ADDIS ABABA UNIVERSITY SCHOOL OF COMMERCE

LOGISTICS AND SUPPLY CHAIN MANAGEMENT UNIT

THE EFFECT OF SUPPLY CHAIN MANAGEMENT PRACTICES ON OPERATIONAL PERFORMANCE: THE CASE OF MAINTENANCE REPAIR AND OVERHAUL OF ETHIOPIAN AIRLINES

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A Thesis submitted to Addis Ababa University School of commerce for the partial fulfillment of the degree of Masters of Art in Logistics and Supply Chain Management

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ADDIS ABABA, ETHIOPIA

JUNE, 2020

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Declaration

I, **Endakmew Getie**, declare that this paper is a result of my independent research work on the topic entitled "The effect of Supply chain management practice on operational performance: In the case of Ethiopian airlines MRO" for the partial fulfillment of the requirements for the Degree of Masters of Art in Logistics and Supply Chain Management at Addis Ababa University, School of commerce. This work has not been submitted for a degree to any other university. All the references are also duly acknowledged.

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Certification

This is to certify that Endakmew Getie has carried out this research work on the topic entitled "The effect of Supply chain management practices on operational performance: In the case of Ethiopian airlines MRO" under my supervision . This work is original in nature and it can be submitted for the partial fulfillment of the requirements for the award of the degree of Masters of Art in Logistics and Supply Chain Management.

_____

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Acknowledgment

I would like to thank my advisor Tariku Jebena (PhD), internal examiner Teklegiorgis Assefa (Asst. Prof.) and external examiner Asmamaw Argeta (PhD) for their constructive comment for the accomplishment of this paper. Secondly, I would like to thank respondents who filled and returned questionnaires on time.

Finally, I would like to thank all people in one way or another who have provided me help and moral support, in the accomplishment of this study.

Table of Contents

Abbreviations

MRO-Maintenance Repair and Overhaul

SCM-Supply Chain Management

SCMP-Supply Chain Management Professionals

SCMR-Supply Chain Management Review

MCC-Maintenance Control Center

IATA-International Air Transport Association

OTP-On Time Performance

List of Figure

List of Table

ABSTRACT

Supply chain management is the most important tools that organizations use to develop their operational performance. The main objective of this study was to assess the effect of supply chain management practices (Supplier partnership, internal integration, level of information sharing and quality of information sharing) on operational performance of Ethiopian airlines MRO. Both quantitative and qualitative research method used for this study to determine the relationship between supply chain management practices (Supplier partnership, internal integration, level of information sharing and quality of information sharing) and operational performance of Ethiopian airlines MRO. Descriptive and explanatory research design employed for the study. Data were collected from 106 employees working in Ethiopia airlines MRO maintenance and logistics and supply chain management department. The data analysis results shows that supplier partnership and quality of information sharing have a positive and significant impact on operational performance of Ethiopian airlines MRO while internal integration and level of information sharing is not significant. The organization has to improve its supplier partnership and quality of information sharing practices to improve the operational performance even further. Specifically, Ethiopian airlines MRO has to work with suppliers to improve suppliers' product quality and to include key suppliers in its continuous improvement program and the company should also work with suppliers to share adequate and complete information with each other.

***Key Words**: Supply chain Management; Supply chain Management Practices; Operational performance*

Chapter One

INTRODUCTION

This chapter consists of back ground of the study, statement of the problem, research questions, objectives of the study, significance of the study, scope of the study, limitation of the study, definition of terms and organization of the study.

1.1. Background of the study

According to Council of Supply Chain Management Professionals (CSCMP, 2016)Supply chain management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers.

According to (Christopher, 1998) SCM is the management of upstream and downstream Relationships with suppliers and customers in order to deliver superior customer value at less cost to the supply chain as a whole. SCM practices involve a set of activities undertaken by the organization to promote effective management of their supply chain.

According to (Faisal, 2011)Logistics and SCM practices may be defined as a set of activities undertaken to promote effective and efficient management of supply chains. These include supplier partnership, physical movement of goods, meeting customer demands and information sharing throughout the supply chain. Some of the key logistics and SCM practices that impact performance is related to estimation of customer needs, efficient and effective delivery, integration and collaboration throughout the supply chain, sharing of information and vision using ICT as well as informal methods and use of specialists for performing specific jobs across the supply chain.

Operational performance is a source of competitive advantage for the enterprise to differentiate itself in the eyes of the customers from its competitors by operating at a lower cost and hence at a greater profit (Christopher, 1998)

The objective for efficient SCM is reducing inventory, lead times and related costs in order to assure reliable and on-time deliveries from manufacturing units towards customers. The main goal of supply chain management is to produce the right products, in the right quantities, at the

right time and at minimal cost with the purpose to satisfy customer requirements and internal targets as efficiently as possible (Kindie, 2017)

Supply chain consists of the whole activities associated with products and services movement from raw material stage to final products which are consumable by customers. This movement includes financial and information flow as well as material flow. In other words, supply chain is a network consisting of downstream and upstream organizations which are involved in different processes and activities that create value for end customers in the form of products or services (Christopher, 1998)

SCM involves the coordination and configuration of different process that is necessary to make products available in a timely, reputable, and suitable condition. The distinctiveness of SCM could be achieved by identifying and making use of SCM practices, in organized way. SCM practices involve a set of activities undertaken by the organization to promote effective management of their supply chain (Faisal, 2011)

According to (Zailani & Rajagopal, 2005)the simultaneous integration of customer requirements, internal process and upstream supplier performance is commonly referred to as supply chain management.

Ethiopian MRO service was established in 1957, Ethiopian MRO Services is a maintenance and engineering division of Ethiopian Airlines. The company provides line and base maintenance services for aircraft, engines and components for Ethiopian Airlines' fleet as well as third party customers like Rwanda airline, Equatorial Guinea airline, Tanzania airline, Cameron airline and so on. Ethiopian MRO Services has 6 main hangars at its maintenance base, Addis Ababa Bole International Airport. According to IATA reports in 2013, Airlines operator are facing difficulty in keeping the aircraft in the air due to different reasons across the supply chain. To ensure reliability and on time performance of flights, airline operators need to assess the main factors affecting flight dispatch reliability. On time performance of flight is highly dependent on chain of activities. To be competitive in the airline industry and attract passengers, Ethiopian airlines needs to ensure on time performance of flights(Girma, 2018).Ethiopian Airlines Maintenance, Repair and Overhaul Services is responsible to ensure reliability and on time performance of aircrafts.

1.2. Statement of the problem

The main goal of MRO in aviation industry is to maintain aircraft and ready for departure within the planned maintenance turnaround time and within the allocated budget. However, it is common to see delayed Aircraft in the Ethiopian MRO hangar due to stock out of the required parts and mandatory tools. As result, Ethiopian airline is incurring additional cost to avail the required parts and tools on AOG basis so as to make the aircraft ready for departure.

According to (Niehues, et al., 2011)punctuality (on time performance) has become the daily concern inside the airline industry. It can be seen as a key performance indicator and a valuable differentiator in customer services.

Ethiopian airlines face different operational disruptions like flight cancelation, flight delays and extension of aircraft schedule related to maintenance problems which is particularly contributed by supply chain management practices of the company. As per the Ethiopian MRO yearly delay report (July 2018- Jun2019) a total number of 138 C-checks delayed from 1298 total checks. Out of the total number of delayed checks faced in July 2018-Jun 2019 103 delays were occurred due to lack of internal integration among MRO functions, Lack of strategic supplier partnership, lack of relevant information sharing; However, there was no study made to clearly assess the level of internal integration among MRO functions, strategic supplier partnership, level & quality of information sharing.

Hence, the researcher aimed to study the level of internal integrations among MRO functions, supplier partnership, level and quality of information sharing to improve the operational performance of Ethiopian MRO.

1.3. Research Questions

In the research, the researcher answered the following research questions in this study.

- How does supply chain management is being practiced in Ethiopian MRO?
- What is the extent of operational performance in Ethiopian airlines MRO?
- How does supply chain management practice influence the operational performance of Ethiopian airlines MRO?

