Examining the Effectiveness of E-Learning: The Case of Ethiopian Airlines

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Business Administration, Specialization in Management

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Declaration

I certify that the thesis entitled ***Examining the Effectiveness of E-Learning: The Case of Ethiopian Airlines*** is my own original work and has not been submitted for any other award degree in any University. It is offered for the award of the degree of Master of Business Administration in Management from Addis Ababa University. Whenever other authors' works are used, they have been properly acknowledged.

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Statement of Certification

This is to certify that the thesis prepared by Kassie Yimam Fetene entitled: ***Examining the Effectiveness of E-Learning: The Case of Ethiopian Airlines*** and submitted in partial fulfillment of the requirements for the degree of Master of Business Administration Specialization in Management complies with the regulations of the university and meets the accepted standards with respect to originality and quality.

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List of Acronyms

AVE: Average Variance Extracted

CFA: Confirmatory Factor Analysis

D & M/D&M: DeLone and McLean

EASA: European Aviation Safety Agency

ECAA: Ethiopian Civil Aviation Authority

ECARAS: Ethiopian Civil Aviation Rules and Standards

E-learning: Electronic Learning

ET: Ethiopian Airlines

IATA: International Air Transport Association

IOSA: IATA Oversight Safety Audit

IS: Information System

ISRAPs: IOSA Standards and Recommended Practices

ISS: Information Systems Success

LMS: Learning Management System

PLS: Partial Least Square

ROI: Return on Investment

SEM: Structural Equation Modelling

SPSS: Statistical Package for Social Sciences

TAM: Technology Acceptance Model

Abstract

Organizations are investing a lot for the implementation of e-learning to train their staff effectively and efficiently. Ethiopian Airlines also implemented e-learning system back in 2011 to train its globally dispersed staff. However, there was no any system to measure the satisfaction and perceived learning of the e-learning participants.

This study investigated the key factors affecting the level of satisfaction and perceived learning of e-learning participants at Ethiopian Airlines. The study identified 8 key factors that determine the effectiveness of e-learning and formulated a model based on literature review. Structural Equation Modeling (SEM) was used to assess the validity and reliability of the measurement items and the interrelationships amongst the factors. A total of 1280 valid responses were received from e-learning participants who have completed at least one online course in the last two years from January 1, 2018 to December 31, 2020. These responses were used to examine the measurement and the structural model of the SEM. SMARTPLS 3.0 software was used as a main analysis tool for the structural equation modeling. The results indicated that all of the measurement items were valid and reliable to proceed with the investigation of the structural model. The study findings along with its model validation test results show that the model has a substantial predictive power to measure e-learning systems effectiveness. The study contributed to theory and practice by providing a valid and reliable model to measure the effectiveness of e-learning systems in businesses, educational institutions and other similar organizations.

Key words: e-learning effectiveness, key factors for e-learning effectiveness, e-learning success, online learning

1. Introduction

1.1. Background of the Study

The widespread explosion of internet technologies and applications provides incredible opportunities for the delivery of education and training to learners in a flexible way anywhere, anytime (Hassanzadeh, 2012; Lee-post, 2009; Lee, 2008; Wang, 2007; Lee, 2006). This makes e-learning an effective and flexible learning system. E-learning has been widely accepted as an innovative and promising solution by many companies to offer learning-on-demand opportunities to individual employees in order to reduce training time and cost (Bhuasiri, et al, 2012, p.1792; Ozkan & Koseler, 2009; Selim, 2007, p. 397; Rosenberg, 2001, p. 30). E-learning is a method of delivering instructional content supported with audio, animations and text via the internet through an online Learning Management System (LMS) (Lee, 2006, p.517; Lee-Post, 2009, p.61). E-learning uses network technologies to deliver and facilitate learning, anytime and anywhere (Liaw, 2008, p. 864).

Ethiopian Airlines implemented e-learning delivery back in 2011 to reap the benefits of e-learning and comply with stringent regulatory requirements as well as meet its strategic goals efficiently. The airline is adding more and more e-learning courses from year to year. Currently, it hosts more than 100 online courses on its online Learning Management System (EAA LMS, December 31, 2020). However, a very critical issue facing organizations is a high failure rate of e-learning projects which is attributed mainly to lack of evaluation (Alsabawy, 2013, pp. 8-10). Petersen (2007, p. 1) states that all e-learning systems shall incorporate some form of evaluation.

