis part of the study. Also, the Ethiopian MRO performance in terms of cost, quality and delivery have been discussed here in table 4.12 below.

Table 4. 12: The Ethiopian MRO Performance

	Statement	**Mean**	**St. dev**
Cost	The organization has reduced AOG cost and expedite fee	3.9223	0.9041
	The organization has reduced penalty fees because of past due invoices and late core returns	3.1553	0.7243
	The organization has acquired products at reasonable cost	3.8155	0.7242
	The organization has reduced maintenance cost	2.8835	0.6152
	The organization has reduced inventory carrying cost	3.6990	0.7648
	The organization has reduced disposal cost	3.5825	0.7736
	Overall mean	**3.5097**	
Quality	The organization has standardized documentation which assured quality	3.9612	0.7912
	The organization has reduced re-work	3.5049	0.5752
	The organization has reduced the level of quality defects	4.0679	0.7176
	The organization has provided world-class maintenance service	3.5534	0.6963
	The organization has reduced the part removal rates	2.8835	0.6903
	Overall mean	**3.5942**	
Delivery	The organization has improved availability of parts	4.5243	0.6238
	The organization has reduced lead time	3.6117	0.7571
	The organization has reduced aircraft on ground time	4.4660	0.6389
	The organization has reduced components maintenance TAT	4.0971	0.6933
	The organization has reduced aircraft maintenance TAT	4.5049	0.6243
	Overall Mean	**4.2408**	
Overall Mean for Operational performance		**3.7816**	

Source: Research data (2020)

The table 4.12 shows that the organization has reduced aircraft on ground cost and expedite fee, acquired products at reasonable cost, reduced inventory-carrying cost and reduced disposal cost to a large extent as indicated by the mean values of 3.92233, 3.815534, 3.699029 and 3.582524. The result also shows that the organization has reduced penalty fees because of past due invoices and late core returns and reduced maintenance cost to a moderate extent as indicated by the mean values of 3.15534 and 2.883495 respectively. The overall mean of 3.509708 indicates that the Ethiopian MRO operational performance in terms of cost was large.

The findings also show that the organization has standardized documentation which assured quality, reduced re-work, reduced the level of quality defects and provided world-class maintenance service to a large extent as indicated by the mean values of 3.961165, 3.504854, 4.067961 and 3.553398 respectively. In addition, the result shows that the organization has reduced the part removal rates to a moderate extent as indicated by the mean value of 2.883495. The overall mean of 3.5941746 indicates that the Ethiopian MRO operational performance in terms of quality was large.

The result further indicates that the organization has improved availability of parts, reduced aircraft on ground time and reduced aircraft maintenance turnaround time to a very large extent as indicated by the mean values of 4.524272, 4.466019 and 4.504854 respectively. Moreover, the result shows that the organization has reduced lead time and reduced components maintenance turnaround time to a large extent as indicated by the mean values of 3.61165 and 4.097087 respectively. The overall mean of 4.2407764 indicates that the Ethiopian MRO operational performance in terms of delivery was large.

Furthermore, the result shows that the Ethiopian MRO overall operational performance was large as indicated by its overall mean value of 3.781553.

4.5 REGRESSION ANALYSIS

To test the fifteen hypotheses three multiple linear regression analysis has been regressed and its result has been presented and discussed as follows:

4.5.1. Regression analysis for The E-procurement practices and cost

The five hypotheses related with cost were,

H 1: E-sourcing positively and significantly affects Ethiopian MRO performance in terms of cost.
H 4: E-tendering positively and significantly affects Ethiopian MRO performance in terms of cost.
H 7: E-ordering positively and significantly affects Ethiopian MRO performance in terms of cost.
H10: E-Invoicing positively and significantly affects Ethiopian MRO performance in terms of cost.
H13: E-Payment positively and significantly affects Ethiopian MRO performance in terms of cost.

Then, the null hypothesis are postulated;

H01: E-sourcing does not positively and significantly affects Ethiopian MRO performance in terms of cost.
H04: E-tendering does not positively and significantly affects Ethiopian MRO performance in terms of cost.
H07: E-ordering does not positively and significantly affects Ethiopian MRO performance in terms of cost.
H010: E-Invoicing does not positively and significantly affects Ethiopian MRO performance in terms of cost.
H013: E-Payment does not positively and significantly affects Ethiopian MRO performance in terms of cost.

To test how E-procurement practice affects MRO performance in terms of cost, multiple regression has been analyzed and the findings are indicated in table 4.18.