1.4. Objective of the study

1.4.1 General objective

The general objective of the study was to assess the effect of supply chain management practices on operational performance of maintenance repair and overhaul of Ethiopian airlines.

1.4.2. Specific objective

1. To assess the supply chain management practices of Ethiopian airlines maintenance repair and overhaul.
2. To assess the operational performance of Ethiopian airlines maintenance repair and overhaul.
3. To assess and examine the relationship of Supply chain management practices and operational performance of Ethiopian airlines maintenance repair and overhaul.

1.5. Significance of the study

The study will have significant effect for the airlines MRO by proposing ideas in which the performance of the MRO operation can be improved so that flight delay and flight cancelation will be reduced. The study will help policy makers in the airline industry and aviation sectors to design policy which will help airline MRO to improve their performance through supply chain. The study wills also help policy makers to understand the importance of developing effective and efficient MRO supply chain management systems for the overall performance of the MRO operation. The study will help airline MROs to design integrated MRO supply chain which help the operators to improve its performance.

1.6. Scope of the study

The researcher doesn't cover all supply chain management practices such as customer relationship due to resource limitation. The supply chain management practices that is covered in this research is supplier partnership, quality of information sharing, level of information sharing and internal integration only. Maintenance team, logistics & supply chain management sections only selected as a participant in this study as they are the one directly involved in maintenance activities of the aircraft.

1.7. Limitation of the study

There is limited research done on MRO supply chain and was difficult to get sufficient literature on the area. The other limitation was lack of data to get industry average dispatch reliability due to confidentiality of the data.

1.8. Operational Definition of Key Terms and Concepts

Supply Chain Management: According to (CSCMP, 2016)Supply chain management is the active management of supply chain activities to maximize customer value and achieve a sustainable competitive advantage. It represents a conscious effort by the supply chain firms to develop and run supply chains in the most effective &efficient ways possible. Supply chain activities cover everything from product development, sourcing, production, and logistics, as well as the information systems needed to coordinate these activities

Internal integration: According to (Darja, et al., 2009) internal integration is the extent in which specialized functions or departments in a company involves in the coordination, collaboration and integration of logistics activities with other functional areas in an organization.

Supplier partnership: is defined as the long term relationship between the organization and its suppliers (Ebrahim & Mahmoud, 2014).

Information sharing: According **to** (Ellram, 2004) the extent to which critical and proprietary information is communicated to one's supply chain partner.

Maintenance Repair and Overhaul (MRO): is an organization in the aviation industry that performs the servicing, repair, modification, and overhaul, inspection of aircraft components and determination of condition of the aircraft

1.9. Organization of the study

The main research study will be organized as follows:

The study contains five chapters. Chapter one is the introduction part which contains background of the study, statement of the problem, research questions, research objectives, scope of the study, and significance of the study and limitation of the study. In chapter two related literature review about effect of supply chain management practices on operational performance and conceptual framework discussed. In chapter three the methodology part which contains research approach, research design and sampling size and techniques discussed. In chapter four research results presented and analyzed. In chapter Five research summary, Conclusion and Recommendation discussed.

Chapter Two

2. Related Literature Review

In this chapter related literature was reviewed. The chapter covered theoretical literature review, empirical review and conceptual framework of the study.

2.1. Supply Chain Management

Supply chain management is the management of information, process, capacity and other activities across the supply chain that create value for end customers in the form of products or services(Ellram, 2004). According to (Gwako, 2008) supply chain management can be defined as a collaborative effort of multiple channel members to design, Implement and manage seamless value added processes to meet the real needs of the end customers; also states supply chain management as it represents a state-of-the-art management tool used to enhance overall customer satisfaction that is intended to improve competitiveness and profitability. It addresses such modern business issues as: long-term strategic alliance and supplier-buyer partnership, cross-organizational logistics management, joint planning and control of inventory, and information sharing

(Christopher, 1998) Defined supply chain and its management as the management of upstream and downstream relationships with suppliers and customers to deliver superior customer value at less cost to the supply chain as a whole

According to (Faisal, et al., 2011) SCM is seen as an approach to improve competitive performance by integrating the internal functions of an organization and linking these with the external operations of suppliers, Customers and other members of the supply chain. This may lead to changes in the traditional structure of the organization. SCM focuses on coordination and configuration of the processes that are necessary to make products on time (no delay), reproducibly, and in a satisfactory condition (quality assurance) together with handling procurement of the material/service inputs.

2.2. Airlines MRO Supply Chain management

The challenge for maintenance, repair, & overhaul (MRO) providers is to be able to cope with the unpredictability and complexity of customer demand. The exact scope and specific requirements of each job including the necessary materials, spare parts, equipment, and employees – are typically not known until a given machine is taken apart and the problem diagnosed(Icron, 2019) . To ensure ongoing productivity and profitability, MRO providers must be able to operate with great efficiency and flexibility to deliver fast, reliable, and customized service for customers, and effectively allocate resources and inventory to reduce operational costs

According to (Koblen & Niznikova, 2013)Supply chain management is a set of approaches utilized to efficiently integrate suppliers, manufacturers, warehouses and stores, so that merchandise is produced and distributed at the right quantities, to the right locations, and at the right time, in order to minimize system-wide costs while satisfying service level requirement .

According to (SCMR, 2019)MRO integrated supply chain involves different departments like Finance, Maintenance, Engineering/Reliability, and Purchasing which have competing interests. While all of them are working toward the common goal of sustaining a profitable business, the different approaches sometimes cause stress**.** Finance seeks less inventory at a lower cost, Maintenance wants to stock more spare parts to avoid downtime of aircrafts, Engineering seeks new equipment and parts needed to sustain aircrafts reliability and purchasing wants to pay less for the necessary spare parts. A decision in one department often ripples across the others. For example, purchasing decides to procure a less expensive part. That decision impacts maintenance, with the less expensive part being replaced more often. It could also impact production because of more frequent downtime, which means still higher maintenance costs. The same with Finance and its preference to have less inventory, which could result in more spot buys and expedited freight costs. Understanding the cause and effect' enables companies to work through the discrepancies between departments. Bridging that gap particularly between Procurement and Maintenance requires consistent communication.

2.3. Supply chain management practices

According to (Ebrahim & Mahmoud, 2014) SCM practices are defined as the set of activities undertaken by an organization to promote effective management of its supply chain. The practices of SCM are proposed to be a multi-dimensional concept, including the downstream and upstream sides of the supply chain.

1. **Supplier partnership**: According to (Ebrahim & Mahmoud, 2014)supplier partnership defined as the long term relationship between the organization and its suppliers. According to (Woods, 2001) supplier partnershipis designed to leverage the strategic and operational capabilities of individual participating organizations to help them achieve significant ongoing benefits. According to (WIJETUNGE, 2016) a strategic partnership emphasizes direct, long-term association and encourages mutual planning and problem solving efforts; Such strategic partnerships are entered into to promote shared benefits among the parties and ongoing participation in one or more key strategic areas such as technology, products, and markets. Strategic partnerships with suppliers enable organizations to work more effectively with a few important suppliers who are willing to share responsibility for the success of the products. Suppliers participating early in the product-design process can offer more cost effective design choices, help to select the best components and technologies, and help in design assessment. Strategically aligned organizations can work closely together and eliminate wasteful time and effort. An effective supplier partnership can be a critical component of a leading edge supply chain. According to (Kiprop, 2015) Strategic partnership is designed to influence the strategic and operational capabilities of an individual partnership participating organization to help them achieve certain significant strategic goals and objectives of the entity.
2. **Level & Quality of information sharing**: According to (Ellram, 2004) Information sharing has two aspects: level (quantity aspect) and quality. Both aspects are important for the practices of SCM and have been treated as independent constructs in the past SCM studies. (Chau,1997) Highlights that both quality and quantity of the information is necessary when communicating among suppliers.

   Level (quantity aspect) of information sharing: According to (Li et, al., 2006) level of information sharing refers to the extent to which critical and proprietary information is communicated to one's supply chain partner. Shared information can vary from strategic

to tactical in nature and from information about logistics activities to general market and customer information. Information flow is a critical in terms of identifying demand, sharing information, establishing expectation through a service level agreement or statement of work, and clearly defining the scope of work, the skills required of service providers and feedback on the performance. Information flow is the foundation of any effective supply chain and reduces the uncertainty that can make all type of supply chains very risky and reactive.