Though, Ethiopian Airlines has used e-learning for about a decade to train thousands of its staff dispersed across the globe, it doesn't have a researched e-learning effectiveness assessment model to identify the current level of learners' satisfaction and perceived learning. Furthermore, there is no research on what factors affect the effectiveness of e-learning and on what to concentrate its efforts to improve its e-learning programs.

The aim of this study is to bridge this gap by identifying the key factors affecting e-learning effectiveness and their interrelationships.

1.2. Statement of the Problem

A very critical issue facing organizations is a high failure rate of e-learning projects which is attributed mainly to lack of evaluation (Alsabawy, 2013, pp. 8-10). All e-learning systems shall incorporate some form of evaluation (2007, p. 1). According to Petersen, the ability of learning executives to understand how effectively their e-learning programs are contributing towards business goals is a necessary and critical activity (2007, p. iii).

Lim, et al (2007) states that organizations are making great efforts to properly adjust to the changing business environment to enhance their competitiveness (p.22). However, it is questionable whether training programs actually change employee behavior after implementation (Lim, et al, 2007, p.22). According to Lim, et al (2007, p.22), with the development of information technology and the Internet, many businesses are replacing traditional vocational trainings with e-learning to better manage their workforce.

Eom et al (2016) states that despite the potential promise of e-learning and its strategic importance, concerns regarding e-learning's effectiveness remain unanswered, and its acceptance is far from universal (p.186). Zhang and Nunamaker (2003, p. 214) states that for a company that provides online training to its employees, it is essential to measure effectiveness, competency, impacts on business objectives, and profits and ROI of e-learning. Dependable ways are required to measure the success and/or effectiveness of an e-learning system in order for e-learning applications to be used effectively in an organization (Wang, et al, 2007, p. 1793).

Ethiopian Airlines implemented e-learning back in 2011 to offer learning-on-demand to its employees to reduce training time and cost with the same notion expressed by Wang (2007, p.1792) and trained thousands of its staff using e-learning on its online learning management system. However, little is known whether the e-learning system is effective at Ethiopian Airlines. So far, little research has been carried out to find out an appropriate e-learning effectiveness assessment model that can be used to assess the level of learners' satisfaction and level of perceived learning. Besides, little is known on the factors affecting the effectiveness of e-learning at Ethiopian Airlines.

Therefore, it is clear that there are research gaps on the assessment of e-learning effectiveness, the different factors affecting e-learning effectiveness and their interrelationships at Ethiopian Airlines. Hence, it is important to investigate and determine an appropriate conceptual model for the examination of effectiveness of e-learning at Ethiopian Airlines. Besides, a detailed

analysis and exploration is required to identify critical factors affecting e-learning effectiveness and their interrelationships at Ethiopian Airlines.

The problems being addressed in this study are the development of e-learning effectiveness assessment model, identifying the key e-learning effectiveness factors, finding out their interrelationships and the current state of e-learners' satisfaction and perceived learning, all of which don't currently exist in the context of Ethiopian Airlines.

1.3. Research Questions

The purposes of this research are to determine an appropriate conceptual model for the measurement of effectiveness of e-learning and essential dimensions of e-learning effectiveness.

The main research questions are:

i. What are the key factors that determine satisfaction and perceived learning of e-learning participants at Ethiopian Airlines?

ii. How do the key factors affecting the e-learners' satisfaction and level of perceived learning relate to each other in the case of Ethiopian Airlines?

1.4. Objectives of the Study

1.4.1. Main Objective

The main objective of this research is to develop an appropriate conceptual model for the measurement of e-learning effectiveness in the context of Ethiopian Airlines and examine the effectiveness of e-learning at Ethiopian Airlines. The research will also investigate the factors affecting the effectiveness of e-learning at Ethiopian Airlines.

1.4.2. Specific Objectives

The specific objectives of this paper are to:

i. identify the key factors that determine satisfaction and perceived learning of e-learning participants at Ethiopian Airlines

ii. determine the interrelationships amongst the key factors which affect e-learning satisfaction and level of perceived learning at Ethiopian Airlines

1.5. Significance of the Study

In search of better, more cost-effective ways to deliver instruction and training, universities and corporations have expanded their use of e-learning (Smart & Cappel, 2006, p. 201). Competition and financial challenges forced several airlines to minimize training costs (de Brito Neto, 2014). According to de Brito Neto (2014), e-learning is one of the most cost-effective training methodologies preferred by most airlines. However, there is a serious lack of research made on the effectiveness of e-learning in the context of airlines (Welsh, 2003).