Table 4.13: Regression analysis for The E-procurement practices and cost

Source	SS	df	MS	Number of obs = 103
				F(5,97) = 555.69
Model	25.6406351	5	5.12812702	Prob > F = 0.0000
Residual	.895149177	97	.009228342	R-squared = 0.9663
				Adj R-squared = 0.9645
Total	26.5357843	102	.260154748	Root MSE = .09606

Y1	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
X1	.3984675	.0234317	17.01	0.000	.351962	.4449731
X2	.1990082	.0681285	2.92	0.004	.063792	.3342243
X3	.5436488	.0699265	7.77	0.000	.4048641	.6824335
X4	.3619637	.0318042	11.38	0.000	.2988412	.4250863
X5	.3809752	.0141661	26.89	0.000	.3528594	.4090909
_cons	.347167	.0808357	4.29	0.000	.1867306	.5076035

Source: Research data (2020)

Dependent variable: Y1 = Cost

Independent variable: X1=E-sourcing, X2=E-Tendering, X3=E-Ordering, X4= E-Invoicing and X5=E-Payment

The R-square value of 0.9663 shows that the independent variables E-procurement (E-sourcing, E-tendering, E-ordering, E-invoicing and E-payment) accounted for 96.63% of the variation in the dependent variable (Cost). The P-value is 0.000< 0.05. it indicates that the regression model is fit and significant. As per the result, the effect of E-Sourcing, E- tendering, E-ordering, E-invoicing and E-payment on cost were positive and significant since its P values (0. 000, 0.004, 0.000,0.000 and 0.000 respectively) are less than 0.05 and also its coefficients ($\beta 1$ =0.3984675, $\beta 2$ =0.1990082, $\beta 3$ =0.5436488, $\beta 4$ =0.3619637 and $\beta 5$ =0.3809752) respectively are positive.

These regression model presented as follows:

Y1=0.347167+0.3984675X1+0.1990082X2+0.5436488X3+0.3619637X4+0.3809752X5

Where: Y1= cost, X1= E-sourcing, X2=E-tendering, X3=E-ordering, X4=E-invoicing and X5=E-payment.

The result implies that a unit change in E-sourcing, E-tendering, E-ordering, E-invoicing and E-payment results 0.3984675, 0.1990082, 0.5436488, 0.3619637, 0.3809752 respectively unit increase in cost performance of Ethiopian MRO.

This is therefore, the all five null hypothesis (H01, H04, H07, H010 and H013) have been rejected. As a result, the first assumptions (H1, H4, H7, H10 and H13) have been supported by this study.

4.5.2. The E-procurement practices and quality

The second five hypotheses which were related quality,

H 2: E-sourcing positively and significantly affects Ethiopian MRO performance in terms of quality.

H 5: E-tendering positively and significantly affects Ethiopian MRO performance in terms of quality.

H 8: E-ordering positively and significantly affects Ethiopian MRO performance in terms of quality.

H11: E-Invoicing positively and significantly affects Ethiopian MRO performance in terms of quality.

H14: E-Payment positively and significantly affects Ethiopian MRO performance in terms of quality.

Then, the null hypothesis are postulated;

H02: E-sourcing does not positively and significantly affects Ethiopian MRO performance in terms of quality.

H05: E-tendering does not positively and significantly affects Ethiopian MRO performance in terms of quality.

H08: E-ordering does not positively and significantly affects Ethiopian MRO performance in terms of quality.

H011: E-Invoicing does not positively and significantly affects Ethiopian MRO performance in terms of quality.

H014: E-Payment does not positively and significantly affects Ethiopian MRO performance in terms of quality.

To test how E-procurement practice affects MRO performance in terms of quality, multiple regression has been analyzed and the findings are indicated in table 4.19.

Table 4.14: Regression Result for E-procurement practices and quality

Source	SS	df	MS		
Model	21.8477587	5	4.36955173	Number of obs	= 103
Residual	2.34874524	97	.024213868	F(5, 97)	= 180.46
				Prob > F	= 0.0000
				R-squared	= 0.9029
Total	24.1965039	102	.237220626	Adj R-squared	= 0.8979
				Root MSE	= .15561

Y2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
X1	.3417613	.0379555	9.00	0.000	.2664301	.4170924
X2	.029153	.1103567	0.26	0.792	-.1898746	.2481806
X3	.6437935	.1132692	5.68	0.000	.4189854	.8686015
X4	.3759846	.0515175	7.30	0.000	.2737366	.4782326
X5	.3537489	.0229467	15.42	0.000	.308206	.3992917
_cons	.6544348	.1309403	5.00	0.000	.3945546	.914315

Source: Research data (2020)

Dependent variable: Y2 = Quality

Independent variable: X1=E-sourcing, X2=E-Tendering, X3=E-Ordering, X4= E-Invoicing and X5=E-Payment

The R-square value of 0.9029 shows that the independent variables E-procurement (E-sourcing, E-tendering, E-ordering, E-invoicing and E-payment) accounted for 90.29% of the variation in the dependent variable (Quality). The P-value is 0.000 < 0.05. it indicates that the regression model is fit and significant. As per the result, the effect of E-Sourcing, E-ordering, E-invoicing and E-payment on quality were positive and significant since its P values (0.000, 0.000, 0.000 and 0.000 respectively) are less than 0.05 and its coefficients ($\beta 1$ =0.3417613, $\beta 3$ =0.6437935, $\beta 4$ =0.3759846 and $\beta 5$ =0.3537489) respectively are positive. While the effects of E-Tendering on

quality was positive but insignificant since its P-value is 0.792 > 0.05 and its coefficient β2=0.029153.