Quality of information sharing: According to (Moberg, 2002) quality of information sharing refers to the accuracy, timeliness, adequacy, and credibility of information exchanged. Supply chain partners who exchange information regularly are able to work as a single entity. Together, they can understand the needs of the end customer better and hence can respond to market change quicker. Moreover, someone consider the effective use of relevant and timely information by all functional elements within the supply chain as a key competitive and distinguishing factor.

3. **Internal integration:** According to (Darja, et al., 2009) internal integration involves the coordination, collaboration and integration of logistics activities with other functional areas in an organization. When specialized functions or departments in a company are interdependent and when operation and procedures occur that allow and require co-operation. Hence, internal integration researches with in a company; it aims to eliminate traditional silo functions and emphasizes better co-ordination between function areas. Internal integration reflects the fact that at least two or more complementary functions of a company act as a whole although they are not integrated into a single entity. It also states that internal integration as a collaboration that facilitates teamwork, sharing of resources and meeting the set objectives between complementary functions; they all contribute to a more successful integration.

According to (Claudine, et al., 2008) internal integration is defined as unifying functions and processes within the firm especially in the areas of warehousing, transportation, inventory management, purchasing, demand planning and production. In order to integrate internal operations, firms need to have cross-functional structures because cross-functional inputs necessitate the consideration of how coordination and integration can be sustained across this intra-firm relationship. This can be achieved with

an appropriate organizational structure with fewer formalities, more empowerment and work teams. The nature of logistics is such that it involves intricacy, extensive documentation and detailed management. There is a need to streamline operations and redesign work routines and processes to eliminate redundancy of work. This allows savings of cost and time, and increases the quality of services, and ultimately value to customers (Bowersox, et al., 2002)

Internal integration is the extent to which business functions work cooperatively and interact through cross-functional process integration to resolve conflicts and achieve mutual goals (Danese et al., 2013; Pagell, 2004).Internal integration is a state of high-level of values, common objectives and collaborative behavior(Souder, et al., 1993). On the other hand (Lorsch & Jay, 1965) defined it as a process of equal input between different subsystems when achieving company tasks.

2.4. Operational performance

According to (Christopher, 1998)Operational performance is a source of competitive advantage for the enterprise to differentiate itself in the eyes of the customers from its competitors by operating at a lower cost and hence at a greater profit. It is also defined as a performance of an organization against its set standards such as waste reduction, productivity, cycle time, environmental responsibility and regulatory compliance.

Operational performance refers to the measurable aspects of the outcomes of an organization's processes, such as reliability, production cycle time, and inventory turns. Operational performance in turn affects business performance measures such as market share and customer satisfaction (Ahmed, et al., 2015)

According to (Tewfik & Ensermu, 2012)Qualitative supply chain (SC) performance measures include customer satisfaction (pre transaction, transaction, and post-transaction), flexibility, information and material flow integration, risk management, and suppliers' performance in terms of delivering the right good in the right time. There are also quantitative measures based on cost and on customer responsiveness. Measures based on cost include cost minimization, sales maximization, profit maximization, inventory investment minimization, and return on investment maximization.

Various studies confirmed that that there is a direct positive relationship between SCM practices and operational performance. (Tan, 2002; Mwale, 2012; Mutuerandu, 2014; Li et. al 2006; Ebrahim and Mahmoud, 2014). (Mutuerandu, 2014) result shows that supply chain management practices (information sharing, customer relations, strategic partnerships and training) has positive relationship with operational performance. (Mutuerandu, 2014) result shows that SCM practices (Strategic Supplier Partnership, Customer Relationship and Level & Quality of Information Sharing) have a positive relationship with operational performance.

2.5. Empirical Reviews of the Effect of Supply Chain Management Practices on Operational Performance

According to IATA (2013), the flight disruptions occurred in the aerospace supply chain is the predominant cause of the operational delays. Operational delay may occur due to natural disasters (such as earthquakes, volcanic eruptions, and floods), bad weather conditions and manmade risks. These are not the only challenges in the aviation industry. The difficulties or delays in MRO (Maintenance, Repair and Overhaul) operations disrupt flight schedules and have a huge financial impact. According to(Atnafu & Omer, 2017) effective supply chain integration (internal integration, customer integration and supplier integration) experienced in Ethiopian Chemical and Chemical product manufacturing firms has an effect on their operational performance. According to (Mutuerandu, 2014) supply chain management practices (information sharing, customer relations, strategic partnerships and training) have a positive effect on organizational performance of performance of Haco industries. According to (Ebrahim & Mahmoud, 2014) finding SCM practices (Strategic Supplier Partnership, Customer Relationship and Level & Quality of Information Sharing) have a direct, positive influence on organizational performance. According to (Addis, 2015)supply chain management practices (JIT supply ,Holding safety stock, Few suppliers, Close partnership with suppliers, Close partnership with customers and Level of information quality (IQ)) have impact on operational performance.

2.6. Identified Literature Gap

Even though the measures of operational performance and supply chain management practices vary from organization to organization, they are essential for effective management of any organization. Supply chain management practices are affected by the global operations, the real challenge for managers of this new enterprise environment is to develop suitable performance measures and metrics to make right decisions that would contribute to an improved supply chain practices, competitiveness of the organization and its operational performance. Some of the empirical studies only focus on upper tier supply chain i.e. suppliers (Addis, 2015) and some only focus on the lower level supply chain i.e. customers (Mutuerandu, 2014)(Ebrahim & Mahmoud, 2014), and (Atnafu & Omer, 2017) focus on both supplier and customer but the variables used as supply chain practices are varied depending on the organization selected on their study.

2.7. Conceptual Frame Work of the Study

A conceptual framework is basically the representation of a particular study or survey topic that drives the investigation being reported based on the problem statement (McGaghie, et al., 2001). Many chains of events occur before flight takes off and on time performance of flights can be affected by some of the factors. On time performance of flights can be affected by many reasons. One of the factors affecting on time performance of flight is technical issue related with aircraft maintenance. In the aviation industry, MRO division is responsible to maintain and ensure airworthiness of flights before flight take off. Internal supply chain integration among MRO members, strategic supplier partnership and level and quality of information sharing plays vital role to ensure on time performance of flights. The conceptual framework showing the effect of supply chain management practices on operational performance of Ethiopian airlines maintenance repair and overhaul can be depicted as follows.