Training represents expensive investment organizations make in their human resources and, therefore, it is important that organizations evaluate the effectiveness of their training efforts (Mathieu, et al, 1992, p.828). Hence, this study is significant in that it attempts to examine the effectiveness of e-learning at Ethiopian Airlines. Besides, the study identified the key factors which affect e-learning effectiveness at Ethiopian Airlines and other similar organizations to make appropriate decisions and improvement measures. Based on the findings of this research, recommendations are provided to top management and training managers of the airline to help them gain greater understanding and insight about its current situation and where to focus the most attention to improve the e-learning system. Recommendations have also been provided to the airline as what actions to take to improve the effectiveness of its e-learning system based on the findings of this study. The study is also significant for Ethiopian Airlines as it developed an e-learning effectiveness assessment model that will be used to evaluate the effectiveness of their e-learning system from time to time.

The study may also be useful to similar organizations that are using e-learning systems to train their employees and they are seeking to assess the effectiveness of their e-learning programs.

1.6. Scope of the study

The scope of this study is the e-learning system of Ethiopian Airlines only. Furthermore, though there are over 20,000 e-learning participants as at December 31, 2020, only those who completed at least one e-learning course in the last two years are considered as a target population for this study as they are believed to have fresh memory to respond to the questionnaire (self-assumption). Besides, the study is limited to the effectiveness of the e-learning system on a specific learning management system (LMS) called MOODLE, which is used by Ethiopian Airlines. No other organizations or other types of LMS are included in this research though the finding of the research can also be useful for other similar organizations and other types of LMS.

Besides a specific learning management system, this study assesses the effectiveness of e-learning from the learners' perspective only. Other stakeholders of the e-learning system such as instructors, e-learning courseware developers, e-learning support staff, supervisors of learners and management are not included in this study.

1.7. Limitations of the study

This paper consulted different e-learning effectiveness assessment models and developed an assessment model suitable to answer the research questions. However, the developed model is not free from limitations. The following are some of the limitations of this research paper which require further future studies.

1. Empirical research on the effectiveness of e-learning in an airline context is limited not only in Ethiopia but also globally. This has put challenge in proceeding with this research. This study assesses the effectiveness of e-learning by considering studies made on other industries and educational institutions in other countries and in Ethiopia.
2. Ethiopian Airlines uses a customized version of MOODLE Learning Management System (LMS). Hence, this paper is based on only a single type of learning management system. Therefore, it is difficult to generalize its findings. Further studies on users of other types of LMS might be another area of research to find out the validity and reliability of the measurement model across different LMS/e-learning platforms.
3. This study assessed e-learning effectiveness only from the perspectives of learners' satisfaction and perceived learning. However, Kirkpatrick (2006, p.21) in his training evaluation model states that there are four levels of training evaluation: reaction, learning, behavior and results. Philips (2005) added a fifth level which he termed it as Return on Investment (ROI). Learners' satisfaction and perceived learning correspond to the first two levels of Kirkpatrick's training evaluation model. That is, another limitation of this paper is that it did not consider higher levels of training evaluations of the e-learning systems in terms of final business results for the organization like whether learners consistently applied what they learnt on the e-learning system back on the job and whether there is an organizational impact like increase in profits, better customer satisfaction, reduced turnaround time, increased productivity, etc. due to the online training. Therefore, this study can serve as a base for further studies into higher levels of training evaluation.

4. This study examined the effectiveness of e-learning only from the learners' perspective. Further study with the inclusion of all e-learning stakeholders may be necessary to find out a complete picture of e-learning effectiveness from the perspective of all stakeholders at Ethiopian Airlines

1.8. Operational Definitions of Key Terms

- **E-learning**: In this paper, e-learning is defined as a means of delivering interactive instructional content supported with audio, animations and text through an online Learning Management System (LMS).
- **E-learning Forms**: Though e-learning could include delivery of courses through different electronic media like CD ROM, hard Disk, memory sticks, etc., in this study e-learning refers to the delivery/learning of training content to learners in asynchronous form to learners using a Learning Management System (LMS) via the internet or intranet.
- **Asynchronous e-learning System:** It refers to self-paced training that allows learners to complete the training at a time convenient for them, any time anywhere without real time communications amongst students and with the instructor.
- **Perceived Learning:** It is the extent to which learners perceive the gains in knowledge, attitude and skill from taking the e-learning course (Chu, 2010, p. 148)

In this paper, e-learning, online learning, e-training, web-based learning and web-based training are used interchangeably. They all mean delivery of instructional content to learners through an online Learning Management System over the internet or local area network/intranet.