This regression model presented as follows.

Y2=0.6544348+0.3417613X1+0.029153X2+0.6437935X3+0.3759846 X4+0.3537489X5

Where: Y2= Quality, X1= E-sourcing, X2=E-tendering, X3=E-ordering, X4=E-invoicing and X5=E-payment.

The result implies that a unit change in E-sourcing, E-tendering, E-ordering, E-invoicing and E-payment results 0.3417613, 0.029153, 0.6437935, 0.3759846, 0.3537489 respectively unit increase in quality performance of Ethiopian MRO quality performance.

This is therefore, four null hypotheses (H02, H08, H011 and H014) have been rejected. As a result, in addition to the first five (H1, H4, H7, H10 and H13) assumptions other four (H2, H8, H11 and H14) have been supported by this study. However, the null hypothesis H05 has not been rejected. As a result, H5 has not been supported by this study.

4.5.3. The E-procurement practices and delivery

The last five hypotheses were,

H 3: E-sourcing positively and significantly affects Ethiopian MRO performance in terms of delivery.

H 6: E-tendering positively and significantly affects Ethiopian MRO performance in terms of delivery.

H9: E-ordering positively and significantly affects Ethiopian MRO performance in terms of delivery.

H12: E-Invoicing positively and significantly affects Ethiopian MRO performance in terms of delivery.

H15: E-Payment positively and significantly affects Ethiopian MRO performance in terms of delivery.

Then, the null hypothesis are postulated;

H03: E-sourcing does not positively and significantly affects Ethiopian MRO performance in terms of quality.

H06: E-tendering does not positively and significantly affects Ethiopian MRO performance in terms of quality.

H09: E-ordering does not positively and significantly affects Ethiopian MRO performance in terms of quality.

H012: E-Invoicing does not positively and significantly affects Ethiopian MRO performance in terms of quality.

H015: E-Payment does not positively and significantly affects Ethiopian MRO performance in terms of quality.

To test how E-procurement practice affects MRO performance in terms of delivery, multiple regression has been analyzed and the findings are indicated in table 4.20.

Table 4. 15: Regression Result for E-procurement practices and delivery

Source	SS	df	MS		
Model	30.6822881	5	6.13645762	Number of obs	= 103
Residual	1.26645305	97	.013056217	F(5, 97)	= 470.00
Total	31.9487411	102	.313222952	Prob > F	= 0.0000
				R-squared	= 0.9604
				Adj R-squared	= 0.9583
				Root MSE	= .11426

Y3	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
X1	.3892284	.0278709	13.97	0.000	.3339123	.444544
X2	-.063301	.0810355	-0.78	0.437	-.2241341	.097532
X3	.8828132	.0831742	10.61	0.000	.7177355	1.04789
X4	.4057735	.0378296	10.73	0.000	.3306923	.480854
X5	.413815	.0168499	24.56	0.000	.3803726	.447257
_cons	.8210193	.0961501	8.54	0.000	.6301879	1.01185

Source: Research data (2020)

Dependent variable: Y3 = Delivery

Independent variable: X1=E-Sourcing, X2=E-Tendering, X3=E-Ordering, X4= E-Invoicing and X5=E-Payment

The R-square value of 0.9604 shows that the independent variables E-procurement (E-sourcing, E-tendering, E-ordering, E-invoicing and E-payment) accounted for 96.04% of the variation in the dependent variable (delivery). The P-value is 0.000 < 0.05. It indicates that the regression model is fit and significant. As per the result, the effect of E-Sourcing, E-ordering, E-invoicing and E-payment on delivery were positive and significant since its P values (0.000, 0.000, 0.000 and 0.000 respectively) are less than 0.05 and its coefficients ($\beta 1$ =0.3892284, $\beta 3$ =0.8828132, $\beta 4$ =0.4057735 and $\beta 5$ =0.413815) respectively are positive. While the effects of E-Tendering on delivery was negative and insignificant since its P-value is 0.437 > 0.05 and its coefficient $\beta 2$=-0.063301.

This regression model presented as follows:

Y3=0.8210193+0.3892284X1-0.063301X2+0.8828132X3+0.4057735 X4+0.413815X5

Where: Y2= Delivery, X1= E-sourcing, X2=E-tendering, X3=E-ordering, X4=E-invoicing and X5=E-payment.

The result implies that a unit change in E-sourcing, E-ordering, E-invoicing and E-payment results 0.3892284, 0.8828132, 0.4057735 and 0.413815 respectively unit increase of Ethiopian MRO delivery performance.

