ADDIS ABABA UNIVERSITY SCHOOL OF COMMERCE DEPARTMENT OF LOGISTICS & SUPPLY CHAIN MANAGEMENT

EFFECT OF ACHIEVING COMPETITIVE EXCELLENCE ON AIR CARGO TERMINAL WAREHOUSE PERFORMANCE: THE CASE OF ETHIOPIAN AIRLINES GROUP

BY

ANEDINET KEBEDE

A THESIS SUMMITED TO THE PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS IN LOGISTICS & SUPPLY CHAIN MANAGEMENT

ADVISOR: TARIKU JEBENA (PhD)

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Declaration

I, the undersigned, declare that this thesis entitled “Effect of Achieving Competitive Excellence on Air Cargo Terminal Warehouse Performance: The Case Of Ethiopian Airlines Group” is my original work and has not been presented for any degree in any other university, and that all the sources of materials used for the thesis have been duly acknowledged.

Declared by:

Name: Anedinet Kebede

Date: June 2020

Signature: _____

Place: Addis Ababa University Department of Logistics and Supply Chain Management
Date of Submission: June 2020

Certificate

This is to certify that Anedinet Kebede has carried out her thesis work entitled “Effect of Achieving Competitive Excellence on Air Cargo Terminal Warehouse Performance: The Case of Ethiopian Airlines Group” under my guidance and supervision. Accordingly, I hereby assure that the study is his own original work and suitable for submission of the award of MA in Logistics and Supply Chain Management.

Tariku Jebena (PhD)	_____	_____
Advisor	**Signature**	**Date**

Addis Ababa University College of Business and Economics Department of Logistics and Supply Chain Management

This is to certify that the thesis prepared by Mr. Anedinet Kebede, entitled "Effect of Achieving Competitive Excellence on Air Cargo Terminal Warehouse Performance: The Case of Ethiopian Airlines Group", which is submitted in partial fulfilment of the requirements for the Degree of Masters in Logistics and Supply Chain Management, complies with the regulation of the university and meets the accepted standards with respect to originality and quality.

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Tariku Jebena (PhD)	_____	_____ **Advisor**
Signature	**Date**	
(PhD)	_____	_____
Internal Examiner	**Signature**	**Date**
(PhD)	_____	_____
External Examiner	**Signature**	**Date**
_____	_____	_____
Chair of Department or Graduate Program Coordinator	**Signature**	**Date**

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The Researcher

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ABBREVIATIONS AND ACRONYMS

ACE: **A**rchiving **c**ompetitive **e**xcellence

DM: **D**ecision **m**aking

ETAG: **Et**hiopian **A**irlines **G**roup

IATA: **I**nternational **A**ir **T**ransport **A**ssociation

IT: **I**nformation **T**echnology

PI: **P**rocess **i**mprovement

QCPC: **Q**uality **C**linic for **p**rocess **c**ontrol

QMP: **Q**uality **m**anagement **p**ractice

TQM: **T**otal **Q**uality **M**anagement

ULD: **U**nit **l**oad **d**evice

RRCA: **R**elentless **r**oot **C**ause **a**nalysis

SD: **S**tandard **D**eviation

SPSS: **S**tatistical **P**ackage for **S**ocial **S**cience

UTC: **U**nited **T**echnologies **C**orporation

VSM: **V**alue **s**tream **m**apping

WE: **W**aste **e**limination

5s+1: **S**ort, **S**traighten, **S**hine, **S**tandardize, **S**ustain & **S**afety

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Abstract:

The objective of this study is to explain the effect of ACE on Air Cargo Terminal Warehouse performances in the case of Ethiopian Airlines Group Cargo section. A systematic literature review was made on ACE operating system and warehouse performance to identify the explanatory or independent variables and dependent variables. The four constructs of ACE namely process improvement tools, waste illumination tools, decision making tools and problem-solving tools are considered as the independent variables. The dependent variable was warehouse performance. Structured questionnaire was used to collect data through self-administered way. The collected data was analysed through SPSS version 20. Descriptive analysis namely percentage, mean and standard deviation were used to describe the variables in the study while inferential analysis specifically of Correlation and regression analysis was conducted to determine the effect of ACE on air cargo terminal warehouse performance. Filed observation, interview, and questionnaires were used to collect data. A total of 55 questioners were distributed to be filled by warehouse operation employees from sections namely, Cargo Import, Cargo export and cargo Transit section, of which 48 questioners were filled and returned with a response rate of 87%. SPSS statistical software was employed for the analysis. The study reviled that waste elimination tools and decision-making tools have direct and strong relationship with 71.1 % of the variation in performance of ECLS Air Cargo Terminal warehouse with the other two variables also have positive relationship.

***Key words**: ACE, warehouse performance, process improvement, decision making, waste elimination.*

CHAPTER ONE

INTRODUCTION

This chapter presents the study background, problem statement and research question, scope, limitation of the research and research paper organization and definition of important terms.

1.1. Background of the Study

Due to the competitive landscape, today's business environment is continually taking shape and has forced business firms to implement quality management practices (QMP) so that they can consistently improve their work process (Chhabra, 2000), eliminate their waste to reduce cost (Manzouri et al., (2014); Rahman et al., (2010), to have a robust and systematic methodologies for solving problems (Jovanović et al., 2009) and decision making capability (Vuorinen, 2014). Organizational leaders in this regard are working to bring the mandatory change needed through implementing quality management systems that can be smoothly integrate with the organization strategic goals. Many researchers agree that Executives can implement QMPs like TQM in any organization in any sectors of the economy such as manufacturing, service, education, and government Dean & Bowen Cited in Jaafreh (2013). ACE is one of such systems adapted by Ethiopian airlines as a group and Ethiopian cargo & logistics service (ECLS) at a strategic business unit (SBU) level on which this study focused.

Having an effective and efficient supply chain management in today's highly competitive business environment is a matter of survival for organizations. Warehouse functions effectiveness and efficiency in this regard are one of the crucial areas that needs to be considered to boost performance in the entire supply chain. Warehouse in Air Cargo Terminals (ACT) play major role in delivering the required transportation service for frights from source to destination or from shippers to consignee without any irregularity or operational discrepancy. Review of literatures shows that there are not many studies available how quality systems affected warehouse performance.

The focus of this study was Ethiopian Airlines cargo who owns and operates its own cargo terminal with a state-of-the-art warehouse capable of handling over 1 million tonnes of cargo per

annum. The company implemented continuous quality improvement tool called achieving competitive excellence (ACE).The study particularly explains the effect of ACE on warehouse performance of Air Cargo terminals by specifically taking Ethiopian Airlines cargo & logistics services (ECLS) as a case company. The performance of the warehouse was assessed against the constructs of ACE operating systems, which are process improvement tools, waste elimination tools, problem solving tools and decision-making tools.

1.2 Background of the organization

Ethiopian Airlines group in recent years is getting tremendous acknowledgement due to not only for being the largest carrier in the continent Africa but also the fastest growing at the back of its vision 2025 lunched in 2010. Currently it operates more than 126 aircrafts with average age of less 6 years. It also has 47 aircrafts in order. Ethiopian Airlines which is a member of the largest alliances "Star Alliance", currently serves 21 domestic destinations and 123 international destinations in 75 countries as of June 2020. The airline, under the vision 2025 plan, transformed itself into the biggest aviation group in Africa with 9 strategic business units – Ethiopian International, Ethiopian Express (regional), Ethiopian Cargo, Ethiopian MRO, Ethiopian Catering, Ethiopian Aviation Academy, Ethiopian Ground Handling, Ethiopian Airports, and Skylight Hotel.

One of this strategic business units is Ethiopian Cargo and Logistics services (ECLS), as per its 15-year development road map, Vision 2025, Ethiopian Cargo and Logistics Services forecasts to generate more than $2 billion revenue with 19 dedicated freighter aircraft and moving over 820,000 tonnes of cargo to 57 destinations using its ultra-modern cargo terminal facility as a central hub.

Strategic objective of the division

Vision:

Ethiopian Cargo & Logistics Services will be one of the most competitive and leading Global Cargo Airlines by providing safe, market driven and customer focused cargo, courier, and mail transport services by 2025.

Mission:

- To become the leading cargo airline in Africa by providing safe, reliable, and fast cargo transport services whose quality and price "Value Proposition" is always better than its competitors.
- To ensure being a cargo airline of choice to its customers, employer of choice to its employees and an investment of choice to the group.
- To support the economic development of Ethiopia and the countries it operates by undertaking its Corporate Social Responsibilities and providing vital global air cargo connectivity.

Values:

- As an airline, safety is its priority,
- Ethiopian is a high performance and learning organization with continuous improvements, innovation, and knowledge-sharing. It accepts change for the growth opportunity it brings and always seek for and apply the best ideas regardless of their source,
- It recognizes and reward employees for their performance and demonstrate integrity, respect to others, condor, and teamwork,
- Act in an open fashion and be result-oriented, creative, and innovative,
- Adopt Zero tolerance to indifference, inefficiency, and bureaucracy,
- Encourage 360° free flow and sharing of information,
- Treat its customers the same way we would like to be treated and always look for ways to make it easier for customers to do business with the carrier,
- The carrier is an equal opportunity employer

1.3 Statement of the Problem

The importance of Air Cargo in the global supply chain and the global economy increased ever than before. As distance becomes an obstacle for people interested to socialize away from their local area, enjoy farther education abroad and doing business and so on. For similar reason distance become a barrier for free movement of raw materials, spare parts, semi-finished and fully finished products (Zondag, 2006 pp17). This movements are become possible due to Air cargo service

provided by carriers. Ethiopian national carrier strived and worked hard to become the most successful and dominant airline in the continent of Africa and beyond on both passenger and cargo transportation. Ethiopian cargo and logistics service (ECLS), one of the nine strategic business units of the aviation group, owns and operates an ultra-modern cargo terminal with warehouse capacity of over 1 million tons per annum. It is also the second best in terms of revenue generated to the aviation group. There are obviously various factors contributed to this extra ordinary achievement. Out of these factors the researcher in this study was interested to see the effect of implementation of ACE operating system, which is a propitiatory continuous quality improvement system, on cargo terminal warehouse performance. Review of ACE activity report generated by the corporate change management shows that there are still challenges to make ACE operating system a culture, to properly implement and use its tools and to acquire the level of competency required by employees. An in-depth review of literatures on the area also shows lack of studies in the area and this study will try to fill the knowledge gap in that respect. The review of available literatures on ACE and related area helped the research to identified variables of ACE operating system which are assumed to affect the warehouse performance and tried to find out their effect and significance on the warehouse performance.

Based on learning from an extensive review several researchers and articles across different disciplines and similar industries there is an increased tendency to see the effects of the selected critical factors ACE operating system. Contrariwise, this research aims to explain which critical factors of ACE attributes on the successful running of Ethiopian Airlines Cargo & logistics service (ECLS) warehouse. As there is such a knowledge gap, it is this rationale that motivate the researcher to conduct this research. Moreover, it is this concern that motivates the researcher to find out about the perception of the management of the organization as well the employees have on each selected factor. Thus, this study will investigate the effects each selected critical factors have on the successfulness of cargo warehouse performance.

1.4 Research Questions

Based on the above statements of the problem the following research questions are developed. The study is dedicated to answer the following basic research questions:

1. What effect dose ACE process improvement tools have on ECLS warehouse performance from employees' perspective?
2. What are the effects of ACE waste elimination tools on ECLS warehouse performance from employees' perspective?
3. What effect dose ACE Decision making tools have on ECLS warehouse performance from employees' perspective?
4. What effect dose ACE Problem solving tools have on ECLS warehouse performance from employees' perspective?

1.5 Objectives of the study

1.5.1 General objective

This study is dedicated to find out the effect of ACE on warehouse performance in ECLS from employees' perspective.

1.5.2 Specific objectives

This research has the following specific objectives:

- ✓ Explaining how ACE process improvement tools affected ECLS warehouse performance from employee's perspective.
- ✓ To describe how ACE waste elimination tools effected ECLS warehouse performance from employee's perspective.
- ✓ To explain how ACE decision making tools effected ECLS warehouse performance from employee's perspective.
- ✓ Describing how ACE Problem solving tools effected ECLS warehouse performance from employee's perspective.

1.6 Scope of the Study

Even though ACE operating system is wide concept and is a corporate quality management system, this study will focus and be limited to explain the effect of ACE on warehouse

performance of ECLS cargo terminal located in Bole international Airport Addis Ababa Ethiopia. It will pick only the warehouse function of the Air cargo handling operation and deeply elucidate the effect it has on warehouse performance. In this study only permanent operational employees (Agents) are involved as respondents as they are also the one involved in the day-to-day ACE activity.

1.7 Significance of the Study

The aim of this study is to examine the effect ACE operating system on warehouse performance of Ethiopian Airlines Cargo & Logistics Services (ECLS). As a micro level investigation on the case organization; the findings of the study are believed to be largely significant to the organization. The effect of continues improvement methodologies like ACE on Air cargo warehouse performance is a less researched area as literature review on the area revealed. This study will try and aim to fill the gap observed in this respect. The researcher believes that the study will encourage other researchers to peruse farther study on air cargo operation and on ACE operating system so that the applicability could be extended to other firms also. In addition, it is the researcher expectation that the case company will get useful findings that will help to use in future business strategies.

1.8 Organization of the study

This proposal for a study on effect of ACE on Air Cargo Terminal warehouse performance will comprise Five respective chapters in which the researcher clearly state the entire process of the study. Chapter one contains the introduction part and this chapter discusses the background of the study, Background of the organization , statement of the problem, objectives of the study, basic research questions, scope of the study, study's significance, organization of the study and definition of terms. Next chapter is , Chapter two, and this part of the study deals with the theoretical review, empirical review, conceptual framework and identifying literature gaps relevant to the proposed study followed by chapter three research methodology of the study in this chapter the researcher describe description of the study area, research approach, research design, population size, data source and type, data collection procedure, method of data analysis and presentation, reliability and validity test and ethical consideration. Chapter four describes

findings of the study including data analysis, interpretation, and discussions of the findings. The last chapter, chapter five, presents the summary, conclusion, and recommendation.

1.9 Definition of Terms

ACE is acronyms for Achieving Competitive Excellence is a quality management system which was developed by united technology corporation in 1990s (Thomas, 2004).

ACE operating Tools: These are the Ten (10) operating tools on which ACE is based on (Roth, 2010)

ACE Cell: In the organisational structure of ACE, ACE cell refers to a group of employees who work together on similar processes closely and share common ACE objectives to improve their products and services (ACE Hand book 2005).

ACT- Air Cargo Terminal are facilities where international air cargo carriers handle their fright as import, export, or transit cargo. It has airside, warehouse, and landside.

CSA-Customer service agent are employees who are trained to handle cargo shipments.

Cargo Spot-Global system hired by ECLS for tracking cargo shipments worldwide

ECLS-Ethiopian Cargo & Logistics service one of the 10 Business unites of Ethiopian Airiness group

GSE- Ground support equipment, are equipment used in the warehouse to move shipments, load, or unload. Example: Forklift, towing tracks etc…

ICS-Inventory control system used by ECLS to track shipments stored in the warehouse

ULD- Unit load device is a cargo container used to consolidate various individual shipments with one container to take one designated position in the aircraft.