1.9. Organization of the Thesis

This research paper has 5 chapters.

Chapter 1: This chapter introduces the thesis as a whole. The first chapter contains the introduction part including the background, research problem, objectives, scope, significance of the study, limitations of the study and operational definitions of key terms

Chapter 2: This chapter reviewed prior literature and it looked into the details of overview of e-learning, IS success models and e-learning Success models. The major IS success models

and the Technology Acceptance models are described. Furthermore, different e-learning success models are explored.

Chapter 3: This chapter described the research methodology

Chapter 4: This chapter presents the results of the data analysis and interpretation.

Chapter 5: This chapter presents the conclusions and recommendations.

The following diagram portrays the structure of this paper.

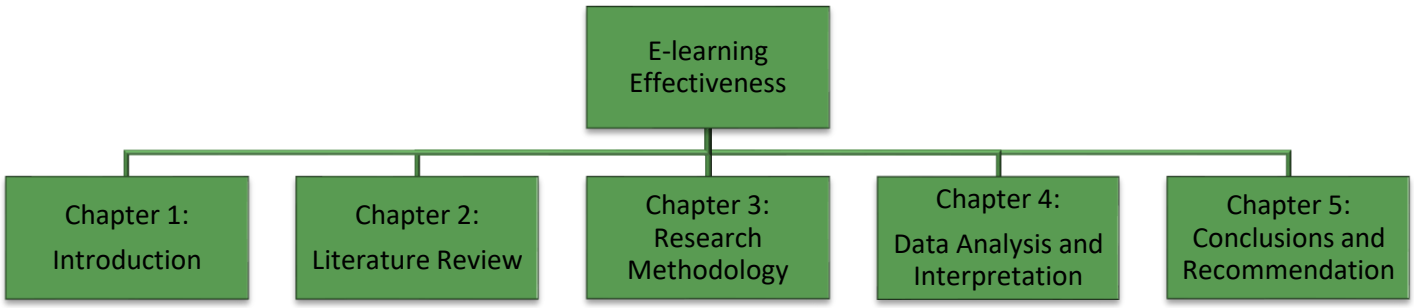

Figure 1. 1: Organization of the Thesis

2. Literature Review

2.1. Introduction

In this chapter, the researcher first examined the definition of e-learning and its benefits to individuals and organizations. The next step is review of the general theoretical literature of IS success models and later to e-learning effectiveness models. Finally, a model used for the measurement of e-learning effectiveness at Ethiopian Airlines was presented. This model was constructed based on the review of the available literature and by including the gaps identified.

2.2. Overview of e-Learning

There are different terms used interchangeably with e-learning, such as web-based learning, online learning, distributed learning, computer-assisted instruction, or internet-based learning (Ruiz, et al, 2006, p. 207). According to Lee (2006), there are differences in the definitions of e-learning amongst different researchers, though there are enormous similarities. Lee (2006, p. 517) defines e-learning as "a method of learning which uses electronic instructional content delivered via the internet and is a term which is synonymous with Web-based or online learning". According to Lee (2006), knowledge acquisition has become the critical means for gaining competitive advantage, and as such learning has become a crucial element of knowledge attainment, application and formation in this age of globalization. The widespread explosion of internet technologies and applications provides incredible opportunities for the delivery of education and training in a portable and flexible way for learners to gain essential knowledge (Lee, 2006, p.517). Learners with access to an online learning management system can interact with instructional materials in various formats such as videos, pictures, texts, audio and so on anytime, anywhere.