This is therefore, another four null hypotheses (H03, H09, H012 and H015) have been rejected. As a result, the H3, H9, H12 and H15 have been supported by this study. However, the null hypothesis H06 has not been rejected. Thus, H6 has not supported by this study.

The study result is summarized and presented in the table 4. 21 below.

Table 4. 16: Result finding summary

Objective	**Indictors**	**Result/ Extent**
Objective 1; To assess the E-procurement practices of the Ethiopian Airlines Group.	E-Sourcing	Small Extent
	E-Tendering	No extent
	E-Ordering	Small extent
	E-Invoicing	Small extent
	E-Payment	Small extent
	Performance Indicators	**Results**
Objective 2; To examine the effect of E-Sourcing practices on the Ethiopian MRO performance in terms of cost, quality and delivery.	Cost	Positive and significant
	Quality	Positive and significant
	Delivery	Positive and significant
Objective 3; To examine the effect of E-Tendering practices on the Ethiopian MRO performance in terms of cost, quality and delivery.	Cost	Positive and significant
	Quality	Positive and insignificant
	Delivery	Negative and insignificant
Objective 4; To examine the effect of E-Ordering practices on the Ethiopian MRO performance in terms of cost, quality and delivery.	Cost	Positive and significant
	Quality	Positive and significant
	Delivery	Positive and significant
Objective 5; To examine the effect of E-Invoicing practices on the Ethiopian MRO performance in terms of cost, quality and delivery.	Cost	Positive and significant
	Quality	Positive and significant
	Delivery	Positive and significant
Objective 6; To examine the effect of E-Payment practices on the Ethiopian MRO performance in terms of cost, quality and delivery.	Cost	Positive and significant
	Quality	Positive and significant
	Delivery	Positive and significant

Source: Research data (2020)

Moreover, the hypotheses test result has been summarized in the table 4.22 below.

Table 4. 17: Hypothesis test summary

Hypothesis	**Result**
H 1: E-sourcing positively and significantly affects the Ethiopian MRO performance in terms of cost.	Positive and significant
H 2: E-sourcing positively and significantly affects the Ethiopian MRO performance in terms of quality.	Positive and significant
H 3: E-sourcing positively and significantly affects the Ethiopian MRO performance in terms of delivery.	Positive and significant
H 4: E-tendering positively and significantly affects the Ethiopian MRO performance in terms of cost.	Positive and significant
H 5: E-tendering positively and significantly affects the Ethiopian MRO performance in terms of quality.	Positive and insignificant
H 6: E-tendering positively and significantly affects the Ethiopian MRO performance in terms of delivery.	Negative and insignificant
H 7: E-ordering positively and significantly affects the Ethiopian MRO performance in terms of cost.	Positive and significant
H 8: E-ordering positively and significantly affects the Ethiopian MRO performance in terms of quality.	Positive and significant
H 9: E-ordering positively and significantly affects the Ethiopian MRO performance in terms of delivery.	Positive and significant
H10: E-invoicing positively and significantly affects the Ethiopian MRO performance in terms of cost.	Positive and significant
H11: E-invoicing positively and significantly affects the Ethiopian MRO performance in terms of quality.	Positive and significant
H12: E-invoicing positively and significantly affects the Ethiopian MRO performance in terms of delivery.	Positive and significant
H13: E-payment positively and significantly affects the Ethiopian MRO performance in terms of cost.	Positive and significant
H14: E-payment positively and significantly affects the Ethiopian MRO performance in terms of quality.	Positive and significant
H15: E-payment positively and significantly affects the Ethiopian MRO performance in terms of delivery.	Positive and significant

Source: Research data (2020)

CHAPTER FIVE

SUMMARY CONCLUSION AND RECOMMENDATION

5.1 SUMMARY OF FINDINGS

The study result shows that the independent variables E-procurement (E-sourcing, E-tendering, E-ordering, E-invoicing and E-payment) strongly explained the dependent variables of cost, quality and delivery as it's indicated by its R values 0.9663, 0.9029 and 0.9604. In addition, the study shows that all the three conducted models are fit as it indicated by its P values of 0.000, 0.000 and 0.000 which are less than 0.05.

As per the study analysis result, the E-sourcing, E-ordering, E-invoicing and E-payment are adopted by the Ethiopian MRO to a small extent as indicated by the mean values of 1.673786, 1.506241, 1.650485 and 2.080097 respectively. However, the result shows no extent for E- tendering as it indicated by the mean value of 1.443366.

The study result shows that the effect of E-Sourcing, E- tendering, E-ordering, E- invoicing and E-payment on cost were positive and significant since its P values (0. 000, 0.004, 0.000, 0.000 and 0.000 respectively) are less than 0.05 and also its coefficients ($\beta 1$ =0.3984675, $\beta 2$ =0.1990082, $\beta 3$ =0.5436488, $\beta 4$ =0.3619637 and $\beta 5$ =0.3809752) respectively are positive.