CHAPTER TWO

RELATED LITERATURE REVIEW

2.1 Theoretical Literature Review

2.1.1 Quality Management Practice (QMS)

Because global pressure is increasing on business firms, various quality management practices have been developed. Researchers define Quality management practice as management style and a guiding principle that have been agreed by executives in organizations to improve competitiveness and organizational performance. Most of these practices are based on the concept of TQM and includes six-sigma, benchmarking. TQM can be implemented to any organization working in any filed of the economy including service, manufacturing, education etc…Review of literatures show that several quality management practices have been developed mostly based on contribution of quality leaders such as the pioneers in TQM like Deming (1986), Juran (1988), highlighted the importance of the quality philosophy as an essential competitive weapon for the transformation of an organization performance.

As per Deming definition quality is "multidimensional to produce a product and/or deliver a service that meets the customer's expectations to ensure customer satisfaction" (Deming, 1986, P.54).

Juran in the other side defined quality based on a various meaning, namely

1. "Quality consists of those product features which meet the needs of customers and thereby provide product satisfaction," and
2. "Quality is apparently associated with customers' requirements, and fitness suggests conformance to measurable product characteristics" (Juran, 1988, P.22).

2.1.2 Review on ACE operating system and its Tools

To start with ACE is acronym for Achieving Competitive Excellence, it is a quality management system (operating system as called by UTC) developed and practiced by UTC (United

Technologies corporation) (Thomas, 2004a). ACE was developed based on the principle of total quality management (TQM) by early 1980's and 1990's, while companies start developing their own quality system based on its principle (Roth, 2010). ACE as a proprietary quality management system and can be implemented only under license from UTC. It is an operating system because it is a concept that specifies a way of management (Roth, 2010).

> *"ACE as an "operating system" defines the management system used by individuals and organization across UTC to delight customers, provide returns to its shareholders, and satisfy its employees. ACE Guides the setting of strategic priorities, establishes for translating strategies into actions and setup feedback mechanisms for assessing improvement and performance."*

It defines the management system having three elements namely, culture, tools, and competency (Huang, n.d.).

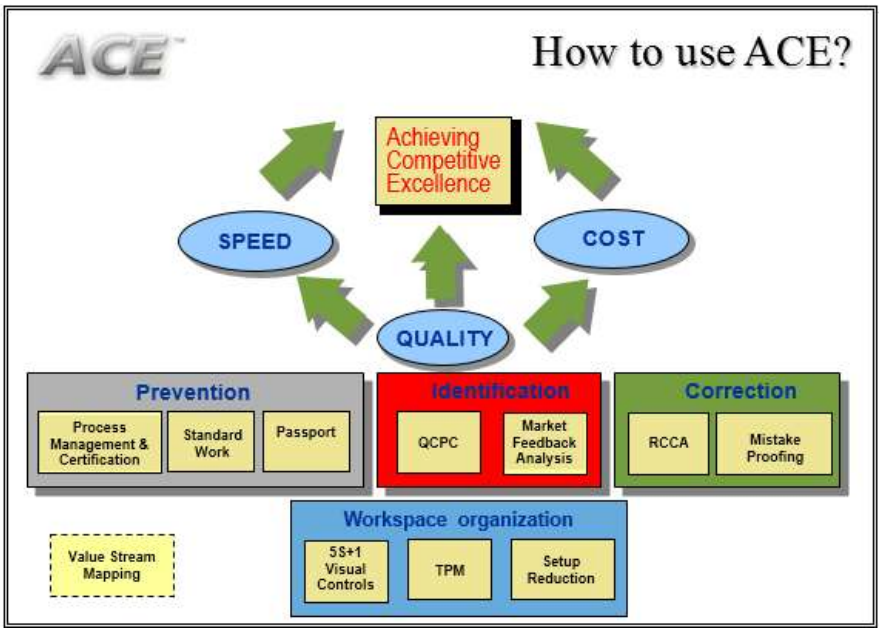
Culture

When we see the cultural perspective, as ACE is a custom-made system and yet not proved useful in other organizations. Its implementation highly depends on organizational culture, company resource and available quality management system. It requires organizational culture of using the ACE tools with the right competency. Different case studies performed showed that ACE has no limit in terms of language and national cultures. ACE in order to deliver the required level of performance it should be implemented in such a way that it becomes a process focused culture (Roth, 2010).Ace to get to its maturity level employees' attitude and organizational culture are a necessity. Managements of firms has provided the right leadership, environment and as a result it becomes a culture. When ACE becomes a culture, it will be easy to identify opportunities for improvement, to solve problems and keep a continuous improvement. At present, Otis elevator, one of the sister companies of UTC, are operating in China, USA, and South America. These show how ACE can be implemented across different languages & national cultures and different organizational types.

ACE Tools

ACE is powered by a disciplined application of tools for Process improvement, waste illumination, problem solving and decision making. As Rout (2010) said ACE tools and methods

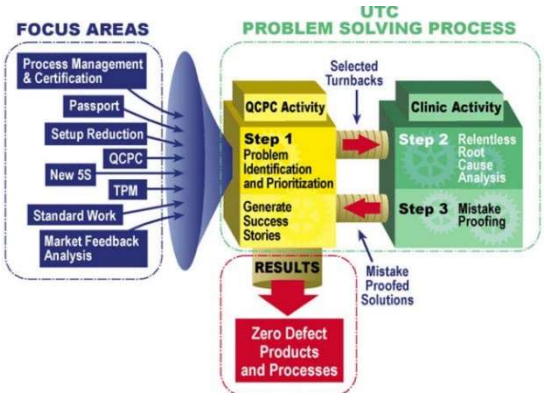
were adapted from lean, quality, and statistical process control practice. ACE operating system consists of a set of tools that can be classified as problem identification tools, correction tools and prevention tools which help an organization identify and solve problems, improve its processes, and make strategic decisions in a quality, timely and minimizing cost. The organizations drive the ACE operating system to close gaps between actual results and business goals and eliminate waste (Roth 2010 and Thomas 2004).



Source: UTC Training materials

ACE is an integrated improvement program that uses the best practices of lean and Six Sigma, such as SPC, TPS, value stream map, waste, and kaizen (AF Themes ACE n.d). Yuzuru Ito was described as the founder of ACE when he took over the Quality organization at Otis Elevator. There was also some foundation of lean principles established in the early 1990's at Otis and Pratt & Whitney with support from Shingijutsu (Roth, 2010b). This tools relationship is best described by the following figure. ACE tools will be explained in depth in the following topic.

Figure 2.1 ACE quality Model



Source: (Huang, n.d.)

Competency

This is a concept that emphasizes on the need for all employees to have competency on utilizing ACE tools. This could be achieved by detailed trainings provided to employees. It is described in ACE manual that leadership have a responsibility to bring this competency to their team through training.

As per Tesema, (2018 p.16), ACE has four major achievements level which measures ACE Cells competency level. These are:

1. **Qualifying** - Awareness education; local process identification and prioritization; waste elimination and cell organization
2. **Bronze** - Advanced training; application of ACE tools to achieve important improvement in selected processes; substantial cell/workgroup involvement
3. **Silver** - First demonstration of step increase in customer satisfaction and business performance; major improvement in selected processes; improvement activities begun on all key processes; employee satisfaction target; significant organizational and leadership involvement
4. **Gold** -Customer satisfaction and best-in-class business performance; total cell/workgroup and leadership involvement.

ACE is less researched when compared to six-sigma. Thomas (2004) described ACE operating system as “less known but very successful”. Roth (2010), on the other side elaborated that ACE guide’s organizations in setting their strategic priorities, establishing processes for translating

strategies into action and to setup feedback mechanisms for assessing improvement and performance. In addition, ACE defines a management system which can be used to delight customers, provide return to stakeholders and last but not list is to satisfy its customers. Training is one of ACEs philosophy as a result, all employees at all level of expertise must receive training for that specific level according to their ACE responsibility.

Table 2.1 ACE training requirement responsibility and Expectation from Employees

Level or Expertise	ACE Responsibilities and Expectations	ACE targeted training
Senior Leaders	• Set direction, targets, and culture • Champion ACE to achieve business goals • Provide resources • Review progress/ask right questions	ACE Leadership Training (subset of Manager/Supervisor training)
Cell and Site Leaders	• Lead & program manage ACE to achieve business goals • Align metrics to established targets • Translate organization strategy/direction into actions • Fully engaged with ACE activities • Engage senior leaders on ACE progress • Ensure appropriate ACE competency exists	ACE Leadership Training • DIVE 101 • QCPC • ITO Foundations • Assessment • ACE At Work
ACE Experts (Practitioners/Masters)	• Coach, train, mentor and facilitate ACE activities • Guidance on ACE site progression requirements to achieve business results • Expert application of ACE to achieve business results	ACE Certification Program Curriculum
ACE Savvy (Associates)	• Identify and communicate opportunities for ACE applications • Promote and support the benefits of ACE • Use ACE daily for individual processes • Engage management on ACE progress • General application of ACE to achieve business results	ACE Certification Program Curriculum
All Employees	• Use ACE daily for individual processes	One or more of the following: • ACE Overview • ACE at Work • ITO Foundations (2 day) • specific tool training as needed

Source: Roth, (2010)

ACE cell progress in an organization is showed by the various levels it achieves particularly Qualifying, Bronze, Silver and Gold. For cells to get these levels they should have competent employees who have been trained on ACE tools and practicing ACE as a culture.

And it is the daily interaction of each element is what makes it an operating system.

Proper implementation of the operating system provides with the following main business results:

1. Focus on perfect quality,
2. On-time delivery,
3. Highly engaged employees working in a safe environment, and

4. Best-in-class financial returns

ACE as a principle is characterized by forming a team on each ACE tool to be effective. For Example: A QCPC team will have the following duties:

- Classify the turnbacks received
- Prioritize the actions to be taken
- Focus on quality and cost reduction
- Assign responsibilities
- Link with other continuous improvement domains when solving problems: RRCA, Mistake Proofing, Process Certification, 5S+1, TPM, etc.

In a similar way all tools may dedicate a team who specifically work on the assigned tool.

ACE is organized based on a set of tools that help a company identify and solve its problems, improve its processes, eliminate its waste, and make strategic decisions. By creating a strong culture of using these tools, the companies bridge the gap between expected and actual outcomes. There are 10 ACE tools which are categorized under three groups (Roth, 2010) and (Thomas, 2004)

1. Process improvement
2. waste elimination tools
3. Problem solving tools
4. Decision making

2.1.2.1 ACE Process improvement tools

Under this group we have the following tools:

a) 5S + 1 and Visual controls
b) Process Management

There are Three (3) tools under this category which were based on the principle of "lean production" (Roth, 2010a). The principle under process improvement and waste elimination tools is based on "Lean thinking" as called by Womack & Jones, cited in Roth (2010). It is ultimately based on Value streaming i.e. specify value by specific product, identify the value stream for each

product, make value flow without interruption, let the customer pull value from the product and pursue perfection.

The tools under this category are 5S+1, VSM, process control and certification, standard work, production preparation process (3P), Total productive maintenance and set-up redaction. Next, we will see each of them in some detail.

a. 5S+1 or 6S- Visual control

This tool mainly works on the principle of visual control. It strives to make the workplace so organized that anyone can visually see and understand the flow of work or material, the steps, and the operating condition. It is in such a way that any deviations are instantly identified. It is a philosophy based on creating conducive workplace for employees by organizing, cleaning, and sustaining. The term 5S was originally from five Japanese words seiri (organization), seiton (tidiness), seiso (purity), seiketsu (cleanliness), and shitsuke (discipline) and when it comes to modern ACE the meanings are as for Sort, Straighten, Shine, Standardize, and Sustain.

Sort: eliminate what is not needed

Straighten: Organize what remains

Shine: Clean work area

Standardize: Scheduled cleaning and maintaining

Sustain: Make 5S a way of life

As studies showed peoples when they use all their five senses, they tend to develop a six sense which tells them that something is not right. Attaining this visual practice creates a workplace in which people attains high level of productivity, service quality and efficiency.

When we say workplace there are physical and electronic workplace. For physical workplace 5S supports to have marked workplaces, tools location, drawers and their contents labeled so that visually effects. When we say electronic workplace, it is like computers and the various work files in them. Files should be kept organized and according to policy.

5S is usually the first step in initiating changes as it helps changes seen immediately. It motivates peoples to organize their work area and identify unwanted materials and remove them away from the workplace enabling performing work more easily.

b. Process Management

Improvements beyond data collection, identification, mapping, implementing changes in process can be made by certification and developing the maturity of process in terms of their reliability to give what is required when it is required. According to UTC process maturation have 6 steps. The setting for strategic priorities is guided by ACE, it set up processes for converting strategies into actions, and to setup feedback mechanisms for assessing improvement and performance. It utilizes tools and methodologies adapted from lean, quality, and statistical process control practices.

c. Standard work

The purpose of Standard Work is to simplify and structure work to guarantee quality, consistency, and repeatability in the course of time. In ACE cells, Standard Work consisted of defining processes and systems and documentation. Creating simplified work instructions and procedures, and documentation of lessons learned. Simplified work instructions, work steps, defined amounts of inventory, and adherence to the standard time were all components of Standard Work in a manufacturing ACE cell. Equipment and processes needed to be reliable for Standard Work to be effective. This ACE tool is characterized by observation of work processes, measurement of standard time for works. The implementation of standard work is basically by standardization of work methods by observing and measuring the standard times within an operation. It simplifies and structure work to ensure quality, consistency, and repeatable results over time.

2.1.2.2 Relation between Process improvement and organizational performance

As defined by Ashogbon (2012) process is an activity executed with the aim of achieving a purposeful result expected to happen in stages. Process starts at some point and end somewhere, and it often have several other sub-activities in between that guarantees the expected outcomes are achieved. Process improvement targets to take a process from it is as-Is to the To-Be state,

with significant measurable improvement and performance that help achieve the anticipated objective(s) (Ashogbon, 2012, p. 9)

As Chhabra (2000) described system model identified process improvement as one of the areas that need intervention to derive performance. Out of the four factors that have been required for process analyzing Chhabra (2002) identified process improvement as one of the factors that need organizational readiness. Various models of performance improvement have helped business evaluate and identify performance problems, devise solutions, and implement performance improvement plans and one such influential model is the Behavior Engineering Model (Gilbert, T., 1996).The model consists of six cells that take into account all the environmental and personal factors that can influence performance.

2.1.2.3 ACE Waste elimination tools

Throughout the industries manufacturers are moving to a different system of production called Lean Manufacturing. Its concept is not about coming up with some new techniques to build products but to change the way of thinking about manufacturing (Abdullah, 2003). Lean manufacturing can be expressed as a theory whereby all employees work together to eliminate waste. All businesses in the field of engineering, industrial technologists, and other similar firms and managements have been trying this since the start of the industrial revolution. Anything that does not add value to the product or service from the angle of the consumer is defined as waste.

Waste is defined by (Gay, n.d.) as any expense or endeavor that is spent but which does not transform raw materials into an item the customer is willing to pay for. Through optimization of process steps and eliminating waste, that value to each phase of the production can be added.