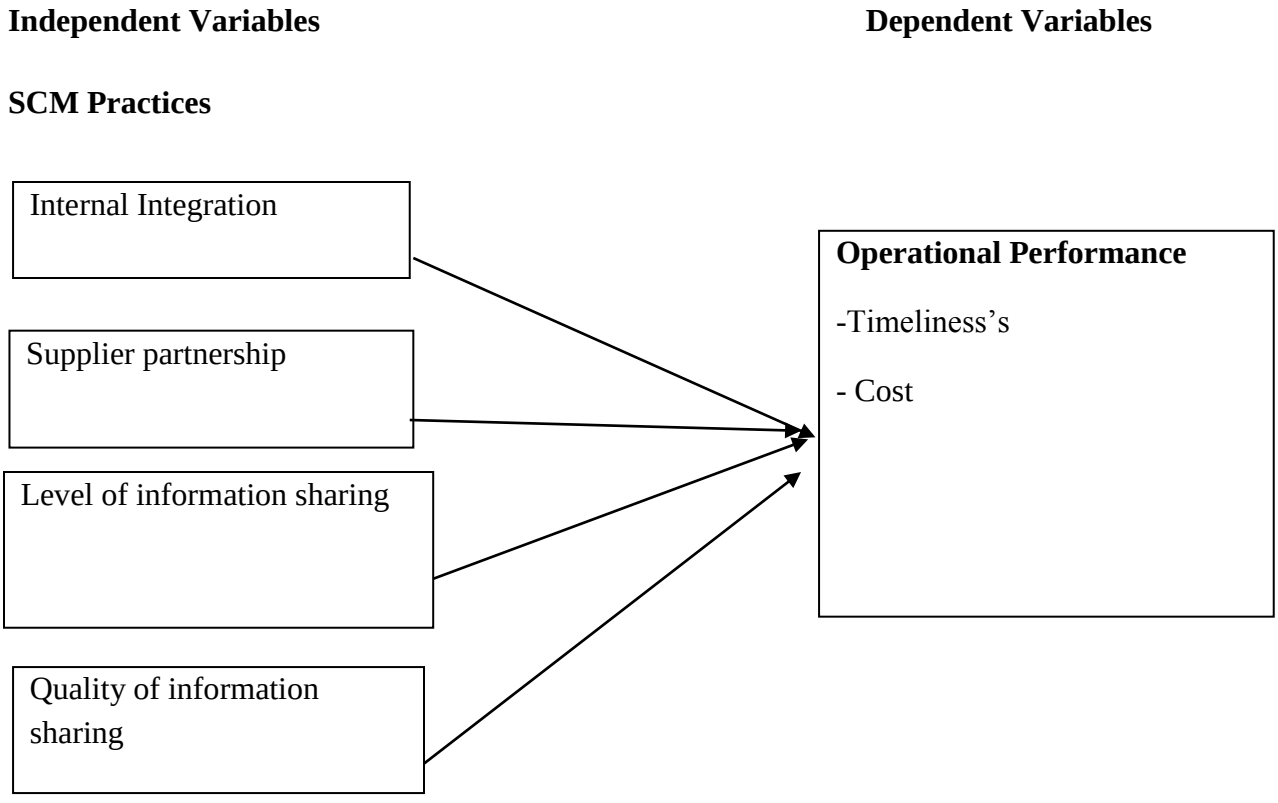

Figure 1: Conceptual Framework, Source: Adopted from (Kindie, 2017; Ebrahim & Mahmoud, 2014; Mutuerandu, 2014 ; Atnafu & Omer, 2017)

Chapter Three

Methodology of the study

Under this chapter research approach, research design, population and sampling techniques, data sources and types, data collection procedures, ethical consideration, and data analysis will be discussed.

3.1. Research Approach

According to (Creswell, 2009) quantitative research is a type of educational research in which the researcher decides what to study, asks specific, narrow questions, collects numeric (numbered) data from participants, analyzes these numbers using statistics, and conducts the inquiry in an unbiased and objective manner. And also states that Quantitative research approach used to determine the relationship between one thing (an independent variable) and another (a dependent or outcome variable) in a population. From this study supply chain management practices are independent variables and operational performance is dependent variable, so objective of this study is to assess the relationship between supply chain management practices and operational performance of Ethiopian airlines MRO. Hence, the research approach employed for this study is Quantitative research method. In addition, the researcher also used qualitative data through interview, so qualitative research method also employed for this study. Hence, both quantitative and qualitative research method employed for this study.

3.2 Research Design

According to University of Southern California (USC, 2019) in quantitative research method the research design will be either descriptive or experimental research design. In descriptive study subjects usually measured once. Descriptive study establishes only association of variables and study includes a sample population of hundreds or thousands of subjects to ensure that a valid estimate of a generalized relationship between variables has been obtained.

The research objective is to study the association of independent variable (supply chain management practices) and dependent variable (operational performance) of Ethiopian maintenance repair and overhaul and descriptive research design employed. As the research

objective is also to show the effect of independent variable (Supply chain management practices) on dependent variable (operational performance) Explanatory research design also employed.

3.3. Unit of Analysis

The unit of analysis is the major entity that will be analyzed in the study. Therefore, the unit of analysis used in this survey is the group of employees involved in the supply chain operation of Ethiopian MRO. The employees' perception towards the supply chain practice and operational performance will be collected using survey questioner and then the quantitative analysis made based on the collected information.

3.4. Population and Sample

Population: As per one of Ethiopian maintenance repair and overhaul human resource section employee information the population under the study is 1000 employees working under the Ethiopian MRO maintenance team and procurement and supply chain management**.**

Sampling Technique and Sample Size: According to (Kothari, 2004) non-probability sampling techniques is the techniques that units in the population have unequal or zero chances for being selected as a member of sample. Non- Probability sampling technique applied to select respondents from Ethiopian airlines MRO maintenance team and procurement and supply chain management. Deliberate or purposive sampling from non-probability sampling used to select participants. By using this sampling technique, 142 respondents selected as a sample size of the study. In order to arrive the correct sampling size for the selection of employees, the researcher has used Krejcie and Morgan (1970) sampling formula. In social science research many researchers suggest the minimum Confidence Level = 95% and the Margin of Error = 5%. Therefore, sample sizes for the employees are.

$$n=\frac{Z^2.P.Q.N}{e^2(N-1)+Z^2.P.Q}=\frac{1.96^2(0.5)(0.5).1000}{0.05^2(1000-1)+1.96^2(0.5)(0.5)}=142$$

N is the required sample size

P is proportion of the sample successfully collected=0.5

Q = failure of sample (1-0.5)= 0.5

e is the percentage maximum error required,5 %

Z is the value corresponding to level of confidence required (in the case of 95% = 1.96)

N is Population size

3.5. Data Sources and Types

Both Primary and secondary data source are employed in this study. Primary data collected through questionnaires and semi-structured interview from Ethiopian airlines MRO maintenance team and procurement and supply chain management. Secondary data collected from company daily delay reports and documents.

3.6. Data Collection Procedures

Primary data collected through questionnaire and semi-structured interview.

Questionnaire: Questionnaire was distributed to 142 sample population through email. a reminder was sent for the non- responding employees and a total of 115 filled questionnaires received from respondents. Out of 115 filled questionnaires 106 was valid & the remaining 9 questionnaires was missing data & invalid.

Semi-structured interview: Interview was conducted with two logistics and supply chain managers and one maintenance manager.

Secondary data collected from daily delay report of the MCC, from material planning section deferred report and aircraft maintenance status report from production planning, post mortem report after schedule maintenance and yearly Maintenance delay report .

3.7. Data Analysis

Before analyzing the data, the quantitative data collected through questionnaire cross checked for its completeness and consistency. After checking the completeness and consistency of the collected data the researcher coded the received data and inserted into IBM statistical package for social studies (SPSS) version 20 software to get the required analysis results for the study and results presented using descriptive statistics such as mean, standard deviation, percentile and frequency. Correlation and Multiple regression analysis employed for the data analysis. Correlation employed to test the relationship of independent variables (supply chain management practices) and dependent variable (operational performance) and multiple regression analysis used to test the cause and effect of independent variable and dependent variable.

3.8. Validity of the Test

Validity indicates the degree to which the instrument measures what it is supposed to measure (Kothari, 2004). According to (Roberta & Twycross, 2015) Validity is defined as the extent to which a concept is accurately measured in a quantitative study; also defined validity as it looks whether the instrument adequately covers all the content that it should with respect to the variable. In other words, does the instrument cover the entire domain related to the variable, or construct it was designed to measure. The instruments adapted from previous researches.

3.9. Reliability of the Test

Reliability analysis's the extent to which data collection techniques or analysis procedures yield consistent findings (Saunders, et al., 2009). Reliability analysis is concerned with the internal consistency of the research instrument. (Yin, 2003) added that the goal of reliability is to minimize the errors and biases in a study. Cronbach's Alpha will be used as a standard test for questionnaire accuracy.

Coefficient alpha (also known as "Cronbach's alpha") is the most widely used reliability coefficient. It estimates test-score reliability from a single test administration using information from the relationship among test items. According to (Tavakol & Dennick, 2011) Cronbach's alpha of less than 0.5 is unacceptable, α less than or equal to 0.6 is poor, α less than 0.7 is questionable, α less than 0.8 and greater than or equal to 0.7 is acceptable, α less than 0.9 and greater than or equal to 0.8 is good and finally α greater than or equal to 0.9 is excellent. Questioners were distributed to a sample of 20 respondents for reliability test and the reliability test presented as below.

Table 3.3: Cronbach's Alpha

Construct	Variables	Number of items	Cronbach's Alpha
Supply chain management practices	Supplier partnership	6	0.817
	Internal integration	11	0.897
	Level of information sharing	6	0.749
	Quality of information sharing	5	0.817
Operational performance	Performance	8	0.854

Source: Survey data, 2020

As it is indicated in Table 3.3 all value of Cronbach's alpha for supply chain management practices and performance measures shows greater than 0.70. Hence, we can conclude that the data collection instruments were acceptable and reliable.