Also the study shows that the effect of E-Sourcing, E-ordering, E-invoicing and E-payment on quality were positive and significant since its P values (0.000, 0.000, 0.000 and 0.000 respectively) are less than 0.05 and its coefficients ($\beta 1$ =0.3417613, $\beta 3$ =0.6437935, $\beta 4$ =0.3759846 and $\beta 5$ =0.3537489) respectively are positive. While the effects of E-Tendering on quality was positive but insignificant since its P-value is 0.792 > 0.05 and its coefficient $\beta 2$=0.029153.

Further the result shows that the effect of E-Sourcing, E-ordering, E-invoicing and E-payment on delivery were positive and significant since its P values (0.000, 0.000, 0.000 and 0.000 respectively) are less than 0.05 and its coefficients ($\beta 1$ =0.3892284, $\beta 3$ =0.8828132, $\beta 4$=0.4057735 and $\beta 5$ =0.413815) respectively are positive. While the effects of E-Tendering on delivery was negative and insignificant since its P-value is 0.437 > 0.05 and its coefficient $\beta 2$=-0.063301.

5.2 CONCLUSIONS

The study shows that E- Sourcing, E- invoicing, E-ordering and E-payment are adopted by the Ethiopian MRO to a small extent. However, the result shows no extent for E-tendering. It can be concluded that Ethiopian MRO had adopted E-Procurement practices to a small extent.

Besides, the study result established that the Ethiopian MRO performance in terms of cost, Quality and delivery were large. Also, it can be concluded that the Ethiopian MRO overall operational performance was large.

Also, the study investigated that that the effect of E- Sourcing, E- ordering, E-invoicing and E-payment on Ethiopian MRO in terms of cost, quality and delivery were positive and significant. While E-tendering practice of the organization has a positive and significant effect on cost, positive and insignificant effect on quality and Negative and insignificant effect on the delivery operational performance of the Ethiopia MRO. Thus, it leads to conclude that E-procurement practices of the organization have positive and significant effect on the Ethiopian MRO operational performance in terms of Cost, Quality and delivery. However, E-tendering practice has no a significant effect on the Ethiopian MRO performance in terms of quality and delivery.

As per the study result, the following two among the total fifteen hypotheses have not been supported.

H 5: E-tendering positively and significantly affects the Ethiopian MRO performance in terms of quality. However, the study result shows Positive and insignificant.

H 6: E-tendering positively and significantly affects the Ethiopian MRO performance in terms of delivery. However, the study result shows Negative and insignificant.

While according to the study by Munyao and Moronge (20018), E-tendering positively and significantly affects purchasing performance. Also, as per the Michael Musyokikiusya (2008) study, E-tendering positively and signify influence operational performance of manufacturing firms in Mombasa county.

5.3 RECOMMENDATION OF THE STUDY

As per the study result, the adoptions of E-procurement practices by the Ethiopian airlines group was a small extent. In addition, the study shows that the effect of E-procurement practices has a positive and significant effect on the Ethiopian MRO performance in terms of cost, quality and delivery. This is therefore, the study recommends that the Ethiopian airlines group MRO should invest more in E-Procurement especially on E-sourcing, E-ordering, E-invoicing and E-payment so as to enhance long payment process, to minimize its turnaround time (TAT) of component maintenances, to improve lead-time, to fix much late core return fee, to solve on-time part availability issue , to eradicate past due payment penalty and wrong payments, not so as to lose potential suppliers and customers, to have adequate supplier database and to improve bidding and sourcing processes. In general, the study recommends the Ethiopian MRO to increase the adoption level of E-procurement practices in order to improve its operational performances.

In addition, the study recommends Ethiopian airlines group MRO to make amendment on the organization procurement policy and producers so as to consider E-procurement.

5.4 SUGGESTIONS FOR FURTHER RESEARCH

The focus of this study was to assess the link between each E-procurement practices (E- Sourcing, E tendering, E ordering, E-Invoicing and E- Payment) and Ethiopian MRO performance in terms of cost, quality and delivery. Then, the study not supported the two hypothesis (H5 and H6) that that E-tendering practice of the organization has insignificant effect on the Ethiopian MRO operational performance in terms of quality and delivery. The study therefore, recommends an additional research assessing the effect of E-procurement practices on the overall operational performances on the other case organizations by including additional operational performance indicators.

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ANNEX I: INTRODUCTION LETTER

I am a student at Addis Ababa University (AAU) currently undertaking a thesis study to fulfill the partial fulfillment of the degree of masters of art in logistics and supply chain management. This thesis is focused on the effect of E-procurement practices on operational performance of the Ethiopian Airlines Group. I would largely appreciate your participation as you have been selected to participate in this study by answering all the questions truthfully and completely. The responses will be treated with extreme confidentiality and privacy as they will be used solely for this study. This study will only be used for academic research. You are required to participate voluntarily and no one will be forced to participate. Kindly spare a few minutes to complete the questionnaire attached.

Thank you in advance for your cooperation.