In a study by Abdullah (2003) it is stated that:

> "*After World War II, Japanese manufacturers were faced with the dilemma of vast shortages of material, financial, and human resources. These conditions resulted in the birth of lean manufacturing concept. Toyota motor company, led by its president (Toyota),*

recognized that American automakers of the era were out-producing their Japanese counterparts; in the mid 1940's American companies were outperforming their Japanese counterparts by a factor of ten. To make a move toward improvement early, Japanese leaders, such as, Shigeo Shingo and Taiichi Ohno, devised a new, disciplined, process-oriented system, which is known today as "Toyota Production System" or "Lean Manufacturing"

Under this category we have two ACE tools:

a) Value stream mapping (VSM)

The creation and improvement of customer value is one of the central concepts of lean. Products and services are developed in such a way that, each activity in performed in the development of the service or product must add value. When we say value stream, we say

"Value" to the customer and the "stream" of the process followed to create the product or service. VSM requires a focus on customer values and an effort to organize activities sequences and improve these processes to deliver reliable service. This requires realignment of activities and processes at organizational level to gain the advantages. VSM helps to identify peoples and resources that do not add value. According to (Magretta, 2002), "Management is the art of performance and management's mission, first and foremost is value creation". The benefits are mainly elimination of operations that do not add values elimination of waste. When we say waste, it could be over production, unnecessary motion excessive inventory, and extra processing.

(Milanoi, 2013) listed the following as the fundamental steps in carrying out a VSM:

"

1. *To determine a product or product family: a set of products with common process steps is called a product family*

2. *To collect appropriate data across the value stream such as inspection and maintenance reports, quality reports and audits. Then, define scope of the VSM exercise.*

3. *Draw a Current State Value Stream Map, which would help as a baseline for improvement.*

4. *After Analyze the Current State Value Stream Map, identify the non-value adding activities or wastes which become evident after analysis.*

5. *To draw the Future State Value Stream Map to eliminates the non-value adding activities.*

6. *A plan will be implementing to develop and execute required changes which address the non-value adding activities. This includes setting objectives required to achieve the future state, setting objective that are measurable, setting an order of work to be carried out, setting milestones, and obtaining validation of all concerned parties*."

How departments and activities organized must be decided in such a way which can create more satisfaction to the customer. When we review historical organizational structure priorities, we can see that they have been in direct conflict with the concept of VSM. UTC used this comprehensive view of VSM to their advantage to achieve process efficiency (Roth, 2010 pp88). The goal of VSM is to identify and focus on improvement to the group of processes that deliver the required values to the customer by taking system level view and focus on creating lean process by diminishing waste. This method identifies and improves value to customers by identifying and

improving the process which created the value. The VSM method can only be effectively and efficiently be used only when it is used along with the supplementary mapping and other diagnostic tools providing a more complete picture of the current product value stream, taking into account the specific nature of company processes and business and also its stakeholders.

b. Total Preventive Maintenance (TPM)

TPM aim for care of the equipment under the notion that well-maintained equipment promoted good quality. It focuses on reliable, safe, and efficient operation of the machine, which will make s that equipment available for productive work for maximum amount of time. Through teamwork, data gathering, and root cause analysis, the TPM process reduced unscheduled downtime and increased reliability of the machines. The process involved the teardown, inspection, and rebuild of the machine, as well as development of a preventive maintenance schedule, daily operator checks, and regular audits.

c. Setup redaction

Setup redaction is defined as minimization of the time taken to restart the subsequent operation after finalizing the initial step in work process. Setup redaction usually finds and eliminates tasks that delays the subsequent tasks.

2.1.2.4 Effect of Waste elimination on organizational performance

Forrester, et.al. Cited in El-Namrouty & AbuShaaban, (2013) stated that managers of the agricultural machinery sector in Brazil have supported a transition towards the adoption of lean manufacturing practices and they have shown a significant improvement in their business performance including the production cost.

2.1.2.5 ACE Problem solving tools

a. Market feedback analysis (MFA)

Customer feedback was incorporated into ACE through MFA. Like other tools of ACE, MFA was a structured and fact-based approach to resolving escapes, which are defined as defects that escaped to the customer, with stringent criteria for response times to customers. MFA's key

strength was in communicating customer feedback on product quality issues to the manufacturing work cell and in involving the operators in the solution.

b. Quality clinic process chart (QCPC)

QCPC is a methodology to identify problems in a cell through the application of a data collection system. A turnback in ACE is anything that prevents an employee from doing the job right the first time Benefits. QCPC is one of the identification tools which will help to identify quality problems like defects, waste, and inefficiencies so that opportunities which help achieve continuous improvement are not missed. Its implementation follows a six-step process:

Step 1 Initiate the QCPC Process

Step 2 Summarize Detailed Turnback Data

Step 3 Analyze the Improvement Opportunities

Step 4 Define Improvement Projects

Step 5 QCPC / Clinic Activity

Step 6 Communicate the Results

QCPC is characterized by:

- Immediate data collection
- Information and progress of the opportunities accessible to all
- Resolution of problems by priority
- Contribution to achieve the objectives

The QCPC tool was a team-based, structured process for identifying and prioritizing turn-backs. This definition of the QCPC tool distinguished it from the definition of QCPC "activity," which involved the use of the QCPC tool, the RRCA tool, and the MP tool, as noted earlier.

c. Relentless root cause analysis (RRCA)

RRCA's goal was to drive to the root of a problem in a structured, fact-based manner. Successful RRCA involved collecting data, brainstorming reasons, and looking for connections using tools like fishbone diagrams, cause-effect diagrams, and the "Five Why's." The RRCA process looked for the permanent solution rather than a temporary one. It was used both as a stand-alone, problem-solving tool and as a subset of TPM, QCPC, and other ACE tools. The "Five Why's" involved asking the question "Why?" five consecutive times to continue delving deeper into the cause of a problem, and to attempt to determine the true root cause of that problem.

d. Mistake proofing

Mistake Proofing involved the design of a work process, part, tooling, or work instruction to make it impossible to perform the work in any way except the correct way. Like the other ACE tools, Mistake Proofing involved a rigorous, structured team process to identify and consider all contributing factors. Despite the structure and rigor, ingenuity and creativity were still highly emphasized in creating the Mistake Proofing solutions. Mistake Proofing, like RRCA, was used both as a stand-alone tool and as a subset of other ACE tools such as TPM and QCPC.

2.1.2.6 Relation between problem solving capabilities and organizational performance

Organizations and business owners need certain skills to solve problems and permanently remove inefficiencies**.** A study by Smith, (2016) ladled those trained on problem solving as professionals. Efficiency is then concerned with comparing the observed and optimal values of a producer's inputs and outputs Rouse et al. cited in, Smith (2016). Problem solving is an important issue to overcome information is required in order to overcome problems, and the problem needs to be presented as a series of facts. Providing the problem solver with good information is integral to finding effective solutions (Condell et al., cited in, Smith (2016).

2.1.2.7 ACE Decision making tools

Passport process

Various Decision-making theories were developed by scholars. This including the classical and neo-classical organizational theories provide a multitude of useful information for the design of the decision making in business organizations. In particular, Adam Smith´s concept of the "division of labor" can be used to divide the decision-making process in differentiated working tasks where specialized staff can achieve better economic results.

One of the ACE tool called passport review is a Top Management tool which is a process used to simplify an organization strategic decision making, used primarily in the design and deployment phase of new products. The Passport System was a set of reviews or checkpoints designed to ensure all problems were identified as early as possible in the new product development process. Using the Passport System, new product development teams would be able to incorporate all

feedback on existing product failures into the new product design and would meet their quality, reliability, cost, and time targets.

In addition when we come to ACE in particular, as United Technologies corporation(UTC) developer of ACE operating system states "management and empowered employees need to work together to remove barriers that hinder improvements in order to provide our customers with highest quality products and services"

Thomas (2004) said "ACE takes its roots from both the lean methodology of Toyota production system and the quality improvement teaching of Dr. W. Edward Deming" ACE operating system consists of tools that are encompassed in the three categories of process improvement and waste elimination, problem solving and decision making. These tools helped the crater UTC identify and solve problem, improve its process, eliminate waste, and make effective strategic decision.

UTC have prepared training modules and qualified instructors to properly train employees. UTC states that in keeping with the ACE philosophy, the ACE tools are relatively easy to learn and use. This concept of UTC shows that, to be able to ripe fruits of ACE implementation, that rigorous training on ACE tools to employees is vital.

Thomas (2004) in his study described ACE as a combination of lean manufacturing and quality improvement philosophy with having border base and is not data intensive as the other quality systems.

2.1.2.8 Effect of Decision making on organizational performance

Decision making is defined, according to Forman E. & Selly M., (2001 p.1), as a process of choosing an alternative from a set of options to achieve defined objectives and goals. Decision making is one of the most important and essential business skills that needs to be developed by managers. By learning appropriate decision-making technique, it was showed that firms could get a significant gain on performance through effective decision making (Vuorinen, 2014). Forman E. & Selly M. (2001) described decision making as a three-step process consisting of identification, developing the alternatives and selection.

The first step which is identification is to know if there is a need for a decision or analysis. Developing the alternatives, a process that consists of Searching and planning. The need for decision may emerge after recognizing that there is a gap between what is desired and what is

obtained. However, effort need to be made by the decision maker to know or recognize from information's available on hand. The idea is to process whatever information is available at present and try to get some new ones.

The second step, which is development of the alternative, is a process which contains searching and planning. Searching for alternatives and planning is building for the solutions (Vuorinen, 2014).

The third and the last step is the selection stage. The alternatives gathered in the previous step are properly screened the remaining alternatives are then evaluated and finally the chosen ones are validated by securing approval from the management. Here, Evaluation has three different methods, judgment, analysis, and bargaining. Judgment means the internal decision making between people, bargaining means multiple persons using judgment and then settling their choice between them (decision and org performance)

2.1.3 Background on Air Cargo supply chain

Since the primary load flight materialized in USA in 1910, the air load business showed huge amendment in terms of capability and volume (En.wikipedia.org.2020). As per the online site:

"Philip Orin Parmelee piloted a Wright Model B heavier-than-aircraft sixty-five miles (105 km) carrying a package of two hundred pounds of silk'.

En.wikipedia.org. (2020, n.p) continues 'Although there have been a couple of tries to arrange air freight airlines from the Nineteen Twenties on, the primary airlines that were all-cargo failed to emerge till once warfare II'. The Air freight business initially failed to show the expected level of growth as airlines square measure attracted a lot of to the traveler business and therefore the load capability, they need is determined by the remaining belly capability once traveler baggages square measure accommodated. As varied literatures in agreement it absolutely was solely in 1990s' that load business starts to look in giant scale ways of airliners. In line with linear unit wikipedia.org. (2020), 'Although freight traffic developed with modesty, it absolutely was attending to solely 800,000 tons globally in mid-1950s'. In 1968, as per a similar supply, the yankee craft manufacturer Boeing launched the four engines heavier-than-aircraft capable of carrying a full pallet load that remodeled the air load business. As globalization rises, the air load business has sustained to operate as a major enabler for world trade and as studies showed its

growth doubles every10 years since 1970(Chang et al., 2007). It continuing to draw in carriers because it becomes a major revenue supply for them (Nobert & J, 1998)
For air load transportation development, additionally to the necessity for dedicated load aircrafts, it conjointly want airdrome facilities and services which has (Ground handlers , load terminals with warehouses, craft parking zone, customs management service and therefore the presence of different service providers) (WSP & KPA, 2018).

On a study by Hu & Huang (2011) it is outlined that, air cargo terminal is:

> "Business bearing on creating a profit by providing instrumentation and services associated with custom clearance and load storage needed at import /export/ transit/ conveyance load freight stations or for leaving/entering restricted zones at the airport"

The revolution in data technology (IT) with the emergence of the internet contributed in air cargo business development. Losing of shipments was one among difficulties visage in world air load transportation visage by users. As a result, business companies want for precise predictions regarding their load transportation (Kim & Lee, 2019). Delays on shipments arrival can induce delay within the provide chain. And delays can directly be coupled to prices.

Since the first cargo flight took place in USA in 1910, the air cargo business showed enormous change in terms of capacity and volume (Wikipedia, 2019). History shows that the earliest air cargo service in the world started in 1919, and the main lines were Vienna-Kiev, Berlin-Weimar, Paris-Brussels, and Paris-Cherbourg (Jun Song, 2013). (Wikipedia, 2019) continues 'Although there were a few attempts to organize air freight airlines from the 1920s on, the first commercial airlines that were all-cargo did not emerge until after World War II'. The Air freight business at first did not show the expected level of growth as airlines were attracted more to the passenger business and the cargo capacity, they have is decided by the remaining belly capacity after passenger baggage were accommodated. As various literatures agreed it was only in 1990s' that cargo business starts to appear in large scale strategies of air carriers. According to En.wikipedia.org. (2020), 'Although freight traffic developed modestly, it was getting to only

800,000 tons globally in mid-1950s'. In 1968, as per the same source, the American aircraft manufacturer Boeing launched the four engines airplane capable of carrying a full pallet load which transformed the air cargo business. As globalization rises, the air cargo business has sustained to function as a significant enabler for world trade and as studies showed its growth doubles every10 years since 1970(Chang et al., 2007). It also continued to attract carriers as it becomes a significant revenue source for them (Nobert & J, 1998)

For air Cargo transportation development, in addition to the need for dedicated cargo aircrafts, it also need airport facilities and services which includes (Ground handlers , Cargo terminals with warehouses, aircraft parking space, customs control service and the presence of other service providers) (WSP & KPA, 2018).

On a study by Hu & Huang (2011) it is defined that, air cargo terminal is:

> "Business pertaining to making a profit by providing equipment and services related to custom clearance and cargo storage required at import /export/ transit/ transshipment cargo freight stations or for leaving/entering restricted zones at the airport"

The revolution in information technology (IT) with the emergence of the internet contributed a lot to the cargo business development. Tracking of shipments is one of difficulties faced in global air cargo transportation faced by users. Internet in this regard contributed to the air cargo business by enabling involved stockholders to track their shipments more easily. As a result, business firms need for precise predictions about their cargo transportation (Kim & Lee, 2019). Delays on shipments arrival will induce delay in the supply chain. And delays will directly be linked to costs.

2.1.3.1 Air Cargo and its role in supply chain

The air cargo industry is becoming a crucial part in the wider logistics segment and is a vital component in today's supply chain management practice of companies. As per Industry (2018), IATA (International Air Transport Association) estimated an increase in total air cargo carried in 2018 to 62.5 million tons, which implies in an increase by 35% in terms of value.

Usually there are two types of airlines involved in the air cargo supply chain; express; carriers or integrators and combinational carriers (Feng et al., 2015). The express carriers are usually dedicated to transport cargo and express mails. The combination types are those dedicated for passenger, but they also carry cargo in their belly capacity. There are many companies involved in transporting cargo by air from pint of origin to point of destination and can be classified in to three main groups: airlines, freight forwarders, and integrated providers (Yurkanskiy, 2016).