Lee-post (2009) defined e-learning in a similar way. According to Lee-Post (2009, p. 61), e-learning is the process of outspreading learning or distributing instructional materials to remote sites via the Internet, intranet/extranet (LAN/WAN), audio, video, satellite broadcast, interactive TV, etc. But, with the development of internet, concept of e-learning has moved to delivery of courses online via the internet (Hassanzadeh, 2012). Chen (2008) provided a narrower definition of e-learning as a process of joining technology with learning, delivered using telecommunication and information technologies, and a type of training delivered on different devices such as tablets, smartphones, computers and other strategies supporting individual learning and organizational goals. Similarly, Wang et al. (2007) and Lee & Lee

(2008) state that an e-learning system is a type of IS based on internet technology that provides training of the learner in an autonomous and flexible way. This technology-based system also called Learning Management System serves as a platform to facilitate teaching and learning (Hassanzadeh et al., 2012). According to Chen (2012), e-learners access the online learning management system via internet or intranet gateways to get skills, knowledge and information. E-learners can autonomously read materials posted on the internet and then administer test for the acquired knowledge. All these flexibilities combined makes the online learning system an effective learning setting (Wang, 2005). Wang et al. (2005) claim that e-learning has been widely implemented as a promising solution by many companies to offer on demand learning opportunities to employees and students in order to reduce training time and cost (p.1792).

According to Bhuasiri, et al (2012, p.843) e-learning is an advanced delivery method to training and education via electronic forms of information that increases the user's knowledge, skills, or other performance". Arbaugh (2002) defined e-learning as the use of the internet or intranet by learners to acquire specific content. Other researchers define e-learning as using modern Information and Communications Technology (ICT) and computers to deliver instruction, information, and learning content (Selim, 2007, p. 397). The different stakeholders of e-learning are technical staff, learners, instructors, administrative and employers (Ozkan & Koseler, 2009).

According to Ozkan et al (2009), e-learning is becoming the new paradigm in training and education because of its reduction of costs, convenience and flexibility. Rosenberg (2001, p. 30) further supported the importance of e-learning for its cost effectiveness, availability anytime and anywhere, building communities, and providing valuable customer service.

Based on review of the existing definitions, this research defines e-learning as a means of delivering interactive instructional content supported with audio, animations and text through an online Learning Management System (LMS) called Moodle. Moodle (Modular Object Oriented Dynamic Learning Environment) is an open source LMS. At Ethiopian Airlines, the Moodle LMS has been customized to meet its brand and training requirements. The LMS is hosted at its own server with an automatic backup of the activities of trainees and training records.

The LMS is accessed over the internet and employees located within the headquarters can access the LMS via the Local Area Network (LAN) also referred to as intranet. Ong & et al (2004) stated that there is a need to implement electronic learning (e-learning) systems to train

people in new technologies, products, and services with the rapid change in all types of working environment. According to Ong & et al (2004), the shift from a product-based to a knowledge-based economy has resulted in an increased demand for knowledge workers who with higher order thinking and reasoning to solve complex problems in the work place. This requires organizations to educate and train anyone, anytime and from anywhere (ong, et al, 2004, p. 795).

Chen (2008) describes that e-learning can be fully online, blended/hybrid, synchronous or asynchronous. A synchronous method means that teaching is delivered in real-time, where students receive information simultaneously and can communicate directly with other students and the instructor (Chen, 2008, P.47; Carswell, 2002, p. 477). Synchronous training refers to training in which the learners complete online training simultaneously from various locations (Carswell, 2002, p. 477). According to Carswell, synchronous distance education consists of real-time interaction between student and teacher, although they could be in different places and they use different technological tools as a means of communication such as videoconferencing, teleconferencing and Internet chat rooms.

On the other hand, asynchronous refers to self-paced training that allows learners to complete the training at a time convenient for them, any time anywhere without real time interactions amongst themselves and the instructor (Carswell, 2002, p. 477). Carswell (2002) elaborates asynchronous distance education as an alternative model of learning where student and teacher are not located in the same classroom at the same time.

Asynchronous teaching and learning can be achieved by students self-learning and taking responsibility to read and obtain information through the e-learning platform (Ruiz et al. 2006). Materials may be provided asynchronously so that students access the website of their e-learning course and hear lectures or complete assignments according to their own timetable.

Ong (2003) elaborates that asynchronous e-learning breaks the limitations of time and space and also creates many benefits, including reduced cost, regulatory compliance, meeting business needs, retraining of employees, low recurring cost, and customer support (p. 795)

The asynchronous e-learning delivery method is implemented at Ethiopian Airlines in which learners can access the online courses, for which they have been enrolled, anytime anywhere by logging into the Moodle Learning Management system using their login credentials given to them via e-mails.