Yours Faithfully,

Shewarga Ayalew,

Researcher

Email: Shewargaa@gmail.com

ANNEX II: QUESTIONNAIRE

This questionnaire is divided into four sections. Section A will be used to obtain general information about the respondents. Section B will be used to obtain information on the E-procurement practice. Section C is about the Ethiopian MRO performance. Section D will be interview question to obtain the overhauled overview of procurement practice and operational performance.

For part A, B and C, Please respond your answer by placing a check mark (√) in the answer box that corresponds to your response and/or fill in the blank where indicated.

Your assistance in completing this questionnaire will be highly appreciated.

Section A: Demographic Data

1. What is your age?

   i. From 18 to 20 ( )
   ii. From 21 to 29 ( )
   iii. From 30 to 39 ( )
   iv. From 40 to 49 ( )
   v. From 50 to 59 ( )
   vi. 60 or older ( )

2. What is your gender?
   i. Male ( )
   ii. Female ( )

3. How long have you been working in this organization?

   i. Less than or equal to 5 years ( )
   ii. Between 6 to 10 years ( )
   iii. B e t w e e n 11 to 15years ( )
   iv. B e t w e e n 16 to 19 years ( )
   v. 20 and above years ( )

4. What is your highest level of education?
   i. Masters ( )
   ii. Bachelors ( )
   iii. Diploma ( )
   iv. Certificate ( )

v. Other, please specify _____

Section B: E-procurement practices

1) Kindly identify the E-procurement practices adopted by Ethiopian Airlines Group.

Please respond your answer by placing a check mark (√) in the answer box that corresponds to your response.

Scale 1: No- Extent, 2: Small –Extent, 3: Moderate-Extent, 4: Large-Extent, 5: Very Large-Extent

E-Procurement Types	**Scale**				
E-Sourcing	**1**	**2**	**3**	**4**	**5**
The organization has vendor management platform					
The organization has a list of pre-qualified suppliers who have online access					
The organization uses online search engines/part locators					
The organization receive online notifications from different suppliers					
The organization uses an E-sourcing Software					
E-Tendering	**1**	**2**	**3**	**4**	**5**
The organization prepares and publishes tenders online					
The organization has data management software					
The organization does online screening and selections of supplier					
The organization has an internet based system that keeps historical bid Submissions					
The organization has online contract signature and documentation					
The organization does online supplier performance assessment					
E-Ordering	**1**	**2**	**3**	**4**	**5**
The organization uses an online order management system					
The organization has online suppliers stock information					
The organization has online order information history					
The organization has online inspection-receiving platform					
The organization has automated inventory monitoring system					
The organization allows suppliers to have real time online access to its stock Information					

The organization has online claiming process for defected parts/shipment					

E-Invoicing	**1**	**2**	**3**	**4**	**5**
The organization is currently using automatic overdue invoice reminder					
The organization is currently using online invoice processing					
The organization is currently accessing its supplier's invoice online					
The organization has the invoice verification software					
The organization has centralized and common platform to receive invoices					
E-Payment	**1**	**2**	**3**	**4**	**5**
The organization ensures that suppliers have access to their online supply account 24/7					
The organization uses online bank/wire transfers to make payments to Suppliers					
The organization is currently using online payment notification					
The organization has a centralized electronic data retaining platform					

Section C: The Ethiopian MRO Performance

2) To what extent adopting E-Sourcing, E-Tendering, E-Ordering, E-Invoicing and E-payment affect the Ethiopian MRO performance in terms of cost, quality and delivery**.**

Please respond your answer by placing a check mark (√) in the answer box that corresponds to your response.

Scale 1: No- Extent, 2: Small –Extent, 3: Moderate-Extent, 4: Large-Extent, 5: Very Large-Extent

Statement	Scale				
Cost	1	2	3	4	5
The organization has reduced Aircraft on ground cost and expedite fee					
The organization has reduced penalty fees for due invoices					
The organization has acquired products at reasonable cost					
The organization has reduced maintenance cost					
The organization has reduced inventory carrying cost					
The organization has reduced disposal cost					

Quality	**1**	**2**	**3**	**4**	**5**
The organization has standardized documentation which assured Quality					
The organization has reduced re-work					
The organization has assured and reduced the level of quality defects					
The organization assure to provide world-class service					
The organization has reduced the part removal rates					
Delivery	**1**	**2**	**3**	**4**	**5**
The organization has improved availability of parts					
The organization has reduced lead time					
The organization has reduced aircraft on ground time					
The organization has reduced components maintenance TAT					
The organization has reduced aircraft maintenance TAT					

3) What are some of the benefits of Electronic Sourcing (E-Sourcing) for Ethiopian MRO performance?

_____

_____

4) What are some of the benefits of Electronic Tendering for Ethiopian MRO performance?

_____

_____

5) What are some of the benefits of Electronic Ordering for Ethiopian MRO performance?