Out of the basic mode of transportation for cargo shipments namely; land, air and see the air transportation option is favored by business owners due to its speed and timeliness on delivery in addition to the dynamism and flexibility it provides to the supply chain (Bernal et al., 2012).
For shippers, there are two major reasons, for them to select the air mode instead of ground/surface transportation (rail, road, and sea). First, the speed of air transportation, especially over long distances, is critical for goods subjected to issue of spoilage, items like newspapers that needs next-morning delivery, items that are subjected to just-in-time(JIT) supply chain pressures, computer related products and fashion goods. Second, air transportation has the advantage of having low risk of losing or damaging to shipments for goods which have higher value compared to their volume. Fees entreated for such type of valuable and time-sensitive items are usually insignificant when matched with the value of the items. As per study report prepared for World Bank group it is agreed that the volume of cargo carrier by air cargo will continue to increase and its integration with the multi modal supply chain system will also continue to grow(Arvis et al., 2009)

2.1.3.2 Role of Warehouse in the supply chain (Air cargo terminals)

Various type of definitions is given in literatures regarding warehouse. Sayeed (2013) defined a warehouse as a storage facility which can be used to receive goods and products so that it can be redistributed to consumers or other businesses. Warehouses are vital for exporters, importers, wholesalers, and producers to store and farther process their products and goods. As per Kondratjev (2015), without the service of a warehouse, flowing of materials in the supply chain

will be impossible as warehouses are used as a temporary concentration area for necessary supplies. Warehouses can be categorized in terms of their type and their role (Ramaa & Subramanya, 2012). Type wise we have manufacturing and distribution warehouse and in terms of role in supply chain we have warehouses for raw material, work-in-progress, finished product and as well for fulfilment and distribution.

According to Thu (2015) 'warehouse management increases productivity and accuracy, reduces and controls cost of inventory and shipping while providing good customer service'. He also elaborated warehouse provide storage nodes in the supply chain, secure storage, possession stock in good condition and reducing loss, offering good customer services, regulating the flow of supplies effectively, sorting materials quickly and accurately, and picking materials effectively to depart them in time.

As (Singh & Singh, 2009) explained, for industries, to remain competitive and retain market share in this global market, continuous improvement of manufacturing system processes has become necessary. Competition and continuously increasing standards of customer satisfaction has proven to be the endless driver of organizations performance improvement.
Perfect warehouse order handling incorporates four basic factors, namely:

1. on time delivery
2. Complete shipment shipped
3. Shipped damage free
4. Correct documentation

Focusing on these basic factors will make operational efficiency of not only the warehouse performance but also the entire supply chain guaranteed.

Warehouse role in the supply chain is rapidly changing from just a storage room nearer to the customer to a value adding key factor. As Mengfei Yu (2008) explains, warehouses play an important role in a supply chain, as products need to be put somewhere along the supply chain for temporary storage before reaching the end user. According to(Jone J. Bartholdi & Steven T. Hackman, 2002), a warehouse is vital component in a supply chain and mainly used for purposes

like consolidation of shipments or products, to realize economies of scale , to provide value adding activities and to minimize response time.

Ramaa & Subramanya, (2012) discussed that, in this competitive market setting businesses are continuously required to advance their warehousing operations. Value proposition by many companies are customized to upturn the level of their customer service, and this in turn forced to changes the role warehouses plays.

Regarding air cargo transport, competition among airports is very strong, especially in relation to intercontinental traffic. Airports winning in this market competition are the ones having: Competent Cargo staff, Procedures, developed infrastructure, and well versatile process management implemented and the effect of quality improvement tools like ACE are believed to contribute significantly (Miroslav, 2017)

Warehouse activities in Air Cargo Terminals (ACT) in general constitute receiving, put away, storage, picking and shipping (Kusrini et al., 2018). Hu & Huang (2011) mentioned Air cargo warehouse as having four functions in the form of sorting area, storage, transit processing and information processing areas. In this same study it is discussed that

"ACT's main line of business involves the provision of cargo handling services, and these service products can be further divided into the following according to their characteristics: Import General Cargo, Export General Cargo, Transit Cargo, Import Perishable Cargo, Export Perishable Cargo, Import Express Handle Unit (Import EHU) and Export EHU."

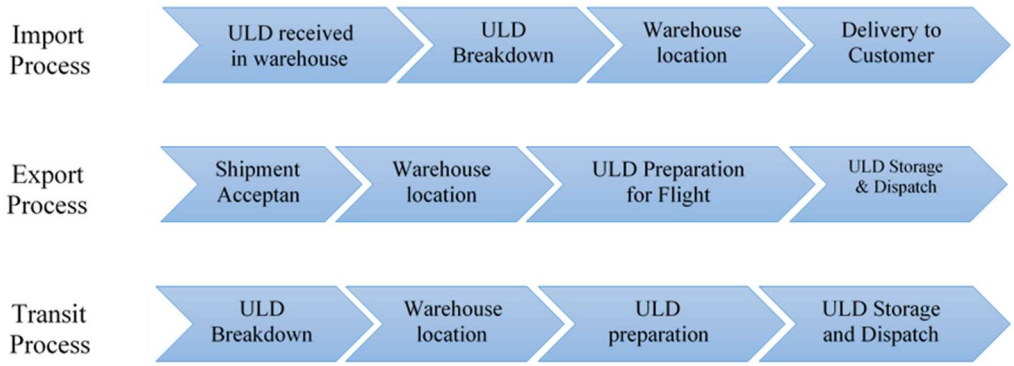
Other study by World Bank group also described main cargo terminal activities as receiving and delivering of cargo, building cargo pallets

The IATA describes the Air cargo warehouse activities in air cargo warehouses as shown below and it majorly concise of ULD breakdown, sorting, information processing, ULDs build-up and storage.

Source: From IATA AHM an airline ground operation activity 2018

Document review and observations done by researcher shows that activities in air cargo warehouses are based on shipment flow and can be summarized per the below diagram. Generally, the warehouse activities are mainly divided in to two as Dry cargo and Perishable cargo. Shipment handled in the dry cargo warehouse are of general type in nature and are not temperature sensitive, whereas shipments handled in the perishable cargo warehouse are temperature sensitive. Both dry and perishable warehouse are farther divided as incoming (import), outgoing (export) and Transfer (Transit).

Figure 2.2 Warehouse process flow



Source: Researcher study

2.1.3 Key performance indicators in Air Cargo Warehouse

One of the concern areas for most organization is performance improvement. As customer demand is ever increasing, organizations must address the issue of performance improvement to keep themselves alive. Whether an organization need to increase performance, cut undesired performance, or acquire a new performance, every organization is required to deal with it in one form or another (Chhabra, 2000).

Interest in measurement of performance along with its management has gained a significant attention in the last couple of years. Various methodologies are also devised such as balanced score card, benchmarking, cost of quality and others (Neely & Adams, 2018). All sectors in

today's business environment need to have a way to measure their performance to help organizations progress towards the organizational goals. Performance management is a process for making sure organizational goals are achieved in the most effective manner. It can be employed to measure organizational performance, departmental performance and employees' performance (Wikipedia, 2019). By having performance measurement, businesses can determine if things are progressing as intended or if there are any issues so that they can be curved and acted upon in timely manner.

Measuring warehouse performance as Kusrini et al., (2018) said, enables organizations to improve the performance of their logistics system. The supply chain demands continuously improving performance to secure and sustain competitiveness. Various key performance indicators (KPIs) were proposed on different literatures for various warehouse scenarios. Widely used KPI categories in supply chain management are categorized under quality, time, costs, and flexibility (Cai, Liu, Liu, & Xiao, cited in Schoenmaker, 2016). Staudt et al. cited in Elisa Kusrini et al., (2018) on the other side suggested cycle time, cost, quality, and productivity to be used as warehouse performance measurement dimensions.

This same trend extends to measurement of air cargo terminal warehouse performance and in most cases quality, time, productivity, and cost are the most agreed KPIs to monitor its performance (Schoenmaker, 2016).

Quality in warehouse performance measurement:

Quality is the ability of a product or service to consistently meet or exceed customer expectations or similarly quality can be defined as the fitness to the customer requirements.

Table 2.2 Warehouse performance indicators

Competitive Indicator	Ability to compete	Performance Objectives	Technique / Approache
Quality	High quality	▪ On-specification products/ services ▪ Error-free booking ▪ Efficient luggage ▪ Maintenance ▪ Reliability	▪ Total Quality Management ▪ Six Sigma ▪ Kaizen
Speed	Meeting the schedules	▪ Fast throughput ▪ Shorter reservation time ▪ Quick luggage handling ▪ Aircraft's turnaround time	▪ Single Minute Exchange of Die (SMED)
Dependability	Reliability	▪ On-time flights ▪ Reliability in luggage service ▪ Dependable delivery ▪ Reliability in operations	▪ Just-In-Time (JIT)
Flexibility	Wide range of products/services	▪ Frequency new products/ services ▪ Additional products/services ▪ Customization	▪ Training ▪ Multi-skilled staff ▪ Operational flexibility
Cost	Low price	▪ Low price with high margin ▪ High total productivity ▪ Managing the increased fuel prices internally	▪ Cost models ▪ Reducing costs throughout the supply chain

Source :(Rodrigo, 2015)

Time as a warehouse performance measurement:

Also referred as speed in literatures, measuring of air cargo warehouse performance in terms of time or speed is a common practice. As Arvis et al (2009) described air freight will increasingly be integrated into multimodal supply chains that provide a better balance between cost and time. (Arvis et al., 2009)

Productivity as a warehouse performance measurement is useful to quantify and compare warehouse with competitors (Ankersmit cited in Schoenmaker, 2016). As part of increasing productivity of the warehouse, nowadays, effective utilization of automated material handling systems in air cargo terminals are vital in enhancing the overall efficiency and performance in terms of seamless flow of shipments as import, export and transit shipments (Lau & Zhao, 2006).

2.2 Empirical Review

Though there are significant number of researches conducted on quality improvement systems like six-sigma and their effect on organizational performance very few are available related to the ACE quality improvement operating system. This is, mainly due to fact that, ACE is a proprietary

quality improvement system owned and developed by UTC and is practiced by only UTC owned or affiliated companies (Thomas, 2004).

There are some researchers conducted in Ethiopia on warehouse performance. Nigus, (2018) tried to see the effect of IT on warehouse performance. (Wubalem, 2018) on the other side tried to see the effect of order picking activity on warehouse performance finding out that all the identified factors time, quality, and productivity.

Though ACE operating system have been practiced in ETAG for over a decade, the effect it created on the overall performance of the ETAG in general and, as the focus of this study, the effect on warehouse performance of ECLS need to be studied.

Problem solving and organizational performance

Empirical study in Romania by (Liviu et al., n.d pp311) on warehouse performance indicators find out that problem solving have a significant impact as a way for reducing cost by improving operations in warehouse. Panza, (1998), another advisor, addressed her clients need by means of using process improvement.

Process Improvement and organizational performance:

A Study conducted in Texas by Chhabra, (2000) showed that organizations conducted process improvement significantly and positively affected their financial and operational performance.

Various processes are accomplished in warehouses which includes order picking, products, or shipments handling, loading, and unloading, building-up on pallets and storage (Yener & Yazgan, 2019). Top businesses firmly engage in customer focus and process excellence to maintain competitiveness (Machinini, 2010). On a study conducted at the University of Kenya by Kising'u et al. (2016) revealed that process improvement had a positive and statistically significant role in sustainable competitive advantage (Kising'u et al., 2016)

As Harrington, H. J et al., (1997) defined, 'process is a sequence of tasks or a set of actions interconnected together, usually having sub-tasks with a level of control, aimed at fulfilling an

objective'. Similar study showed that defective processes can significantly affect the contribution of individual performers and so process improvement should be a key step in improving the overall organizational performance. Chhabra (2000) also showed in his study that practicing process improvement in organizations can have a significant impact in terms of financial and operational aspects. He farther elaborated that, process improvement is central to performance improvement through process analysis and redesign.

Waste elimination and organizational performance

It becomes clearer to firms like the aviation industry that reducing total cost and waste across their entire supply chain is a means for them to stay competitive. Meyers and Stewart (cited in (El-Namrouty & AbuShaaban, 2013) described Lean manufacturing as 'a concept whereby all production employees work together to eliminate waste'. This shows how engaged employees are required for securing the performance expected from the quality system implemented.
Rivalry for market share between cargo handling companies continuously increasing and under such circumstances air cargo terminal operators must be able to provide better service with lower cost to develop competitive edge (Rong & Grunow, 2009).

The seven wastes that are targeted by the Lean Manufacturing Philosophy are: Overproduction, Inventory, Over-processing, Motion, Waiting, Defects, and Transportation (Poppendieck, 2002).

Decision making tools

As (Goa & Liu, 2014) find out the efficiency within the supply chain mostly depends on management decisions. As Vuorinen (2014) finds out it became noticeable that theories, methods, practices and tools play a large role in defining and understanding decision making process, and that data can play insignificant role if not assessed properly. He also farther investigated decision making stages and their corresponding available tools with respect to the case company studied. Some of these tools he studied were SWOT analysis, brainstorming, benchmarking,

2.2.1 Supply chain management and warehouse performance

The study conducted in Jordan showed the importance of using Warehousing management system (WMS) for inventor control and automated shipments handling system provides less effort, more efficient, and reliable results compared to manual handled system and reduces costs through effective warehouse processes(Atieh et al., 2016)

Different ACTs allocate different proportion of their warehouse space for these major activities according to their demand situation. Every ACT warehouse have a design throughput which is amount of cargo handled with in a period usually per year. The throughput of the warehouse can be achieved only if there are effective and efficient warehouse management system (WMS). The study conducted in Jordan showed the significance of using WMS for inventor control and automated shipments handling system provides less effort, more efficient, and reliable results compared to manual handled system and reduces costs through effective warehouse processes (Atieh et al., 2016). In addition, the availability of well trained and skilled cargo employees and well-prepared processes & procedures are critical to the successful deliverance of exceptional Cargo service to the customer (Miroslav, 2017). Effective warehouse operation can potentially affect the overall supply chain activities of the enterprise and directly contributed to the productivity of the company.

Warehouse performance measurement refers to the measurement of optimal use of storage space, customer relation activity, quality level, asset usage and costs. Tesema (2018) in his study tried to show the role of ACE on internal supply chain integration on business firm's bay taking a case company without showing its effect on performance.

Likewise all industries, air carriers also need to have robust and effective quality management system in place to be able to stay competitive and market leader Negate.T.A (cited in Aklilu, 2017)

2.2.2 Supply Chain Management (Focusing on Air Cargo industry)

Lee & Yang, (2003) identified the need for well-developed infrastructure that can providing virtuous linkage to other transport modes and logistics facilities fulfilling all required intercontinental standards.

Empirical studies in Air cargo study identified cargo terminal operation as one of the main problem areas (Feng et al., 2015).

Reviewing the literature, at national and international level in the fields of logistics and transportation, it could be noticed that limited number of studies focus on air cargo and warehouse performance. Comparing among modes, air cargo is not significant in terms of volume. This fact is due to its high costs, which limited this mode mainly to express, valuable or perishable goods. Optimizing space utilization is one of the main goals in warehouse design and operation.

According to IATA Air cargo (2019) the value of goods carried by air is expected to exceed $6.2 trillion in 2018. Air Cargo carriers transport over 52 million metric tons of goods a year, representing more than 35% of global trade by value but less than 1% of world trade by volume. That is equivalent to $6.8 trillion worth of goods annually, or $18.6 billion worth of goods every day. Cost is a limiting factor for demand of Air freight, typically priced 4–5 times that of road transport and 12–16 times that of sea transport.