3.10. Model and Estimation Techniques

In order to found the cause and effect relationship between dependent and independent variables, the study have used multiple regression model to measure the level of significant relationship between the dependent and independent variables.

The model applied to show this influence is presented as follows;

$$Y = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \varepsilon$$

Where:

Y = Operational performance of Ethiopian MRO.

β0 = Constant (value of Y when X1, X2, X3 and X4 = 0)

β1 = Regression coefficient for Supplier partnership

X1=Supplier partnership

β2=Regression coefficient for internal integration

X2= Internal Integration

β3=Regression coefficient for Level of information sharing

X3= Level of information sharing

β4=Coefficient of regression for Quality of information sharing

X4= Quality of information sharing

ε = the error

3.11. Ethical Considerations

According to (Leedy & Ormarod, 2010), there are four ethical issues that need to be addressed in the process of undertaking a research: That are protection from harm, informed consent, right to privacy, and honesty with professional colleagues. Therefore, the participants in this study was selected with full consent and informed to respond for questionnaires with confidence and understanding the purpose of the thesis; and the researcher was assured that as he will keep the information confidential and the data will be used for intended purpose only.

Chapter Four

Results and Discussion

4.1. Introduction

This chapter presents the data analysis and result interpretation part of the research. In order to presents the findings of the research effect of supply chain management practices of Ethiopian MRO on its operational performance the collected data was tabulated using quantitative method and analyzed using descriptive and regression analysis statistical tools.

4.2. Data Processing

Only 115 questioners are collected out of 142 distributed questioners to the selected respondents that make 80.99% response rate and 19.01% non-response rate. However, in order to reduce the possible errors in the data administration, immediately after the collection of data the researcher has cleanses the outlier, missing values and discrepancies. Finally, 106 complete respondents' data are used for the survey analysis using SPSS 20.0.

4.3. Descriptive Analysis

In this part of analysis, the researcher has divided and described it in to two parts. The first part focuses on the demographic information of the respondents so frequencies and percentage used for the analysis. The second part focused on the basic questions which are intended to acquire the perceptions of the respondents towards supply chain practices i.e. supplier partnership, level of information sharing, level of information quality and internal integration practices in the organization and also focuses on the perceptions of the employees towards the operational performance of the company. Therefore, for the analysis mean and standard deviation are used to describe the findings.

4.3.1 Demographic Data of the Respondents.

The profile of the respondents' in the selected department of logistics and supply chain management and Maintenance section are summarized in to four parts in this survey. The first one is about the respondents' educational qualification, the second is about employee level in the organization, the third is about experience of employee in the selected departments, and the fourth one is about respondents' department.

4.3.1.1. Educational Qualification of Respondents

Education is paramount in enabling the respondents to conceptualize issues related to resource utilization. This finding was in line with Katz (1992) finding that those with higher education are more successful as they have more knowledge and have modern managerial skills making them more conscious of the reality of the business work.

Table 4.1: Respondents Educational qualification

Level of Education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Certificate	4	3.8	3.8	3.8
	Bachelor Degree	92	86.8	86.8	90.6
	Master's Degree	10	9.4	9.4	100.0
	Total	106	100.0	100.0	

Source: Survey data, 2020

As it can be seen form Table 4.1, Most of respondents' educational qualification (96.2 %) is above 1stdegree level i.e. 86.8% and 9.4% of the respondents have bachelor and Master degree respectively and 3.8 % of the respondents have Aviation certificate. This implies that they are capable of conceptualizing and respond authoritatively on issues and practices.

4.3.1.2. Job Experience of the Respondents' in the Selected Department

It is also important to note the experience level of the respondents on the area of the study for the successful implementation of the survey. The following Table presents the respondents' experience on selected departments.

Table 4.2: Respondents Job experience

Job Experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	< 5 Years	15	14.2	14.2	14.2
	5-10 Years	47	44.3	44.3	58.5
	> 10 Years	44	41.5	41.5	100.0
	Total	106	100.0	100.0	

Source: Survey data, 2020

Based on the Table 4.2, 85.8 % of the respondents have more than five-year experience on the company's logistic and supply chain management and maintenance department. Specifically, 44.3% of respondents' have five up to ten years' experience, 41.5 % more than 10 years' experience. Only 14.2% of them have experience less than 5years' experience. Therefore, we can conclude that they can understand the supply chain practices their response can be taken as reliable result.

4.3.1.3. Job Positions of the Respondents' in the Selected Department

The other important factor on the respondents' demographic variable is the respondents' level of employment in the company. In Ethiopian airlines MRO, there are different levels of employment starting form officer level to the highest level of ranking as Managerial director of MRO. The following table shows the respondents' employment level in the company.

Table 4.3: Respondents Job position

Job Position

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Officer	80	75.5	75.5	75.5
	Team leader	18	17.0	17.0	92.5
	Manger	8	7.5	7.5	100.0
	Total	106	100.0	100.0	

Source: Survey Data, 2020

As Table 4.3 shows out of 106 valid responses on the survey, 75.5 % of the questioners were from officers (procurement officers and maintenance technicians), 17 % were from team leaders and 7.5 % of the respondents are from managers. This implies that due to their detailed involvement on logistic and supply chain activity of the company, the information gathered from them are accurate and relevant for the study.

4.3.1.4. Departments of the Respondents in the Company

The following table shows the frequency and the percentage of response in the selected departments.

Table 4.4: Frequency and percent of the respondents' department

		Department	
		Frequency	Percent
Valid	Logistics and supply chain management	64	60.4
	Maintenance	42	39.6

Source: Survey Data, 2020

As table 4.4 shows the number of respondents' on the two selected department is almost proportionate. 60.4 % of the respondents are from Logistics and supply chain management department and 39.6 % of the respondents is from maintenance department. Therefore, the findings can be generalizable for the company.

4.4. Descriptive analysis on Independent variables

4.4.1. Supplier Partnership

In order to assess the supplier relationship, the selected employees were requested to respond for six related question in order to assess the partnership of Ethiopian airlines MRO with suppliers. The questions are focused on criteria for supplier selection in Ethiopian MRO; involvement of key suppliers in problem solving; joint involvement for new capability development; Joint involvement in improving supplier's product quality and services; involvement of key suppliers in Ethiopian MRO continuous improvement program and Involvement of manufacturers in

maintenance planning activates of Ethiopia airlines MRO. Table 4.5 shows the responses of each questions asked as strategic supplier partnerships.

Table 4.5: Descriptive Statistics for Supplier partnership

	N	Mean	Std. Deviation
We consider quality as our number one criterion in selecting suppliers	106	4.38	.654
We regularly solve problems jointly with our suppliers	106	4.31	.681
We have helped our suppliers to improve their product quality	106	3.70	.830
We have continuous improvement programs that include our key suppliers	106	3.65	.916
We include manufactures in our maintenance planning activities	106	4.34	.584
We actively involve our key suppliers in new capability development processes	106	4.36	.589

Source: Survey data, 2020

As it is analyzed in table 4.5,most of the respondents agree that Ethiopian airlines MRO consider quality as a number one criteria to select vendors (M=4.38, SD=0.654), Involve key suppliers in its new capability development process (M=4.36, SD=0.589), Includes manufacturers in its maintenance planning activities (M=4.34, SD=0.584) and solve problems jointly with suppliers. However, the result shows that Ethiopian airlines MRO is not good in helping suppliers to improve their product quality (M=3.70, SD=0.830) and including suppliers in continuous improvement program (M=3.65, 0.916).

Interview with two logistics and supply chain management managers and one maintenance manager also shows that Ethiopian MRO is not working closely with suppliers to improve supplier product quality and doesn't include supplier in continuous improvement program.

4.4.2. Internal integration

In order to assess internal integration, the selected employees were requested to respond eleven related question in order to assess internal integration of different sections in selected departments. Table 4.6 shows the responses of each questions asked as internal integration.