_____

_____

6) What are some of the benefits of Electronic Invoicing for Ethiopian MRO performance?

_____

_____

7) What are some of the benefits of Electronic Payment for Ethiopian MRO performance?

_____

_____

Section D: Interview Questions

1. Please mention your overall view of the current Ethiopian Electronic procurement (E-procurement) practice regarding the five types (E-Sourcing, E-Tendering, E- Ordering, E-Invoicing and E-Payment).

2. To what extent E-Procurement affects the Ethiopian MRO performance in terms of cost, quality and delivery.

ANNEX III: DATA SUMMARY

Table 4.19. Research Data Summary

I/N	X1	X2	X3	X4	X5	Y1	Y2	Y3
1	2.40	1.00	1.00	1.00	1.00	2.83	3.00	5.00
2	2.20	1.00	1.00	1.00	1.00	2.83	2.80	4.80
3	1.20	1.00	1.00	1.00	1.00	2.17	2.60	4.80
4	2.00	1.00	1.00	1.00	3.00	3.33	3.00	3.00
5	2.40	1.00	1.00	1.20	1.00	2.83	3.00	3.00
6	1.20	1.00	1.00	1.20	1.00	2.50	2.60	4.80
7	2.40	1.00	1.00	1.20	3.00	3.50	3.80	5.00
8	2.20	1.00	1.14	1.20	1.00	2.83	3.00	3.00
9	2.40	1.00	1.14	1.20	1.00	3.00	3.00	4.80
10	2.40	1.33	1.43	1.40	3.00	3.83	4.00	4.60
11	1.80	1.00	1.43	1.20	1.00	2.83	3.00	3.00
12	2.40	1.33	1.43	1.40	1.00	3.17	3.00	3.80
13	2.00	1.33	1.43	1.40	3.00	3.83	3.80	5.00
14	2.00	1.50	1.71	1.40	1.00	3.17	3.40	4.00
15	2.00	1.50	1.71	1.40	1.00	3.17	3.40	3.00
16	2.20	1.50	1.71	1.40	3.00	4.00	4.20	4.40
17	2.00	1.50	1.71	1.40	1.25	3.33	3.40	4.80
18	2.40	2.00	2.00	1.60	1.25	3.83	3.80	5.00
19	1.60	2.00	2.00	1.40	1.25	3.50	3.60	4.60
20	2.00	2.00	2.00	1.60	3.00	4.33	4.40	4.60
21	1.60	2.00	2.00	1.60	1.50	3.67	3.80	4.00
22	2.00	2.00	2.00	1.60	3.00	4.33	4.40	4.60
23	2.00	2.00	2.00	1.60	3.00	4.33	4.40	4.80
24	1.40	2.00	2.00	1.60	1.50	3.50	3.60	3.00
25	1.60	2.00	2.00	1.60	1.50	3.67	3.80	4.00
26	2.00	2.00	2.00	1.60	1.75	3.83	3.80	3.80
27	2.20	2.00	2.00	1.60	1.75	3.83	3.80	4.40
28	1.60	2.00	2.00	1.60	1.75	3.67	3.80	4.20
29	1.60	2.00	2.00	1.60	3.00	4.17	4.20	4.40
30	1.80	2.00	2.00	1.80	1.75	3.83	3.80	3.80
31	1.60	2.00	2.00	1.80	3.00	4.33	4.40	3.80
32	2.00	2.00	2.00	1.80	1.75	3.83	3.80	4.00
33	1.60	1.83	1.86	2.00	3.00	4.17	4.20	4.80
34	1.80	1.50	1.71	2.00	1.75	3.67	3.80	4.40
35	1.60	1.50	1.71	2.00	3.00	4.17	4.20	4.60
36	1.40	1.33	1.43	2.00	2.00	3.33	3.60	4.60
37	1.60	1.50	1.71	2.00	2.00	3.67	3.80	4.60
38	1.20	1.33	1.43	2.00	2.00	3.33	3.60	4.60
39	1.60	1.50	1.57	2.00	2.00	3.67	3.80	4.00
40	2.20	1.33	1.43	2.00	2.00	3.83	3.80	3.80
41	1.40	1.00	1.14	2.00	2.00	3.17	3.20	3.80
42	1.40	1.00	1.14	2.00	2.00	3.17	3.40	3.00
43	1.60	1.00	1.14	2.00	2.00	3.17	3.40	4.20
44	1.20	1.00	1.00	2.00	2.00	3.00	3.20	5.00
45	1.20	1.00	1.00	2.00	2.00	3.00	3.20	5.00
46	1.80	1.00	1.00	2.00	2.00	3.33	3.40	4.00
47	1.40	1.00	1.00	2.00	2.00	3.17	3.20	3.60