Rates for Air freight generally range from USD1.50–4.50 per kilogram, while the value of air cargo typically exceeds USD4.00 per kilogram. Frights by air have high values per unit or are very time-sensitive, such as documents, pharmaceuticals, fashion garments, production samples, electronics consumer goods, and perishable agricultural and seafood products and also include some inputs to meet just-in-time production and emergency shipments of spare parts. (World Bank Group Professionals, 2019)

Chen & Chou (2006) explained the air cargo industry incorporates an industrial supply chain, which includes airlines, customs, ground services, air cargo forwarders, brokers, domestic transportation, air cargo terminals, and distribution centers and integrated international express services. He also elaborated, air cargo terminals are critical in the air cargo supply chain and a typical air cargo terminal has three mains.

Global supply chain is dependent on the efficient air transport and express services. Although air cargo must flow, time gained in the air is often lost on the ground due to inefficiency &

ineffectiveness of activities. Warehouse operation is one of these critical ingredients in the end-to-end supply chain. The role of warehouse performance is particularly seen as the enabler of supply chain overall efficiency. Movements of shipments within the entire Airport and particularly with in the warehouse should be very effective in terms of visibility, safety, special handling requirements and environmental condition demanded by some of these shipments. IATA states, Perishable goods such as fruits, flowers, and vegetables carried by air deteriorate over time and under extreme temperatures and humidity and must thus be handled with particular care. With experience developed over the years, airlines have developed effective handling techniques for chilled and frozen products, providing shippers with optimum, cost-efficient packaging methods.

Terminal congestion due to lack of space usually mentioned as challenge for airport operators, congestion is commonly used to describe situations when demand increases beyond what airports and cargo carriers can efficiently handle. However, we need to account for the fact that the air cargo system is complex. It comprises both on-airport facilities and services (airlines, ground handlers, cargo terminals, aircraft parking, on-airport parking, Federal Inspection Services, etc.) and off-airport facilities and services (freight forwarders, trucking terminals, warehouses, sort facilities, customs brokers, shippers and receivers, etc.), and capacity constraints at any one of its components can cause congestion.

2.2.3 Empirical review on quality management systems and organizational performance

2.2.4 Achieving Competitive Excellence

As United Technology corporation says www.utc.com (2012), Achiving competeive excelence(ACE) focuses on the drivers of competeive excellence – People and work process. UTC's leadershipe and empowered employees work togather to impiliment ACE practice in all activities across UTC business.

ACE benefits can only be achieved when empowered employees use it as an operating system to guide them what they do, including the further development of ACE itself (Rout, 2010). UTC

former CEO George David ascertained that ACE is behind the high performance of their company. United technologies corporation (UTC), reported a revenue doubling while a workspace square footage declines after the implementation of ACE (Roth, 2010). This shows that profitability of each square meter of the warehouse space can be significantly increased by having efficiency and effectiveness in process.

As Roth(2010) described, ACE guides the setting of strategic priorities, establishes processes for translating strategies into actions, and set up feedback mechanisms for assessing improvement and performance. The researcher also elaborated that, based on various case studies ,ACE enables UTC to delight its customers, provides shareholders return and satisfaies its employees.
Some case studies done on success history of UTC & other firms who implimented this propriatory continious improvement tools have achived the level of performance they set in their strategy. Former chairman & CEO to UTC , George David, cradites ACE with having a significant role in UTC's dramaticaly improved performance(Roth, 2010)

ACE is one of the continuous improvement platforms developed and implemented by UTC as a propitiatory operating system since early 1990's. ACE enabled UTC's organic growth of 7% to 9% from 2004 to 2007 and 5% in 2008. A study by Image result for MIT Massachusetts institute of Technology (MIT) compared ACE & Six sigma, shows that ACE is a broader based than six sigma approach, however, ACE is not as data oriented as six sigma. The same study also elaborated that, ACE revolved around three principal categories namely, process improvement and waste minimization tools, decision making tools and problem-solving tool.

ETAG is licenced to implemented ACE as its quality management system by directly adopting from UTC since 2007. The decision by ETAG to implement ACE operating system by collaborating with UTC shows how a strong "operating sytsem" ACE is , if managed and practiced properly. Thomas C. Hutton (2014) in his study said, in all sectors of the world Economy, quality management system and improvement is a central consideration. As quality is an important part of customer satisfaction, it is thereby a critical element of most, if not all, businesses. The study also further elaborated that, in some industries, quality goes beyond

customer satisfaction and into critical areas such as customer and public safety and prime example of these type of industries are the aerospace and building systems industry.

A case study performed by (Roth, 2010a) on ACE operating system quoted UTC CEO as saying

> "*Management and empowered employees need to work together to remove barriers that hinder improvements in order to provide our customers with high quality products and services" the ACE successful journey requires the commitment from the passionate leadership and engaged employees."*

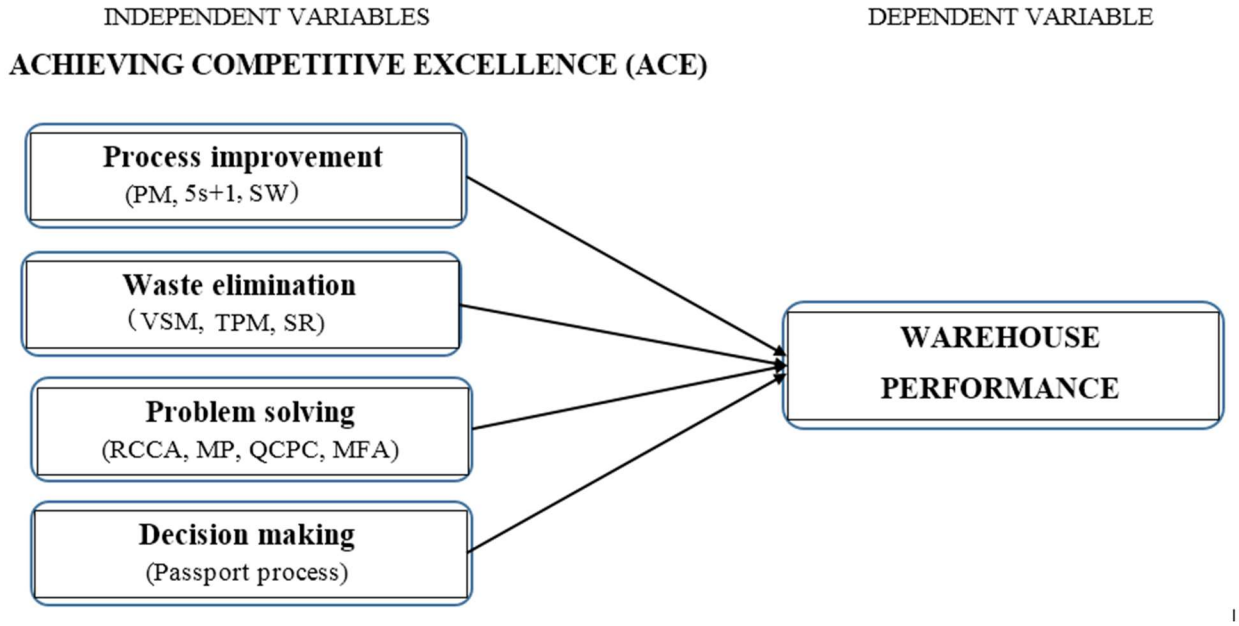
UTC ACE Mission statement states to "Achieve a level of quality and productivity improvement that will delight our customers and allow us to satisfy increased workload more efficiently (Roth, 2010)

2.3 Conceptual framework

A conceptual framework is researcher's synthesis of literature on how to explain the phenomena. It elucidates the main thing to be studied such as key factors, concepts, variables, and presumed relationship among them, either graphically or in narrative form.

As this study have four (4) independent variables and one dependent variable and the relationship among them is shown as below:

Figure 2.3 Conceptual framework



Source: Own Research and Modification

2.4 Literature Gap

There are not many literatures found related to ACE. The researcher believes that it is due to ACE is proprietor quality management system owned by UTC. There are also few empirical studies on ACE and its role in creating improved business performance. In similar manner literature gap is observed on study of warehouses performance related to air cargo.

CHAPTER THREE

RESEARCH METHODOLOGY

Research design plays a fundamental role in conducting quality research. This chapter discusses the research design and the methodology followed in detail to have a clear understanding on techniques used to conducting the study. It provides a comprehensive plan, which in effect help to answer the research questions. It also gives information on how samples are designed from the population in question, describes the respondents and how they were selected. It also discusses about the instruments for data collection. This chapter also discusses data analysis of the study both explanatory and descriptive design is suitable for this study. Explanatory studies establish causal relationships between variables and focuses on studying a situation or a problem to explain the relationships between variables (Saunders, Lewis & Thornhill, 2009, p.139). Descriptive researches are those studies for which the purpose is to produce an accurate representation of persons, events, or situations (Saunders et al., p.590). The focus of descriptive research studies is to describe the characteristics of a individuals or group. Therefore, this study used both descriptive and explanatory method to examine effect of ACE on air cargo terminal warehouse performance Ethiopian Airlines Group.

3.1. Description of the Study Area

Warehouse handling performance at airports is one of the areas that needs to be optimised to increase efficiency in the overall supply chain. ECLS operates a 1.2 million tone/ year warehouse to handle various types of cargo shipments as incoming cargo, outgoing cargo, or transfer cargo in the warehouse facility. To deliver superior service to its customers it implemented a continuous improvement tool called ACE to gain superior warehouse performance. Both incoming, outgoing and transit shipments are handled in this warehouse. It is the aim of this study to assess the effect ACE has brought to the warehouse performance of ECLS.

3.2 Research Approach

There are three type of research approaches; qualitative, quantitative and a mix of both (Clark et.al, 2008 as cited by Manayeh.W).While trying to explain the effect of ACE operating system implementation on ECLS warehouse performance by taking ECLS's warehouse function, this study decides to use a mixed approach which employed both qualitative and quantitative research aiming to gain advantages from both approaches to increase flexibility and the reliability.

Following a structured approach by way of questioner, closed ended questions will be asked, to operational employees who work in the warehouse operation. Open ended questions will be used to interview ECLS operational management members who are responsible for operations and ACE implementation to gate qualitative data.

3.3 Research Design

In this study both descriptive and explanatory way of research design were followed. Descriptive research design is followed because as (C.R Kothari, 2004,p.2) put descriptive study 'portray accurately the characteristics of a particular individual, situation or a group' and the researcher is interested in describing the existing situation in terms of mean and standard deviation. (Kumar, 2011) described explanatory research design as one who tries to 'attempts to clarify why and how there is a relationship between two aspects of a situation, phenomenon' or in our case variables. This study in addition to primary data collected through structured questioners, also prepared 6 in-depth interviews questions which will be presented to the operational mangers to get their view in a qualitative way. This will help to triangulate the result found in the quantitative study. The participants in this study will be operational employees who are involved in the day-to-day warehouse operation and are aware of the ACE operating system. The employees will be presented with questioners to answer according to instruction given. Further, in-depth interview will also be performed with warehouse operation managers particularly Export, Import and transit cargo handling managers and team leaders. This study will be conducted from April to Jun 2020.

3.4. Population and Sample Design

ECLS cargo operation is led by Director of Addis Ababa Hub Operations (Dir. ADD HUB opt.). The warehouse operation is managed under the director and is divided in to three sections namely, cargo export, Import and transit sections with their own managers reporting to the director. The employees in these sections are operation employees also called agents and cargo handlers (Labor workers). To full fill the objective of this study only operational staffs (Agents) are used as population of the study. This is since, they are the one who also practice ACE in their day-to-day activity. As per information from the management, agents are used in rotation among these three sections to get flexibility advantage and this makes all employees to have all rounded knowledge and their view about the operation makes them all important to be considered as population of study. Purposive sampling design is therefore followed which uses the view of these operational employees were selected for the study. According to data gathered from ECLS Human resource department the total number of agents in these three sections are 55 and all of them were used as respondent in this study.

3.5Data Sources and collection procedure

In this study, the researcher used both primary and secondary data. These data were collected from employees working in warehouse operational unites which includes Cargo Export, Cargo Import and Transit operation. Primary data were collected by using predesigned questionnaires developed by the researcher after an in-depth review of literatures were done. The questionnaire was tested using reliability test and was filled by the population under study. Detail in depth interview was also performed with warehouse operation management to get qualitative data. Secondary data were collected from the Airline's reports, from operational HR department of ECLS, organization webpages, ACE Cells portal page, and ACE documentation.

3.6 Data Analysis Method

This stage was the critical part of the study where the collected large amount of date were changed to some meaningful way which showed how ACE affected the ACT warehouse performance of ECLS. Since the study was a case study both quantitative and qualitative approach were applied. The study was analysed using a statistical software application called Statistical Package for Social Sciences (SPSS v20) to analyse data through statistical tools used in this study, namely descriptive analysis, correlation, and multiple regression analysis.

3.7Reliability and validity test

Table 3.1 Cronbach's Alpha

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
WP. Cumulative	13.4356	7.353	.764	.935
PI. Cumulative	13.3563	7.026	.835	.923
WE. Cumulative	13.6796	6.487	.858	.919
PS. Cumulative	13.3989	6.630	.845	.921
DM. Cumulative	13.2691	7.360	.894	.916

Source: Own survey 2020

Reliability test was conducted to examine the properties of measurement scales and the items to obtain the overall index of internal consistency of the scales. Cronbach's alpha is the most common measure of internal consistency ("reliability"). According to Table 3.1, it was calculated Cronbach's alpha for each field of the questionnaire. This table shows the values of Cronbach's alpha for each part of the questionnaire, the values of Cronbach's alpha obtained is from 0.916 to 0.935. This reliability statistics is above the minimum required threshold (0.7). Hence, the instrument is reliable.

Validity

Validity is the extent to which it gives the correct answer (Kirk and Miller, 1996). It indicates the degree to which an instrument measures what it is supposed to measure. Questionnaire papers were modified according to literatures within the specific topic and were reviewed by experts on the subject area and by academicians.

3.8 Ethical Consideration

Considering the relevance of ethics in research work, the researcher considered ethical issues as much as possible. Proper written communication will be secured first from the case organization to get permission of the intended study.

Quality research is important in producing quality evidence and new knowledge in a subject matter. Research quality is measured by validity and reliability. Reliability is the degree to which an instrument measures the same way each time it is used under the same condition with the same subjects or the consistency of a measurement. And instrument validity ensures that using correct research instrument to accurately measure the variable during the data collection procedures.

This research will use subject area expert's feedback on the survey questionnaires and system functionality review methods to measure the internal consistency and validity of intended measurements. The measure will be reliable when respondents gave the same answer in different situations. To maintain the validity of the instruments, the questionnaires will be adopted from previous researches. Some of the questionnaires will be developed based on careful review of literatures.