Table 4.6: Descriptive Statistics for Internal integration

	N	Mean	Std. Deviation
The extent of integration between Line Maintenance and Procurement positively affected ET MRO performance	106	4.04	.716
The extent of integration between Component Maintenance and Procurement positively affected ET MRO performance	106	4.36	.605
The extent of integration between Schedule Base maintenance and Procurement positively affected ET MRO performance	106	4.00	.743
The extent of integration between Line Maintenance and Engineering positively affected ET MRO performance	106	3.93	.796
The extent of integration between Material Requirement Planning and Procurement positively affected ET MRO performance	106	4.06	.674
The extent of integration between Engineering and Procurement positively affected ET MRO performance	106	4.04	.742
The extent of integration between Procurement and Finance positively affected ET MRO performance	106	4.43	.618
The extent of integration between Procurement and Logistics positively affected ET MRO performance	106	4.49	.502
The extent of integration between Component Maintenance and Line maintenance positively affected ET MRO performance	106	4.08	.643
The extent of integration between Schedule Base Maintenance and Line Maintenance positively affected ET MRO performance	106	4.03	.668
The extent of integration between Engine Maintenance and Line Maintenance positively affected ET MRO performance	106	4.55	.519
Valid N (listwise)	106		

Source: Survey Data, 2020

As it is analyzed in table 4.6, most of the respondents agree that The extent of integration between Engine Maintenance and Line Maintenance(M=4.55, SD=0.519), The extent of integration between Procurement and Logistics (M=4.49, SD=0.502), The extent of integration between Procurement and Finance(M=4.43, SD=0.618) and The extent of integration between Component Maintenance and Procurement (M=4.36, SD=0.605) highly positively affected ET MRO performance ;Internal integration of other Ethiopian MRO sections scored with medium

mean. However, the result shows that the extent of integration between Line Maintenance and Engineering least positively affected ET MRO performance (M=3.93, 0.796).

Interview with two logistics and supply chain management managers and one maintenance manager also shows that integration of line maintenance and engineering is least integrated and affecting the performance of Ethiopian airlines MRO. Therefore, the finding shows that Ethiopian airlines MRO has to improve the integration of line maintenance and engineering to improve its operational performance.

4.4.3. Level of information sharing

In order to assess the level of information sharing in Ethiopian airlines MRO, the selected employees were requested to respond six related question. Table 4.7 shows the responses of each questions asked as level of information sharing.

Table 4.7 : Descriptive Statistics for level of information sharing

	N	Mean	Std. Deviation
We inform suppliers in advance of changing needs	106	4.41	.493
Our suppliers share proprietary information with us	106	3.78	.793
Our suppliers keep us fully informed about issues that affect our business	106	4.39	.489
Our suppliers share knowledge with us at the time of new repair capability development	106	4.42	.497
We and our suppliers exchange information that helps establishment of maintenance task	106	3.72	.790
We and our suppliers keep each other informed about events or changes that may affect the operation	106	4.35	.553
Valid N (listwise)	106		

Source: Survey Data, 2020

As it is analyzed in table 4.7, highest mean score observed for suppliers' knowledge sharing with Ethiopian MRO at the time of new repair capability development (M=4.42, SD=0.497), informing suppliers in advance of changing needs (M=4.41, SD=0.493), Suppliers fully informed Ethiopian airlines MRO about issues that affect its business (M=4.39, SD=0.489) and Suppliers and Ethiopian airlines MRO keep each other informed about events or changes that affect the

operation (M=4.35, SD= 0.553). However, suppliers sharing proprietary information with Ethiopian airlines MRO (M=3.78, SD=0.793) and Ethiopian airlines MRO and supplier's information exchanging that helps establishment of maintenance task (M=3.72, SD=0.79) scored lowest mean.

Interview with two logistics and supply chain management managers and one maintenance manager also shows that suppliers is not good in sharing proprietary information with Ethiopian airlines MRO and Ethiopian MRO and suppliers is not good in exchanging information that helps in establishment of maintenance task. Therefore, the finding shows that Ethiopian airlines MRO has to improve in sharing proprietary information with suppliers and information exchanging that helps establishment of maintenance task.

4.4.4. Quality of information sharing

In order to assess the level of information sharing quality in Ethiopian airlines MRO, the selected employees were requested to respond five related question. Table 4.8 shows the responses of each questions asked as level of information sharing quality.

Table 4.8: Descriptive Statistics for Quality of information sharing

	N	Mean	Std. Deviation
Information exchange between our suppliers and ET MRO is timely	106	4.34	.702
Information exchange between our suppliers and ET MRO is accurate	106	4.38	.593
Information exchange between our suppliers and ET MRO is complete	106	3.79	.813
Information exchange between our suppliers and ET MRO is adequate	106	3.93	.707
Information exchange between our suppliers and ET MRO is reliable	106	4.49	.590
Valid N (listwise)	106		

Source: Survey Data, 2020

As it is analyzed in table 4.8, highest mean scored for reliability of Information exchange between suppliers and Ethiopian airlines MRO (M=4.49, SD=0.590), accuracy of Information exchange between suppliers and Ethiopian airlines MRO (M=4.38, SD=0.593) and Timely Information exchange between suppliers and Ethiopian airlines MRO (M=4.34, SD=0.702). However, adequacy of information exchange between suppliers and Ethiopian airlines MRO (M=3.93, SD=0.707) and completeness of information exchange between suppliers and Ethiopian airlines MRO (M=3.79, SD=0.813) scored lowest mean. Therefore, Ethiopian MRO

has to work on adequacy and completeness of information exchange with suppliers to improve its level of information sharing quality.

Interview with two logistics and supply chain management managers and one maintenance manager also shows that information exchange with suppliers is not adequate and complete. Hence, Ethiopian airlines MRO has to work with suppliers to share adequate and complete information.

4.5. Descriptive Analysis on Dependent Variable

In order to assess the operational performance of Ethiopian airlines MRO the selected employees were requested to respond eight related question. Table 4.9 shows the responses of each questions asked as operational performance.

Table 4.9: Descriptive Statistics for operational performance

	N	Mean	Std. Deviation
We deliver parts and tools at reasonable price	106	4.39	.684
We purchase quality parts and tools whenever required	106	4.36	.665
Our planning is always meet the aircraft planned maintenance date	106	3.92	.874
Our planning(budget and delivery plan) is accurate	106	3.76	.857
We receive parts and tools on time	106	4.39	.711
We receive repaired units from supplier in reduced turnaround time	106	4.30	.745
We purchase parts and tools with no expedite fee	106	3.66	.935
We complete aircraft maintenance within the planned turnaround time and deliver aircrafts to marketing on time	106	4.34	.742
Valid N (listwise)	106		

Source: Survey Data, 2020

As it is analyzed in table 4.9, highest mean scored for delivery of parts and tools at reasonable price (M=4.39, SD=0.684), receive parts and tools on time (M=4.39, SD=0.711), purchase quality parts and tools whenever required (M=4.36, SD=0.665), complete aircraft maintenance within the planned turnaround time and deliver to marketing on time(M=4.34, SD=0.742) and receive repair units from supplier in reduced turnaround time (M=4.30, SD=0.745). However, accuracy of budget and delivery plan (M=3.76, SD=0.857), planning meet the aircraft planned

maintenance date (M=3.92, SD=0.874) and purchase parts and tools with no expedite fee (M=3.66, SD=0.935) scored lowest mean. Therefore, Ethiopian airlines MRO has to work on improving accuracy of budget and delivery plan, improving planning to meet the aircraft planned maintenance date and purchasing parts and tools with expedite fee to improve its operational performance.

4.6. Correlation Analysis between Dependent and Independent Variables

Correlation analysis tests the relationship between the dependent and independent variables. In this correlation analysis the operational performance is taken as dependent variable and supply chain management practices (Suppliers' partnership, Internal Integration, Level of information sharing and level of information quality) are used as independent variables. To test the statistically significant relationship between the participants' responses to the two Likert scales questions for the independent and dependent variables, Spearman rank correlation test is used on this survey since the variables are measured on a scale that is at least ordinal.