48	1.60	1.00	1.00	2.00	2.00	3.17	3.40	3.80
49	1.80	1.50	1.71	2.00	2.00	3.83	3.80	3.60
50	1.00	1.00	1.00	2.00	2.00	3.00	3.00	5.00
51	1.00	1.00	1.00	2.00	2.00	3.00	3.00	4.20
52	1.20	1.00	1.00	2.00	2.00	3.17	3.20	3.60
53	1.60	1.00	1.00	2.00	2.00	3.17	3.40	4.40
54	1.00	1.00	1.00	2.00	2.00	3.00	3.20	4.20
55	1.40	1.00	1.00	2.00	2.00	3.17	3.20	5.00
56	1.00	1.00	1.00	2.00	2.00	3.00	3.20	3.80
57	1.80	1.00	1.14	2.00	2.00	3.33	3.60	3.60
58	2.20	1.00	1.00	2.00	2.00	3.50	3.60	4.60
59	1.80	1.00	1.00	2.00	2.00	3.33	3.40	3.80
60	1.40	1.00	1.14	2.00	2.00	3.17	3.40	5.00
61	2.00	1.33	1.43	2.00	2.00	3.67	3.80	3.60
62	2.20	1.00	1.14	2.00	2.00	3.50	3.60	3.60
63	2.00	1.33	1.43	2.00	2.00	3.67	3.80	4.60
64	1.00	1.33	1.57	2.00	2.00	3.33	3.60	4.40
65	1.80	1.50	1.71	2.00	2.00	3.83	3.80	3.60
66	1.20	1.33	1.43	2.00	2.00	3.33	3.60	4.20
67	1.60	1.50	1.71	2.00	2.00	3.67	3.80	3.80
68	1.40	1.50	1.71	2.00	2.00	3.67	3.80	4.60
69	1.80	2.00	2.00	2.00	2.00	3.83	4.00	4.80
70	1.00	1.50	1.71	2.00	2.00	3.50	3.60	4.00
71	1.20	1.83	1.86	2.00	2.00	3.67	3.80	4.20
72	2.00	2.00	2.00	1.80	3.00	4.67	4.60	4.80
73	2.00	2.00	2.00	1.80	3.00	4.67	4.00	4.80
74	1.00	2.00	2.00	1.80	3.00	3.83	4.00	4.60
75	1.20	2.00	2.00	1.80	3.00	4.17	4.20	4.00
76	1.40	2.00	2.00	1.60	1.75	3.67	3.80	3.80
77	2.00	2.00	2.00	1.60	3.00	4.50	4.40	4.60
78	2.20	2.00	2.00	1.60	3.00	4.83	5.00	4.60
79	1.00	1.50	1.71	1.60	3.00	3.67	3.80	4.20
80	1.20	2.00	2.00	1.60	3.00	4.00	4.00	4.40
81	1.20	2.00	2.00	1.60	3.00	4.00	4.00	4.20
82	1.00	2.00	2.00	1.60	3.00	3.83	4.00	3.80
83	2.00	2.00	2.00	1.60	3.00	4.50	4.40	4.40
84	1.00	2.00	2.00	1.60	3.00	3.83	4.00	4.40
85	1.40	1.83	1.86	1.60	1.75	3.50	3.60	4.00
86	1.40	1.83	1.86	1.60	1.75	3.50	3.60	5.00
87	2.20	1.50	1.71	1.40	3.00	4.17	4.20	4.00
88	1.00	1.50	1.71	1.40	1.00	3.00	3.00	5.00
89	2.00	1.50	1.71	1.40	3.00	3.83	4.00	4.40
90	1.40	1.50	1.71	1.40	1.75	3.33	3.40	5.00
91	1.40	1.33	1.43	1.40	1.50	3.00	3.20	4.00
92	1.80	1.33	1.43	1.40	3.00	3.83	3.80	5.00
93	2.40	1.00	1.43	1.40	1.00	3.17	3.20	4.20
94	1.00	1.33	1.43	1.40	3.00	3.50	3.00	3.60
95	2.00	1.00	1.14	1.40	1.00	2.83	3.00	3.80
96	1.40	1.00	1.14	1.20	1.50	2.83	2.80	3.60
97	2.40	1.00	1.00	1.20	3.00	3.67	3.80	4.40
98	1.40	1.00	1.00	1.20	1.50	2.83	2.80	5.00
99	2.20	1.00	1.00	1.20	3.00	3.50	3.60	3.80
100	1.00	1.00	1.00	1.20	1.00	2.50	2.60	4.00
101	1.60	1.00	1.00	1.00	3.00	3.17	4.00	5.00
102	1.80	1.00	1.00	1.20	3.00	3.33	3.00	4.00
103	1.80	1.00	1.00	1.00	1.00	2.67	2.60	4.60

Where;

X1 = Mean of E-Sourcing practice

X2 = Mean of E-Tendering practice

X3 = Mean of E- Ordering practice

X4 = Mean of E-Invoicing practice

X5 = Mean of E-Payment practice

Y1 = Mean of Cost performance

Y2 = Mean of Quality performance

Y3 = Mean of Delivery performance