CHAPTER FOUR

RESULT, DISCUSSION AND INTERPRITATION

This chapter is dealing with results, discussions, and interpretation of the study on effect of ACE on warehouse performance Ethiopian airlines cargo division. Bothe quantitative and qualitative data collected are analysed and the results obtained are presented as follows. There are several software packages for processing quantitative data some of which are broader in scope and user friendly like the SPSS. After data are collected in a manner that can enable the researcher to have concrete information to address the objective of the study, it was edited, coded and entered in to a Statistical Package for Social Science (SPSS) version 20 for analysis. In the scope of the survey, 55 questionnaires were distributed to employees who are working in the warehouse operation, specifically, in Cargo Export, cargo import and cargo transit sections. The data collected from them were later used to assess the effect of ACE on warehouse performance of ECLS. Moreover, the responses of the subjects are presented, analysed, and interpreted using SPSS 20, reliability tests, and other descriptive statistics such as Mean, and standard deviation. Out of a total of 55 respondents, 48 (87 %) filled and return the questionnaires. Therefore, it can be concluded that majority of the respondents returned the questionnaire with answers. To deal with issue of non-return researcher used self-administered questioner distribution. Therefore, the researcher used all the questionnaires returned.

4.1 Demographic Characteristics of the Respondents

This includes respondents' sex category, level of education, employment status. This helps to understand that from which age group, sex category, and level of education the data were obtained. Besides, it also helps to know their work experience in the subject area.

4.1.1 Gender

Table 4.1 Gender composition of respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	FEMALE	13	27.1	27.1	27.1
	MALE	35	72.9	72.9	100.0
	Total	48	100.0	100.0	

Source: Own survey 2020

As the gender profile shows by frequency and percentage in Table 4.1, out of the 48 respondents 35(72.9%) and 13(27.1%) were female. Their proportion is large, the organization is advised to encourage the involvement of female.

4.1.2 Educational qualification

Table 4.2 Educational background of the respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	DIPLOM/CERTIFICAT	9	18.8	18.8	18.8
	1ST DEGREE	29	60.4	60.4	79.2
	2ND DEGREE	10	20.8	20.8	100.0
	Total	48	100.0	100.0	

Source: Own survey 2020

This figures in the above table shows that 10(20.8%) respondents out of 55 have MBA/MSC while 29(60.4%) are qualified with BA/BSC. Moreover, 9(18.8%) respondents out of 55 have Diploma or certificate. From this it can be inferred that most of the respondents were well educated to better understand the questionnaire and filled properly.

4.1.3 Respondent's Age Range

Table 4.3 Age composition of respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-29	26	54.2	54.2	54.2
	30-45	16	33.3	33.3	87.5
	46-60	6	12.5	12.5	100.0
	Total	48	100.0	100.0	

Source: Own survey 2020

As per Table 4.3, 26(54.2%) of the respondents were from the age range of 18-29, 16(33.3%) of the respondents were from age group of 30-45%, and 6(12.5%) were from age group of 46-60. The finding from Table 4.2 and Table 4.3 shows that the warehouse operation has a young, easy to learn and competent workforce which is also an opportunity for the success of ACE.

4.1.4 Respondent's Work Experience in the Organization

Table 4.4 Work experience of respondents in Ethiopian Airlines

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	> 1 YEAR	1	2.1	2.1	2.1
	1-2 YEARS	14	29.2	29.2	31.3
	3-5 YEARS	13	27.1	27.1	58.3
	>5 YEARS	20	41.7	41.7	100.0
	Total	48	100.0	100.0	

Source: Own survey 2020

As can be seen from Table 4.4 one (1)2.1% of the respondents were found to have less than one-year experience in the operation. 14(29.2%) have 1-2 years of experience, 13(27.1%) have 3-5 years of experience and 20(41.7%) have more than 5 years of experience and the situation allows to get views from very experienced employees.

4.1.5 Position status of respondents

Table 4.5 Position composition of the respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	JUNIOR LEVEL	13	27.1	27.1	27.1
	MIDIUM LEVEL	9	18.8	18.8	45.8
	SINIOR LEVEL	26	54.2	54.2	100.0
	Total	48	100.0	100.0	

Source: Own survey 2020

Position wise, as Table 4.5 shows, more than 35(73%) of the respondents are above medium level in terms of position they hold and have a good understanding of the cargo operation. In general, the demographic characteristics of the respondents created ideal situation in terms of reliability & validity of the study.

4.2 Descriptive statistical Analysis

In this section the descriptive analysis part is presented, the researcher used frequency, percentage, and standard deviation to show the results obtained from the primary data sources. As a rule of thumb, a mean score range of 1 - 1.80 implies the respondents strongly disagreed, 1.90 - 2.60 implies a disagreement , 2.70 - 3.40 indicates respondent is not sure, 3.50 - 4.20 implies agreement and a mean score more than 4.30 and above indicates that that respondents strongly agreed with the statement. A standard deviation more than 0.9 implies high variability in view of the statement in question.

1.2.1 Descriptive analysis for Measurement Process improvement tools

Table 4.6 Descriptive analysis for Measurement Process improvement tools

A	Process improvement	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean	SD
		f	%	f	%	f	%	f	%	f	%	f	%
6	Work process is simplified, structured, and facilitated to ensure maximum quality, consistency, reputability over time and safety to employees	0	0	8	16.7	13	27.1	21	43.8	6	12.5	3.7708	0.8565
7	Standard operating procedures (SOPs) are so simplified that instructions/procedures are easy for employees to use them	1	2.1	3	6.3	5	10.4	21	43.8	18	37.5	4.0833	0.96389
8	Service level agreement (SLAs)are in place with major stakeholders who has impact on warehouse operation (Example: Customs, Maintenance, Security etc…) and their performance is monitored	3	6.3	4	8.3	10	20.8	25	52.1	6	12.5	3.5625	1.02949
9	There is a visible *efficiency improvement* in the warehouse operation	1	2.1	2	4.2	8	16.7	28	58.3	9	18.8	3.875	0.8411
10	*Resources* are effectively *managed* in the warehouse	0	0	8	16.7	13	27.1	21	43.8	6	12.5	3.5208	0.92229
11	There is high compliance to regulatory requirements	1	2.1	6	12.5	21	43.8	15	31.3	5	10.4	3.3542	0.91068
12	Every employee have a good understanding of *value stream mapping* (VSM)	5	10.4	13	27.1	15	31.3	9	18.8	6	12.5	2.9583	1.18426
	Grand mean											**3.589**	

Source: Own survey 2020

As Table 4.6 shows majority of the respondents agreed (with mean value of 3.77) that there is simplified, structured well facilitated work process which resulted quality, consistency, and safety to employees. Almost all employees agreed (with mean score of 4.08) that Standard operating procedures (SOPs) are simplified and instructions/procedures are easy for employees.

In a similar way majority of employees agreed (with mean vale of 3.56) about the availability of SLAs and their implementation, this result was found to be in consistence with findings of the interview. The interviewees perceived that effect of stockholders on the overall performance of warehouse operation is significant. Almost all respondents agreed (with mean score of 3.88) there

is visible efficiency improvement in the warehouse operation. In a similar way most of the respondents agreed (with mean score of 3.52) that resources are effectively managed in the warehouse, but a significant number of employees disagree with this point. Almost half of the respondents agreed (With mean score of 3.35) that there is high compliance to regulatory requirements. Whereas in terms of knowledge of employees on VSM, majority of respondents disagree (With mean score of 2.96) emphasizing that they have little to know about the concept of VSM. This finding is also found to be consistent with data obtained by interview as the management personnel admitted that the VSM concept at the division level need to be aligned to bring the expected level of performance.

Overall, process improvement tools have a grand mean of 3.59 shows that process wise ECLS have a well-established process management and this was also confirmed by interview finding that processes and standards are well matured due to the reason that aviation is a highly standardized and regulated business. Contrary, it is found that VSM thinking and implementation is still an area that needs to be focused by the company.

1.2.2 Descriptive analysis for Measurement waste elimination tools

Table 4.7 Descriptive analysis for Measurement waste elimination tools

B	Waste elimination	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean	SD
		f	%	f	%	f	%	f	%	f	%	f	%
13	Employees are willing to report *Defects/wastes/inefficiencies* they identified	1	2.1	9	18.8	12	25	17	35.4	9	18.8	3.5	1.07188
14	All Cargo Handling equipments are *reliable, safe and efficient* to use and operate.	1	2.1	7	14.6	14	29.2	17	35.4	9	18.8	3.5417	1.03056
15	Operational disruptions due to *equipment Downtime (failures)* are minimized	1	2.1	9	18.8	15	31.3	18	37.5	5	10.4	3.3542	0.97827
16	There is *acceptable level of belongingness* by operators to machines and equipments	2	4.2	6	12.5	12	25	20	41.7	8	16.7	3.5417	1.051
17	ACE helped the ECLS to *identify and eliminate waste*	1	2.1	4	8.3	14	29.2	22	45.8	7	14.6	3.625	0.91384
18	There are still *people and resources* that *do not add value* in the warehouse operation	9	18.8	13	27.1	11	22.9	10	20.8	5	10.4	2.7708	1.27562
	Grand Mean											**3.389**	1.05353

Source: Own survey 2020

As can be seen from Table 4.7 even though majority of the respondent agreed (with mean score of 3.5) that they are willing to report defects/wastes/inefficiencies significant number of

respondents still have their disagreement. Similarly, most of the respondent agreed that all Cargo Handling equipment are reliable, safe and efficient to use and operate ,there are less operational disruptions due to equipment Downtime and also agreed that presence of acceptable level of belongingness by operators for machines and equipment with mean score of 3.54, 3.35 and 3.54 respectively. It is observed also that there was a significant disagreement from respondents on this area.

In a similar way majority of the respondents agreed (with mean score of 3.62) that ACE helped ECLS to identify and eliminate its wastes. Most respondents disagree on the idea that there are still people and resources that do not add value in the warehouse operation (with mean score of 3.35).

Therefore, in this regard, the grand mean vale of 3.39 shows that waste elimination tools are critical area that needs to be looked at, for the existence of a very efficient resource utilization mainly manpower and equipment in line with this the company also needs to look in to the maintenance management of equipment and automated machineries as they affect the day to day operation due to unplanned downtime.

1.2.3 Descriptive analysis for Measurement problem solving tools

Table 4.8 Descriptive analysis for Measurement problem solving tools

C	**Problem Solving**	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean	SD
		f	%	f	%	f	%	f	%	f	%	f	%
19	System is in place for regularly collecting improvement opportunities from customers and employees for better and effective service	1	2.1	2	4.2	10	20.8	27	56.3	8	16.7	3.8125	0.84189
20	Turn-back collection from both employees and customers are well documented and prioritized	1	2.1	7	14.6	17	35.4	18	37.5	5	10.4	3.3958	0.93943
21	Identified corrective actions for these prioritized opportunities are usually get effective solutions and their effectiveness is monitored	0	0	4	8.3	18	37.5	21	43.8	5	10.4	3.5625	0.79643
22	Eight (8) step root cause corrective actions analysis is done for prioritized opportunities to identify the most effective solutions	2	4.2	4	8.3	14	29.2	19	39.6	9	18.8	3.6042	1.02604
23	The solutions identified are effectively implemented, all similar processes are *standardized* and incorporated to SOPs to prevent problems from reoccurring	1	2.1	4	8.3	16	33.3	26	54.2	1	2.1	3.4583	0.7707
24	The four(4) step ***DIVA (D****efine,* ***I****nvestigate,* ***V****erify and* ***E****nsure)* process of *problem solving* is well understood and utilized by employees	2	4.2	10	20.8	13	27.1	19	39.6	4	8.3	3.2708	1.02604
	Grand Mean											**3.517**	

Source: Own survey 2020

As per Table 4.8 it can be seen that there is strong agreement among respondents about the availability of a system to regularly collecting improvement opportunities(feed backs) from customers and employees for better and effective service, that turn-back collection from both employees and customers are well documented and prioritized and identified corrective actions for these prioritized opportunities are usually get effective solutions and their effectiveness is monitored with mean score value of 3.81, 3.39 and 3.56 respectively.

More than half of the respondents agreed (with mean value of 3.60) that the eight step root cause corrective actions analysis is done for prioritized opportunities to identify the most effective solutions and that the solutions identified are effectively implemented and similar processes are standardized and incorporated to SOPs to prevent problems from reoccurring and the four (4) step DIVA (Define, Investigate, Verify and Ensure) process of problem solving is well understood and utilized by employees with mean score of 3.60 3.46 and 3.27 respectively.

The result of problem-solving tools with a grand mean vale of 3.5 shows that there is strong system in place to addressing customer feedbacks as part of the problem-solving mechanism. Solutions obtained from root cause analysis techniques are effective. The result also exposed the need for improvement specially in using DIVA.

1.2.4 Descriptive analysis for Measurement decision making tools

Table 4.9 Descriptive analysis for Measurement decision making tools

D	Decision making	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean	SD
		f	%	f	%	f	%	f	%	f	%	f	%
25	Leadership made high Level objectives are cascaded down to each warehouse operation so that employees are aware of them	2	4.2	2	4.2	12	25	30	62.5	2	4.2	3.5833	0.82083
26	Smart and timely decisions are made by management on operational issues	1	2.1	7	14.6	8	16.7	27	56.3	5	10.4	3.5833	0.94155
27	There is a developed process for effective and efficient program/project management	1	2.1	4	8.3	13	27.1	26	54.2	4	8.3	3.5833	0.84635
28	The leadership is highly committed to make ACE a culture in ECLS	2	4.2	2	4.2	13	27.1	25	52.1	6	12.5	3.6458	0.91068
29	There is well developed work quality checks for each activity to proceed to the next step.	1	2.1	3	6.3	11	22.9	28	58.3	5	10.4	3.6875	0.82916
	Grand mean											**3.617**	

Source: Own survey 2020

Table 4.9 shows that respondents strongly agree (with mean score of 3.58) that the leadership provides with high Level objectives which are cascaded down to each warehouse operation so

that employees are aware of them but there are some employees who did not agree on this . Most of the respondents agreed (with mean score of 3.58) that smart and timely decisions are made by management on operational issues, but some (16.7%) still disagree on management decision making approaches.

In a similar way majority of the respondent agreed (with mean value of 3.58) that there is a developed process for effective and efficient program/project management. Most of respondents agreed (with mean score of 3.64) the leadership is highly committed to make ACE a culture in ECLS. In a similar way majority of the respondents agreed (with mean value of 3.69) that there are well developed work quality checks for each activity to proceed to the next step.

Altogether, a grand mean value for decision making tools of 3.6 shows about the existence of good leadership practice in terms of objective oriented leadership, flexible and informed decision-making capability development, speedy and flexible decision-making approach and good level of managing projects.