Table 4.10: Correlation analysis between Supply chain management practices (Supplier partnership, internal integration, level of information sharing and information quality) and operational performance

		SP	II	IS	IQ	OP
Spearman's rho	OP Correlation Coefficient	.305**	.232*	.202*	.351**	1.000
	Sig. (2-tailed)	0.001	0.017	0.038	0.000	
	N	106	106	106	106	106

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed)
Source: Survey data, 2020

Each questions in each category of supply chain practices are transformed in to five variables i.e. SP, II, IS, and IQ. For operational performance, the collected data using Likert scale type questioners was transformed in to OP variable. The finding shows that all supply chain

management practice variables coefficients are significant at the 0.01 and 0.05 levels. Based on the above output value of sig (2-tailed), in Ethiopian airlines MRO,

- All independent variables (SP, II, IS and IQ) used as supply chain practices and operational performance have a statistically significant relationship.
- The direction of the relationship independent variables and dependent variables are positively correlated, that means these variables tend to increase together.

In general, positive relationship between all independent and dependent variables are observed on the finding. Specifically, the coefficient of the relationship between supplier partnership and Operational performance (r = 0.305). Therefore, if the supplier relationship increases the operational performance of the Ethiopian airlines MRO will increase. The same holds for the other variables i.e. the coefficient of operational performance with internal integration (r = 0.232), the level of Information sharing (r = 0.202), the level of information quality (r = 0.351). Therefore, if the companies' supplier partnership, internal integration, level of information sharing and level of information sharing quality practices increases the operational performance of the company will increase proportionally.

4.7. Results of Regression Analysis

4.7.1. Regression Analysis Model Summary

A multiple regression model R-squared is determined by pairwise correlations among all the variables, including correlations of the independent variables with each other as well as with the dependent variable. The multiple correlation coefficient (R) is a measure of the strength of the relationship between Y (in this case the operational performance) and the four predictor variables selected for inclusion in the equation as the supply management practices i.e. SP, II, IS and IQ. Large values of the multiple R represent a large correlation between the predicted and observed values of the outcome. A multiple R of 1 represents a situation in which the model perfectly predicts the observed data. (Field, 2009)

Adjusted R-square is a measure of the loss of predictive power or shrinkage in regression. The adjusted R-square tells us how much variance in the outcome would be accounted for if the model had been derived from the population from which the sample was taken Adjusted R-squared is always smaller than R-squared, but the difference is usually very small unless you

are trying to estimate too many coefficients from too small a sample in the presence of too much noise.

Table 4.11: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.604[a]	.365	.340	.38497

a. Predictors: (Constant), Level of Information Quality, Level of information Sharing, Internal Integration, Supplier Partnership
Source: Survey Data, 2020

Based on SPSS generated data above, the adjusted R-square (coefficient of determination) explain 34 % of the factor affecting operational performance is represented by the four independent variables that were studied. Therefore, a further research should be conducted to investigate the other factors (66 %) that affect operational performance in Ethiopian airlines MRO.

4.7.2. ANOVA Table

The most important part of the table is the F-ratio, which is a test of the null hypothesis that the regression coefficients are all equal to zero. Because R-square is not a test of statistical significance (it only measures explained variation in Y from the predictor Xs), the F-ratio is used to test whether or not R^2 could have occurred by chance alone. In short, the F-ratio found in the ANOVA table measures the probability of chance departure from a straight line.

Table 4. 12: **ANOVA[a]Table**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.604	4	2.151	14.514	.000[b]
	Residual	14.968	101	.148		
	Total	23.573	105			

a. Dependent Variable: Operational Performance
b. Predictors: (Constant), Level of Information Quality, Level of information Sharing, Internal Integration, Supplier Partnership

Source : Survey, 2020

From this survey data shown on the table 4.11, F is 14.514, which is significant at p <0.001 (because the value in the column labeled Sig. is less than 0.001). This result tells us that there is less than a 0.1% chance that an F-ratio this large would happen, if the null hypothesis proposed about F-ratio were true. Hence, can be conclude that the researcher regression model results in significantly better prediction of operational performance and that the regression model overall predicts the operational performance significantly well.

4.7.3. Coefficients of Regression Analysis

In order to know which of the predictors' i.e. Supplier partnership, internal integration, Information sharing or Information sharing quality has contributed significantly to our understanding of Y (operational performance), the following table shows Coefficients when we explore each predictor's beta (i.e., standardized regression coefficient) and its level of significance.

Table 4.13 Coefficient table for regression analysis

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.535	.657		.814	.418
	Supplier Partnership	.181	.088	.178	2.054	.043
	Internal Integration	.023	.123	.015	.184	.854
	Level of information Sharing	.158	.106	.126	1.488	.140
	Level of Information Quality	.503	.082	.497	6.096	.000

a. Dependent Variable: Operational Performance

Source: Survey Data, 2020

A multiple regression analysis so as to determine the relationship between operational performance of the Ethiopian airlines MRO and the four supply chain management practices variables. As per the SPSS output above, the equation ($Y = \beta 0 + SPX1 + IIX2 + ISX3 + IQX4 + \varepsilon$) becomes: $Y=0.535+0.181X1+0.023X2+0.158X3+0.503X4+0.385$

From the above equation, if X1 differed by one unit (and X2, X3, X4 did not differ) Y (Operational performance of Ethiopian airlines MRO) will differ by B1 units, on average. The same holds for the other variables. Therefore, for our model if the supplier partnership increases by 1%, on average, the operational performance of Ethiopian airlines MRO will be increased by 18.1 %. Similarly, a one percent increase in the internal integration of Ethiopian airlines MRO; we would expect the operational performance of the company will increase by 0.023 % having constant the other variables. In addition, keeping the other variables constant, for one percent increase in operational performance, 15.8 % is form the information sharing and 50.3 % is form information quality of the organization.

4.7.4. Finding Based on The research questions

Based on the finding of the study, the researcher has answered for the following research questions.

"**How the supplier partnership influences the operational performance of Ethiopian airlines MRO**?"

Based on generated data, supplier partnership has a positively and significantly influence the operational performance of Ethiopian airlines MRO, where the t- statistic value was calculated to be 2.054 at p value < 0.05. The value of the coefficient supplier partnership was also found to be 0.181 which means that, keeping other things constant, a unit change in strategic partnership cause 18.1% increase in operational performance of the company.

"**How the Internal integration influence the operational performance of Ethiopian MRO performance?"**

Based on generated data, Internal integration is not statistically significant with operational performance of Ethiopian airlines MRO since the p value >0.05.

"How the levels of information sharing influence the operational performance of Ethiopian airlines MRO?"

The regression analysis result shows that level of information sharing is not statistically significant with the operational performance of Ethiopian airlines MRO since the p value > 0.05.

“How the level of information quality influences the operational performance of Ethiopian airlines MRO?”

Level of information quality has positively and significantly influences the operational performance of Ethiopian airlines MRO, where the t- statistic value was calculated to be 6.096 are significant at p value < 0.05. The value of the coefficient of level of information quality was also found to be 0.503 which means that, keeping other things constant, a unit change in level of information quality causes 50.3 % increase in operational performance of Ethiopian airlines MRO.

In general, the survey result showed that supplier partnership and level of information quality has significant association with Ethiopian airlines MRO operational performance; whereas, internal integration and level of information sharing is not statistically significant with operational performance of Ethiopian airlines MRO.

Therefore, by improving supplier partnership and quality of information sharing in Ethiopian airlines MRO, the operational performance of the organization could significantly and positively improve. The finding of this survey is consistence with the findings of the other empirical researches findings on the area of the study. The relationship between supplier partnership and level of information quality finding is supported by (Mutuerandu, 2014), (Karimi & Rafiee, 2014), (Li, et al., 2006) and (Mustefa, 2014). Bivariate analysis found that increase in supplier partnership, internal integration, level of information sharing and quality of information sharing were associated with increased operational performance (P<0.05) .On Multivariate analysis result only supplier partnership and quality of information sharing is significant association with operational performance of Ethiopian airlines MRO while internal integration and level of information sharing is not significant. Significance and positive association of internal integration and operational performance was supported by (Atnafu & Omer, 2017) and significance of level of information sharing and operational performance was supported by (Mutuerandu, 2014), (Karimi & Rafiee, 2014), (Li, et al., 2006) and (Mustefa, 2014). More studies in this study area needed to be conducted to verify the result.