1.2.5 Descriptive analysis general ACE related factors

Table 4.10 general ACE related questions

E	General ACE Related questions	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean	SD
		f	%	f	%	f	%	f	%	f	%	f	%
30	ACE operating system is now a culture at ECLS	1	2.1	6	12.5	14	29.2	19	39.6	8	16.7	3.5625	0.98729
31	As ACE Tools are data driven, easy to use IT systems are implemented	1	2.1	5	10.4	12	25	22	45.8	8	16.7	3.6458	0.95627
32	Regular recurrent trainings are provided to employees on ACE system	2	4.2	6	12.5	16	33.3	9	18.8	15	31.3	3.6042	1.18033
33	ACE tool team are well structured and are properly functioning	0	0	11	22.9	14	29.2	15	31.3	8	16.7	3.4167	1.02798
	Grand mean											**3.557**	

Source: Own survey 2020

As per Table 4.10 most respondent have agreement (with mean score of 3.56) that ACE operating system becomes a culture at ECLS. In other side, most of the respondents agreed (with mean score of 3.65) that as ACE Tools are data driven, easy to use IT systems are implemented. Majority of the responders agreed (with mean score of 3.60) that regular recurrent trainings are provided to employees on ACE system. Most of respondents agreed (with mean score of 3.41) that ACE tool team are well structured and are properly functioning but significant number of

respondents (22.9%) disagree on this point. This result shows that more need to be done on ACE tool team activities otherwise overall ACE practice is on acceptable level.

1.2.6 Descriptive analysis on warehouse performance

Table 4.11 Descriptive analysis on warehouse performance

F	Warehouse Performance	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean	SD
		f	%	f	%	f	%	f	%	f	%	f	%
34	There is High data quality in all cargo IT systems used (**Example**: Cargo spot and ICS)	2	4.2	5	10.4	5	10.4	27	56.3	9	18.8	3.75	1.02105
35	There is Error free shipment documentation handling	2	4.2	13	27.1	16	33.3	13	27.1	4	8.3	3.0833	1.02798
36	Track unloading time at Export acceptance gates (Dry/ perishable terminal) is minimal	1	2.1	6	12.5	12	25	24	50	5	10.4	3.5417	0.92157
37	Time taken for handover incoming commercial Shipment to customs area for inspection is reduced	0	0	8	16.7	15	31.3	22	45.8	3	6.3	3.4167	0.84635
38	Shipment dwell time in the warehouse is kept minimal	0	0	5	10.4	16	33.3	24	50	3	6.3	3.5208	0.77156
39	Time taken to locate shipment in the warehouse is minimized	3	6.3	5	10.4	12	25	20	41.7	8	16.7	3.5208	1.09135
40	Warehouse space configuration and utilization is effective	2	4.2	3	6.3	12	25	21	43.8	10	20.8	3.7083	1.0097
41	Electrical energy usage at cold room and dry cargo storage are minimal	1	2.1	3	6.3	14	29.2	24	50	6	12.5	3.6458	0.86269
42	GSE travel routes are kept minimal inside the warehouse to save cost on equipment wear & tear	1	2.1	5	10.4	15	31.3	20	41.7	7	14.6	3.5625	0.9432
43	Damage free use of resources like ULDs, pallets etc… improved	3	6.3	6	12.5	9	18.8	27	56.3	3	6.3	3.4375	1.00861
44	Claim paid due to damage or loss of shipment decreased	2	4.2	5	10.4	16	33.3	21	43.8	4	8.3	3.4167	0.94155
	Grand Mean											**3.5095**	

As per Table 4.11 majority of the respondents agreed (with mean score of 3.75, 3.70 and 3.64) that there is High data quality in all cargo IT systems, warehouse space configuration and utilization is effective, and presence of good energy management respectively.

In the other side most of the respondents agreed (with mean score of 3.52, 3.54, 3.56 and 3.52) that shipment dwell time in the warehouse is kept minimal, track unloading time at Export acceptance gates (Dry/ perishable terminal) is minimal, GSE travel routes are kept minimal inside the warehouse to save cost on equipment wear & tear and Time taken to locate shipment in the warehouse is minimized respectively. Majority of the respondents agreed that agreed (with mean score of 3.41, 3.43 and 3.41) that time taken for handover incoming commercial Shipment to customs area for inspection is reduced, damage free use of resources like ULDs improved and , Claim paid due to damage or loss of shipment decreased. The number of respondents agreed and disagreed on availability of Error free shipment documentation handling is almost in parity (With mean score of 3.08).

Overall, the grand mean of 3.5 for warehouse performance shows a good warehouse management practice in terms of quality, speed, productivity and cost minimization. In parallel the study also showed that there is improvement needed in the document handling process.

4.3. Inferential analysis Results

This chapter exhibits an extensive data analysis and the results of the statistical test. Inferential Data Analysis is conducted by correlation and regression analysis, by using statistical software SPSS. This part focuses on the results and discussion, based on the tables generated by SPSS. Based on this, the results are discussed below.

4.3.1. Correlations

Correlation measures the degree to which the change in one variable follows the pattern of change in the other variable. When to predict membership of only continuous outcomes the analysis is known as Pearson product-moment correlation Field (2009). Pearson product-moment correlation coefficients were computed to assess the relationship between Independent and dependent variables that are measured quantitatively.

Table 4.12 Summary of Correlations Results

Correlations

		WP.Cumulative	DM.Cumulative	PS.Cumulative	WE.Cumulative	PI.Cumulative
WP.Cumulative	Pearson Correlation	1	.787**	.699**	.707**	.677**
	Sig. (1-tailed)		.000	.000	.000	.000
	N	48	48	48	48	48
DM.Cumulative	Pearson Correlation	.787**	1	.714**	.599**	.699**
	Sig. (1-tailed)	.000		.000	.000	.000
	N	48	48	48	48	48
PS.Cumulative	Pearson Correlation	.699**	.714**	1	.695**	.778**
	Sig. (1-tailed)	.000	.000		.000	.000
	N	48	48	48	48	48
WE.Cumulative	Pearson Correlation	.707**	.599**	.695**	1	.684**
	Sig. (1-tailed)	.000	.000	.000		.000
	N	48	48	48	48	48
PI.Cumulative	Pearson Correlation	.677**	.699**	.778**	.684**	1
	Sig. (1-tailed)	.000	.000	.000	.000	
	N	48	48	48	48	48

**. Correlation is significant at the 0.01 level (1-tailed).

Source: Analysis of survey data, May 2020

Table 4.12. Depicts the values of Pearson's correlation along with the associated significance value between the independent and dependent variables.

It shows the Pearson r's, the significance of each r, and the sample size (N) for each r. Here the main research objective is to examine. "The Effect of Achieving Competitive Excellence on Air Cargo Terminal warehouse Performances".

It can be assumed that the value of the one variable is a linear function of the value of the other variable. Correlation coefficients describe how well a straight line fits the data. The correlation coefficient or "r" provides a numerical measure of the strength of the relationship between two numeric variables. The rule of thumb for interpreting correlation coefficient is to divide the range of possible scores in five intervals: 0 to 0.20 corresponds to a very weak relationship; 0.21 to 0.40 corresponds to a weak relationship, 0.41 to 0.60 corresponds to a moderate relationship, 0.61 to 0.80 corresponds to a strong relationship, and 0.81 to 1.00 corresponds to a very strong

relationship (Cohen -2003). These rules apply whether the sign of the correlation coefficient is positive or negative.

Therefore, from the above table the r value of Decision-Making tool is 0.787 with p-value<0.05(0.000). This shows that Decision Making tool as a factor is positively, and strongly correlated (since it lies between 0.61 to 0.80 corresponds to a strong and positive relationship) and also problem solving tool r-value is 0.699 with p-value<0.05(0.000) as factor is positively, and strongly correlated (since it lies between 0.61 to 0.80 corresponds to a strong and positive relationship). Similarly, waste elimination factor functions as a factor having r-value 0.707 with p-value<0.05(0.000) is positively and strongly correlated (since it lies between 0.61 to 0.80 corresponds to a strong and positive relationship). Moreover, from the above table the r value of process improvement as a Factor is 0.677 with p-value<0.05(0.001) as factor is positively and strongly correlated (since it lies between 0.61 to 0.80 corresponds to a strong and positive relationship).

4.3.2. Multiple Regression Analysis

In this study multiple regressions were conducted to examine and a measure how much of the variability in the outcome (in this case Air Cargo Terminal warehouse Performances) accounted by the above-mentioned predictors. In conducting the multiple regression analysis, several′ main assumptions were considered and examined to ensure that the multiple regression analysis was appropriate. The assumptions to be examined are as follow:

(1) Outliers,

(2) Normality linearity and homoscedasticity, and

(3) Multicolinearity

In order to see outliers, it is needed to check data whether there are any potential outliers existing in the analysis. Multiple regression is very sensitive to outliers (i.e. very high or low score)" Thus, outliers should be removed before running the regression analysis. Multivariate outliers can be detected by using statistical methods such as case wise diagnostics. During conducting multiple regression and Collinearity Diagnostics, four outliers were detected and removed.

The tolerance for a variable is 1 - R-squared for the regression of that variable on all the other independents, ignoring the dependent. When tolerance is close to 0 there is high multicollinearity of that variable with other independents and the B and Beta coefficients will be unstable. But in this case tolerance is much higher than 0 which is (0.308 - 0.459) - coefficient table. Hence, multicollinearity is not a threat to the substantive conclusions of this study and the B and Beta coefficients are stable. VIF (Variance Inflation Factor) is (2.179 -3.244) simply the reciprocal of tolerance. In this case, since VIF are less than 10 and greater than 1, thus multicollinearity is not a threat to the substantive conclusions of this study and the B and Beta coefficients are stable.

Table 4.13 Coefficients

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.050	.349		.144	.886		
	PI. Cumulative	.041	.152	.039	.272	.787	.327	3.062
	WE. Cumulative	.306	.117	.316	2.606	.013	.459	2.179
	PS. Cumulative	.085	.148	.085	.574	.569	.308	3.244
	DM. Cumulative	.546	.133	.510	4.093	.000	.433	2.309

a. Dependent Variable: WP. Cumulative

Source: Analysis of survey data, May 2020

Where:

WP= warehouse performance

PI = Process Improvement tools

WE = Waste elimination tools

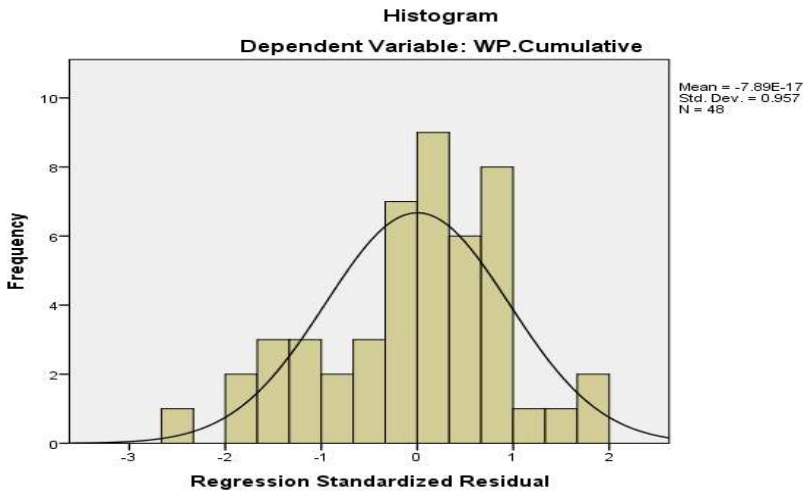
PS= Problem solving tools

DM= Decision Making tools

One of the assumptions to be examined is normality linearity and homoscedasticity. To check normality a graph is plotted using SPSS regression graph. The below graph shows the assumption

of normality is accepted; thus, the assumption of normality is met as the histogram shows the assumption of normality is met .

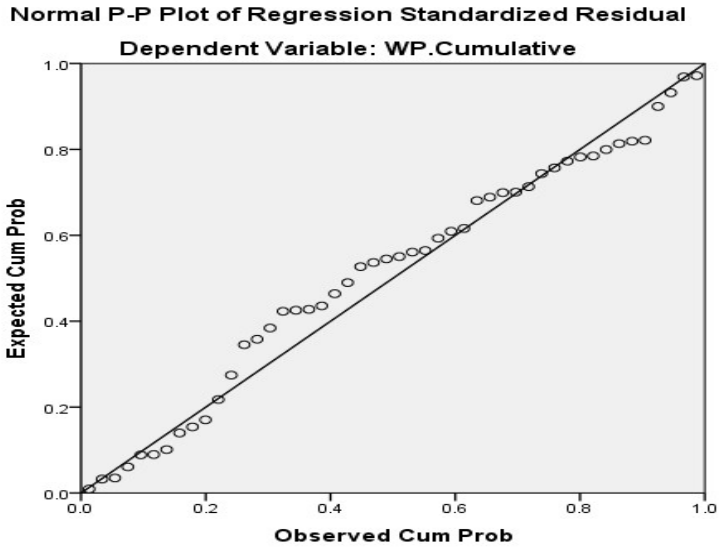
Figure 4.1 Regression assumption



Source: Analysis of survey data, May.2020

Moreover, to check linearity, a graph is plotted using SPSS regression graph. The below graph shows the assumption of linearity is met.

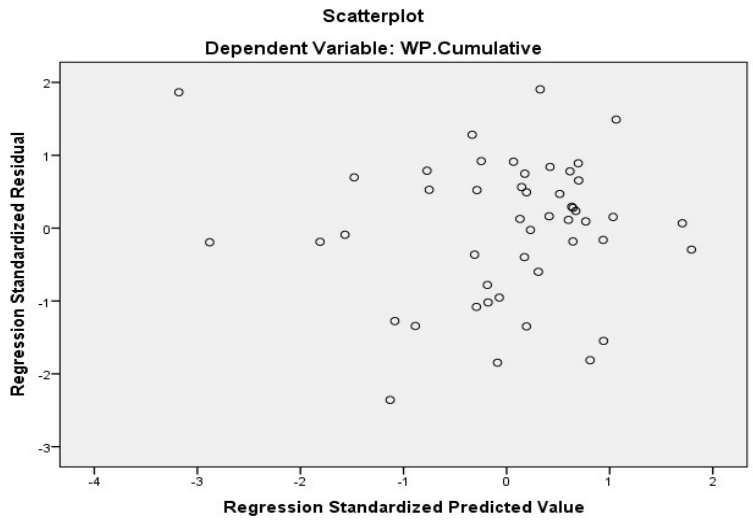
Figure 4.2 Normal P-P Plot of regression standardized residual dependent variable



Source: Analysis of survey data, May, 2020

To check assumption of homoscedasticity or homogeneity, residual data is plotted using SPSS regression graph and the graph shows most of the data scattered are compacted in one area in homogenized pattern.

Figure 4.3 Scatterplot dependent Variable



Source: Analysis of survey data, May, 2020

The above graph shows the assumption of linearity, normality and homoscedasticity is valid and distributed normally.

4.3.3. Multiple Regression Model summary

This chapter exhibits an extensive inferential statistical analysis and their results. Inferential Analysis is also conducted using linear regression analysis based on statistical software SPSS. When to predict membership of only continuous outcomes the analysis is known as linear regression. This chapter focuses on the results and discussion, based on the tables generated by SPSS, Field (2009)

Table 4.14 Model summary of critical factors with the dependent variable Air Cargo Terminal warehouse Performances

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.843[a]	.711	.684	.39508	.711	26.385	4	43	.000	1.960

a. Predictors: (Constant), DM.Cumulative, WE.Cumulative, PI.Cumulative, PS.Cumulative

b. Dependent Variable: WP.Cumulative

Source: Analysis of survey data, May, 2020

From the above table, it is also possible to find out that $R^2$is a measure of how much of the Variability in the outcome (in this case Air Cargo Terminal warehouse Performances) is accounted for by the above-mentioned predictors (factors). As shown in table 4., R^2value is 0.711, which means that all the mentioned critical factors account for 71.1 % of the variation in the Air Cargo Terminal warehouse Performances. The remaining 28.9 % of the variance is explained by other variables not included in this study.

4.3.4 ANOVA table summary of critical factors with the dependent variable – Air Cargo Terminal warehouse Performances

Table 4.15 ANOVA table summary of critical factors with the dependent variable – Air Cargo Terminal warehouse Performances

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16.474	4	4.118	26.385	.000[b]
	Residual	6.712	43	.156		
	Total	23.186	47			

a. Dependent Variable: WP .Cumulative

b. Predictors: (Constant), DM. Cumulative, WE. Cumulative, PI. Cumulative, PS. Cumulative

Source: Survey May 2020 data analysis

The above ANOVA table result shows sig. value= 0.000. This suggests that the model is quite significant in explaining the variances. The significance result at p< 0.05(0.000) provides support for the significant relationship.

4.3.5. Regression Coefficients

Table 4.15 depicts the coefficients of multiple regressions.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.050	.349		.144	.886		
	PI. Cumulative	.041	.152	.039	.272	.787	.327	3.062
	WE. Cumulative	.306	.117	.316	2.606	.013	.459	2.179
	PS. Cumulative	.085	.148	.085	.574	.569	.308	3.244
	DM. Cumulative	.546	.133	.510	4.093	.000	.433	2.309

a. Dependent Variable: WP. Cumulative

Source: Analysis of survey data, May 2020.

The above Table 4.15 depicts the coefficients of multiple regressions. It shows in detail the beta (standardized and unstandardized) value of various independent variables and its associated significance value.

B column shows the constant values for the regression for predicting the dependent variable from the independent variable. Beta is measured in units of standard deviation. Table 4.15 above displays the estimates of the multiple regression of Air Cargo Terminal warehouse Performances against its independent variables. The Un-standardized Coefficients of determination under the B column in, table 4.15, were used to substitute the unknown beta values of the regression model. The beta values indicated the direction of the relationship. Nature of the relationship is indicated by a positive or negative sign. The p-value or the significant values under sig. column imply the statistical significance of the relationship or the probability of the model giving a wrong prediction. The recommended p-value should be less than 0.05 as it signifies a high degree of confidence. In this case, the predictor variables produced statistically significant results p< 0.05. Waste elimination (p=0.0130), Decision Making tool (p= 0.000), from the results, a p-value of

the above-mentioned factors scores are less than 0.05. These variables have direct and significant relationship with Air Cargo Terminal warehouse Performances and can be inferred that the mentioned variables are critical factors that have major contribution for the improvement in Air Cargo Terminal warehouse Performances.

On the other hand, problem solving tool p-value= 0.569 and process improvement factors p-value=0.787 have insignificant relationship with Air Cargo Terminal warehouse Performances and can be inferred also that the mentioned variables are not critical factors and thus do not have major contribution for the success of Air Cargo Terminal warehouse Performances.

Thus, WP = -0.05 +0.306* WE + 0.546*DM

Where:

WP = warehouse Performances.

WE = Waste Elimination factor

DM = Decision Making Tool

The summary of the above findings shows and supports the fact that these two factors are significant factor which affects performance of Air Cargo Terminal warehouse. The study also shows that, the two dimensions account for 71.1 % of the variation in performance of Air Cargo Terminal warehouse. Accordingly, these two dimensions were found to be the strongest statistical predictor of performance of ECLS Cargo Terminal warehouse successfully. It is known that; the study is dedicated to answer the following basic research questions:

The first research questions, “What effect dose ACE process improvement tools have on ECLS warehouse performance from employees’ perspective?” is answered by this study showing that the organisation have a well matured process management which have a positive and strong relation with the warehouse performance. Similarly, research question two and three namely, “What are the effects of ACE waste elimination tools on ECLS warehouse performance from employees’ perspective? and, “What effect dose ACE Decision making tools have on ECLS warehouse performance from employees’ perspective? is answered by the fact that both decision making tools and waste elimination tools are found to be major contributors to the warehouse

performance of ECLS as shown by the regression analysis with corresponding p-value of p=0.0130 and p=0.000 respectively . The final research question, “What effect dose ACE Problem solving tools have on ECLS warehouse performance from employees’ perspective? Is answered showing that market feedback analysis(MFA) , Relentless root cause analysis (RRCA) and mistake proofing are well integrated to the system and are being practiced accordingly having a positive and strong relation with warehouse performance as shown by the correlation analysis.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

In this section the main findings of the research are summarized and conclusions on major findings are presented. Recommendations are given based on the research findings and the limitation of the study is mentioned. Finally, the study forwarded some suggestions for further investigations.

5.1 Summery of the finding

The result of this study which is on the effect of ACE on air cargo Terminal warehouse performance can be summarized as:

- Overall, due to the implementation of ACE process improvement are effective in ECLS are well-established and matured and this may be due to the reason that aviation is a highly standardized and regulated business. Contrary, it is found that VSM thinking and implementation is still an area that needs to be focused by the company.
- In regard to waste elimination tools, since they have a positive and significant contribution to the warehouse performance, they have to be critically given attention for keeping the result achieved through continuous improvement. It is also noted that a very efficient resource utilization mainly manpower and equipment exist.
- The result of problem-solving tools shows that there is strong system in place to addressing customer feedbacks as part of the problem-solving mechanism. Solutions obtained from root-cause analysis techniques are effective. The result also exposed the need for improvement specially in using DIVA process of problem solving.
- In terms of decision making the result shows about the existence of good leadership practice in terms of objective oriented leadership, flexible and informed decision-making capability development, speedy and flexible decision-making approach, and good level of managing projects.
- The result also showed the existence of a good warehouse management practice in terms of quality, speed, productivity, and cost minimization. In parallel the study also showed that there is improvement needed in the document handling process.

- As the descriptive analysis result in the previous chapter shows majority of the employees agreed that, ACE implementation helped the ECLS to identify and eliminate its waste. Most respondents also agreed that the overall performance in terms of process management is improved**,** **s**tandard operating procedures (SOPs) that instructions/procedures are easy for employees to use them. There is well developed work quality checks for each activity to proceed to the next step, system is in place for regularly collecting improvement opportunities from customers and employees for better and effective service and finally it is the view of majority of the respondents that manpower and other resources are very effectively utilised.
- On the other side, the result also showed that there are respondents who disagree with some of the above pointes which highlights that strong commitment required from the leadership side in making ACE a culture, the result also showed that VSM method which is central to creating value to the customer is not known to most of the employees, there are ACE team for each ACE tool but they are not functional at the required level due to various operational issues. Some respondents showed concern with the way timely decisions are given for operational issues and finally few respondents have a concern on equipments downtime and unavailability of resources like empty ULDs.

5.2 Conclusion

From this study it is concluded that ACE operating system factors namely; process improvement tools, waste elimination tools, problem solving tools and decision making tools all are found to have an effect on ECLS warehouse performance with waste elimination tools and decision making tools are found to have a direct and significant impact account for 71.1 % of the variation in performance of Air Cargo Terminal warehouse. The result also showed that value stream mapping concept needs to be worked at too to get more value to the customer and resulting customer satisfaction.

From Table 4.6, it can be concluded that the process has some gap to ensure quality, consistency and safety to employees are always maintained. Performance indicators like throughput of the warehouse can significantly be affected if resources like warehouse space, equipment, and available work force etc... are not effectively used and the study showed that there are gaps in this

regard. As the airline business is heavily regulated business it is recommended that the cargo division should full fill this requirement at all time. The study also showed that staffs should be trained and encouraged to reporting defects, wastes and inefficiencies observed in work processes to get into the highest level of performance as employees' engagement and empowerment is a core of ACE operating system. Some concerns raised about data quality is advised to be corrected as it is very significant in warehouse management. As safety, as mentioned in the airline core values, is priority in aviation biasness, there are very few respondents with some concerns in that area, the cargo carrier is advised to give it farther consideration. All in all, ECLS warehouse performance, as agreed by majority of the respondents is very satisfactory.

5.3 Recommendations

This study on effect of ACE on Air cargo terminal warehouse performance recommends that:

- The company needs to investigate the maintenance management of equipment and automated machineries as they affect the day to day operation due to unplanned downtime.
- Even if most respondents agree on satisfactory safety record in the warehouse operation very few disagreed with this point and, Knowing safety always comes first, the organization is recommended to review its processes so that any safety concerns are minimized to level zero.
- Effective resources utilization like warehouse space management, equipment management and workforce management need recommended to be reviewed.
- From the demographical data obtained female employees' proportion is found to be small; the organization is advised to encourage the involvement of female.

5.4 Limitation and Suggestions for Future Studies

This study under its scope tried to explain the effect of ACE on Air cargo terminal warehouse performance of ECLS in the cargo transportation industry. This study tried to explain the effect of ACE on air cargo terminal warehouse performance from the perspective of employees who work in the warehouse operation, which may have caused in an inherent bias. Future research

paper may as well assess the views of customers too. This study is conducted uniquely in the case company and on quality system that can be implemented under licence, this will limit the practicality of the system in other organizations. Finally, the study identified based on employees view that, 71.1% the warehouse performance is contributed by proper implementation of ACE operating system tools significantly due to the application of the waste elimination tools and the Decision-making tools. This result also revealed that there are other factors contributing to the warehouse performance (28.9%). As a result, other researchers are encouraged to pursue farther study on this area.

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Appendix-A Questioners

Addis Ababa University

College of business and economics

School of commerce

Dear Respondents

The objective of this questionnaire is to secure the necessary and relevant first-hand information that may be useful to conduct a Thesis regarding "*Effect of Achieving Competitive Excellence (ACE) on Air Cargo Terminal Warehouse Performance the case of Ethiopian airlines group cargo section*" which will be used to prepare a thesis required for my MSc degree in Logistics and supply chain management. Therefore, your response in this regard helps a lot to undertake the study. The result of this survey will be treated with at most confidentiality and will be strictly used for academic purpose only. The researcher thus appreciates in advance your cooperation and sparing your valuable time in filling this questionnaire.

Thank you

PART I: PERSONAL INFORMATION/PROFILE, PLEASE MARK (√) YOUR CHOICE.

1. **Sex** **a)** ☐ Female **b)** ☐ Male

2. **Age** **a)** ☐ 18-29 **b)** ☐ 30-45 **c)** ☐ 46-60 **d)** ☐ Above 60

3. **Educational Status** **a)** ☐ Diploma/ Certificate b) ☐ BA/BSc
c) ☐ MA/ MSc **d)** ☐ PHD **e)** ☐ Other

4. **Company Position** **a)** ☐ Junior Level **b)** ☐ Medium Level **c)** ☐ Senior Level

5. **Work Experience in Ethiopian Airlines Group** **a)** ☐ Less than 1-year **b)** ☐ 1- 2 years **c)** ☐ 3-5 years **d)** ☐ >5years

	PART II: Question on ACE practice in Ethiopian Airlines Cargo warehouse operation					
	Direction: On the following scale, please tick (√) the appropriate number under the space provided that best represents your opinion.					
	(1=strongly disagree 2=disagree 3= Neutral 4= Agree 5=strongly agree)					
A	**Process improvement**	1	2	3	4	5
6	Work process is simplified, structured, and facilitated to ensure maximum quality, consistency, reputability over time and safety to employees					
7	Standard operating procedures (SOPs) are so simplified that instructions/procedures are easy for employees to use them					
8	Service level agreement (SLAs)are in place with major stakeholders who has impact on warehouse operation (Example: Customs, Maintenance, Security etc…) and their performance is monitored					
9	There is a visible *efficiency improvement* in the warehouse operation					
10	*Resources* are effectively *managed* in the warehouse					
11	There is high compliance to regulatory requirements					
12	Every employee have a good understanding of *value stream mapping*(VSM)					
B	**Waste elimination**	1	2	3	4	5
13	Employees are willing to report *Defects/wastes/inefficiencies* they identified					
14	All Cargo Handling equipments are *reliable, safe and efficient* to use and operate.					
15	Operational disruptions due to *equipment Downtime (failures)* are minimized					
16	There is *acceptable level of belongingness* by operators to machines and equipments					
17	ACE helped the ECLS to *identify and eliminate waste*					
18	There are still *people and resources* that *do not add value* in the warehouse operation					
C	**Problem Solving**	1	2	3	4	5

19	System is in place for regularly collecting improvement opportunities from customers and employees for better and effective service					
20	Turn-back collection from both employees and customers are well documented and prioritized					
21	Identified corrective actions for these prioritized opportunities are usually get effective solutions and their effectiveness is monitored					
22	Eight (8) step root cause corrective actions analysis is done for prioritized opportunities to identify the most effective solutions					
23	The solutions identified are effectively implemented, all similar processes are *standardized* and incorporated to SOPs to prevent problems from reoccurring					
24	The four(4) step ***DIVA(Define, Investigate, Verify and Ensure)*** process of *problem solving* is well understood and utilized by employees					
	Decision making	1	2	3	4	5
25	Leadership made high Level objectives are cascaded down to each warehouse operation so that employees are aware of them					
26	Smart and timely decisions are made by management on operational issues					
27	There is a developed process for effective and efficient program/project management					
28	The leadership is highly committed to make ACE a culture in ECLS					
29	There is well developed work quality checks for each activity to proceed to the next step.					
E	**General ACE Related questions**					
30	ACE operating system is now a culture at ECLS					
31	As ACE Tools are data driven, easy to use IT systems are implemented					
32	Regular recurrent trainings are provided to employees on ACE system					
33	ACE tool team are well structured and are properly functioning					

	PART II: Question on ACE practice in Ethiopian Airlines Cargo warehouse operation					
E	**Warehouse Performance**	1	2	3	4	5
34	There is High data quality in all cargo IT systems used (**Example**: Cargo spot and ICS)					
35	There is Error free shipment documentation handling					
36	Track unloading time at Export acceptance gates (Dry/ perishable terminal) is minimal					
37	Time taken for handover incoming commercial Shipment to customs area for inspection is reduced					
38	Shipment dwell time in the warehouse is kept minimal					
39	Time taken to locate shipment in the warehouse is minimized					
40	Warehouse space configuration and utilization is effective					
41	Electrical energy usage at cold room and dry cargo storage are minimal					
42	GSE travel routes are kept minimal inside the warehouse to save cost on equipment wear & tear					
43	Damage free use of resources like ULDs, pallets etc… improved					
44	Claim paid due to damage or loss of shipment decreased					

Appendix B. In-Depth Interview Questions

Interview questions for Warehouse operations management Team.

1. How do you evaluate that ACE has become an integral part of ECLS continuous quality improvement system?
2. How do you evaluate the status of value stream mapping (VSM) at Cargo level?
3. How do you evaluate management involvement on ACE practice in ECLS?
4. Do you think ACE implementation brought the required warehouse performance in terms of Quality, speed, productivity, and cost?
5. What are the major challenges for ACE to bring the required level of Warehouse performance at ECLS?
6. How do you evaluate staff engagement on ACE activities?
7. How do you rate the effect of other stakeholders (Customs, Security, maintenance department etc…) on warehouse performance?