Chapter Five
Summery, Conclusion and Recommendation

This chapter focused on summarizing the research finding, conclusion drawn from the research finding and recommendation.

5.1. Summary of the finding

The main objective of this study was to assess the effect of supply chain management practices on operational performance of Ethiopian airlines MRO and also to assess implementation of supply chain management practices and operational performance in the company. Multivariate results indicated that supply chain management practices supplier partnership and quality of information sharing has significant impact on the operational performance of Ethiopian airlines MRO. However, multivariate analysis shows that internal integration and level of information sharing is not significant. The finding indicated that 34 % of corresponding change in the operational performance of Ethiopian MRO is the result of the change in supplier partnership and quality of information sharing practices.

5.2. Conclusion

Based on the multiple regression analysis results supplier partnership and quality of information sharing are significant and positively related with the operational performance of Ethiopian airlines MRO. However, internal integration and level of information sharing are not significant with operational performance of Ethiopian airlines MRO. Specifically,

- Supplier partnership and operational performance are significantly and positively related, so supplier partnership is one of the main predictor of the operational performance of Ethiopian airlines MRO. As supplier partnership, Ethiopian airlines MRO consider quality as a number one criterion to select vendors, involve key suppliers in its new capability development process, Includes manufacturers in its maintenance planning activities and solve problems jointly with suppliers. However, the result shows that Ethiopian airlines MRO is not good in helping suppliers to improve their product quality and including suppliers in continuous improvement program.

- The relationship between quality of information sharing and operational performance of Ethiopian are also positive and significant. Ethiopian airlines MRO has reliable, accurate and timely information exchange with its suppliers. However, information exchange between Ethiopian airlines MRO and its supplier is not adequate and complete.

5.3. Recommendation

The following recommendations can be drawn from the analysis and conclusion made.

- Supplier partnership of Ethiopian airlines MRO will improve if the company helps supplier to improve their product quality and include key suppliers in continuous improvement program. Therefore, the company has to work with suppliers to improve suppliers' product quality and to include key suppliers in its continuous improvement program.
- The quality of information sharing in Ethiopian airlines MRO will be improved if adequate and complete information exchanged between suppliers and Ethiopian airlines MRO. Therefore, the company has to work on improving adequate and information exchange with its supplier.

5.3. Suggestion for Further Research

This study focused on supply chain management practices such as supplier partnership, internal integration, level of information sharing and quality of information sharing and operational performance of Ethiopian airlines MRO only; further research can be done on other supply chain management practices such as customer relationship. More researches with different sample needed to be done on internal integration and level of information sharing to verify the result as the multivariate analysis result found contrast with other empirical finding. Different research can be done on other MRO and the result can be compared.

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Appendix I:

I. Questioner of the Survey

Addis Ababa University

School of Commerce

Department of Logistics & Supply Chain Management

Survey Questionnaires to be filled by selected respondents

Dear Respondent,

The purpose of this questionnaire is to collect data on the effect of supply chain management practices on Operational performance: The case of Ethiopian MRO. The study is conducted for partial fulfillment for the degree of Master of Arts in Logistics and Supply Chain Management at Addis Ababa University School of Commerce Department of Logistics and Supply Chain Management. The study is purely for academic purpose and will not affect you in any case. Your genuine, frank and timely response is vital for the outcome of the study. Therefore, I kindly request you to respond to each items of the question very carefully.

The survey may take between 10 and 20 minutes. I would like to thank you for your valuable time to complete the survey.

Answering Instructions:

In order to investigate the effect of SCM practices on Ethiopian MRO performance, the researcher prepared the following questions, please tick (√) on the appropriate question number to indicate the extent to which you agree or disagree with each statement. The item has five-point Likert type scales; the scales have the following meaning

1. Strongly Disagree
2. Disagree,
3. Neutral,
4. Agree,
5. Strongly Agree.

Part A: Demographic related Information (please use √ on the choice you make)

1. What is your gender?

a. Male _____ b. Female ____

2. What is your current job position within the organization?

a. Officer _____ b. Team leader _____

c. Manger _____ d. Director _____

3. What is your age range?

a. 24 & below _____ b. 25 – 34 _____

c. 35 – 44 _____ d. 45 – 54 _____

e. 55 – 65 _____

4. What is the highest level of education you have completed?

a. Diploma /Certificate _____ b. Bachelor Degree _____

c. Master's Degree _____ d. PhD _____

5. How many years have you worked in Ethiopian Airlines?

a. Less than 5 years_____ b. 5 up to 10 Years _____

d. More than 10 years _____

f. If other, specify: _____

6. Your department

a. Logistics and Supply management----------

b. Maintenance----------

Part B: Instruments of Supply chain management practice (please use √ on the choice you make)

	1. Strategic supplier partnership (SSP)	**Scale**				
		1	2	3	4	5
1.1	We consider quality as our number one criterion in selecting suppliers.					
1.2	We regularly solve problems jointly with our suppliers.					
1.3	We have helped our suppliers to improve their product quality					
1.4	We have continuous improvement programs that include our key suppliers.					
1.5	We include manufactures in our maintenance planning activities.					
1.6	We actively involve our key suppliers in new capability development processes.					
	2. Level of information sharing (IS) & Level of information quality (IQ) ➢ **Level of information sharing (IS)**	1	2	3	4	5
2.1	We inform suppliers in advance of changing needs.					
2.2	Our suppliers share proprietary information with us.					
2.3	Our suppliers keep us fully informed about issues that affect our business.					
2.4	Our suppliers share knowledge with us at the time of new repair capability development.					
2.5	We and our suppliers exchange information that helps establishment of maintenance task.					

2.6	We and our suppliers keep each other informed about events or changes that may affect the operation.					
	➢ **Level of information quality (IQ)**	1	2	3	4	5
2.7	Information exchange between our suppliers and ET MRO is timely.					
2.8	Information exchange between our suppliers and ET MRO is accurate					
2.9	Information exchange between our suppliers and ET MRO is complete.					
2.10	Information exchange between our suppliers and ET MRO is adequate					
2.11	Information exchange between our suppliers and ET MRO is reliable.					
	3. Internal Integration	1	2	3	4	5
3.1	The extent of integration between Line Maintenance and Procurement positively affected ET MRO performance.					
3.2	The extent of integration between Component Maintenance and Procurement positively affected ET MRO performance.					
3.3	The extent of integration between Schedule Base maintenance and Procurement positively affected ET MRO performance.					
3.4	The extent of integration between Line Maintenance and Engineering positively affected ET MRO performance.					
3.5	The extent of integration between Material Requirement					

	Planning and Procurement has affected ET MRO performance .					
3.6	The extent of integration between Engineering and Procurement positively affected ET MRO performance.					
3.7	The extent of integration between Procurement and Finance positively affected ET MRO performance.					
3.8	The extent of integration between Procurement and Logistics positively affected ET MRO performance.					
3.9	The extent of integration between Component Maintenance and Line maintenance positively affected ET MRO performance.					
3.10	The extent of integration between Schedule Base Maintenance and Line Maintenance positively affected ET MRO performance.					
3.11	The extent of integration between Engine Maintenance and Line Maintenance positively affected ET MRO performance.					

Part C: INSTRUMENTS OF OPRATIONAL PERFORMANCE (please use √ on the choice you make)

	4. Performance	**Scale**				
		1	2	3	4	5
4.1	We deliver parts and tools at reasonable price					
4.2	We purchase quality parts and tools whenever required					
4.3	Our planning is always meet the aircraft planned maintenance date					
4.4	Our planning(budget and delivery plan) is accurate					
4.5	We receive parts and tools on time.					
4.6	We receive repaired units from supplier in reduced turnaround time.					
4.7	We purchase parts and tools with no expedite fee.					
4.8	We complete aircraft maintenance within the planned turnaround time and deliver aircrafts to marketing on time.					

Adapted from (WIJETUNGE, 2016; Kindie, 2017&Girma, 2018)

Any additional comments/suggestions to be considered in this study

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Thank you very much!!

Appendix II - Interview Questions for key informants

In your review how do you describe supplier partnership, internal integration, level of information sharing and Quality of information sharing practices of Ethiopian airlines MRO?