2.3. Benefits of E-Learning

E-learning has several advantages over classroom training including content consistency, cost-efficiency, increased convenience, location and time flexibility, self-pacing, high interactivity, automated feedback, on-demand availability, and automatic tracking of learner progress (de Brito Neto, 2014, p. 1062; Buasiri, 2012, p. 843; Ruiz, Mintzer, & Leipzig, 2006, p. 209; Zhang, Zhao, Zhou, & Nunamaker, 2004, p.76; Hagos, et al, 2016, p.1). E-learning reduces cost of classrooms and facilities, , printed materials cost, training cost, labor cost, travel cost and information overload (Ruiz et al., 2006, p.209; Zhang & Nunamaker, 2003, p.76).

Chen (2008, p. 49) states that there are many benefits of e-learning such as the ability to learn from the employees' desktop or the convenience to learn from home. According to Chen (2008), life-long learning can be done while having both a career and a family using e-learning. In other words, the benefits of e-learning include avoiding interactions between instructors and learners, or amongst learners, from geographic and temporal limitations through the asynchronous learning network model (Sun et al, 2007). Besides, it allows organizations to have greater employee satisfaction, globally trained staff, and cost savings all while creating a competitive advantage.

In addition, the following are some of the advantages of e-learning described in different literatures.

Travel Savings: Many companies are now widespread or even global. Flying employees to a training center or a university to take a course or class for a week or even a few days can be very costly (Chen, 2008). Another circumstance that could occur would be to fly the instructor to each location to give the training which can cost the organization unnecessary funds in both the instructors travel costs as well as their labor cost and personal time (Chen, 2008). According to Chen (2008) a study conducted at BAE systems demonstrated that e-learning helped them save travel and instructor costs as the learners learnt by themselves at their own desktops without the need for an instructor.

Globalization: E-learning has the distinct advantage to allow companies to raise their employees' level of knowledge without requiring them to travel to seminars or fit college-level course into their off hours (Allen, 2008). This allows for companies to continue to be spread across continents and even be global while training employees on the same strategies and business goals throughout the company (Chen, 2008, p.50).

Improved Value Chain Activities: It is important that companies can create added value to sustain their business and stay competitive. E-learning can support competitiveness of companies as it can provide training services for various activities in the organization, such as in the production or service arenas. Chen (2008) states that an empirical study on two US forms showed a positive result on creating an improved value chain to create competitive advantage through organizational learning linked to customer services.

Return on investment: other than cost savings and the above-mentioned benefits, e-learning has several illicit advantages which often are difficult to calculate such as travel time, instructor time, easily updatable content, permanent availability of material for ease of reference, employee satisfaction due to higher learning outcomes, maximizing current investments on internet and intranet infrastructures, etc. (Chen, 2008, p. 51).

2.4. IS Success Measurement Models

E-learning system is a special type of IS (Wang, et al, 2007, p. 1794). Hence, the researcher first investigated the different approaches of measuring IS success and proceeded to the different models adapted to measure e-learning effectiveness/success.

Al-Sabawy (2013, p. 73) states that success of information systems is the central issue in the information systems field. According to Al-Sabawy (2003, p.74), the four approaches of IS success measurement models are: The Technology Acceptance Model (TAM); user satisfaction approach; user involvement approach; and DeLone and McLean approach. Each of them are discussed briefly here.

2.4.1. Technology Acceptance Model (TAM)

Fred Davis developed the Technology Acceptance Model (TAM) in 1985 based on the Theory of Reasoned Action (TRA) developed by Ajzen and Fishbein (1969) (Davis, 1985). The model was developed to forecast and describe the factors that determine the user acceptance of computers (Davis, 1989, p.319). According to Davis, perceived ease of use and perceived usefulness are the two fundamental factors of system use. He further explained that people incline to use or not use an application to the level they believe it will help them do their job better, which he referred to this as perceived usefulness. Davis (1989, p. 320) elaborated that potential users may believe that the system is too hard to use even if that given application is useful. Learners may continue to use the system if the performance benefits of usage are outweighed by the effort of using the application. That is, besides usefulness, usage is

conceived to be influenced by perceived ease of use. An application believed to be easier to use than another is more likely to be accepted by users, all other things being equal (Davis, 1989, p. 320).

Figure 2.1 below depicts the Technology Acceptance Model (TAM) as depicted by Davis (1996, p. 20).

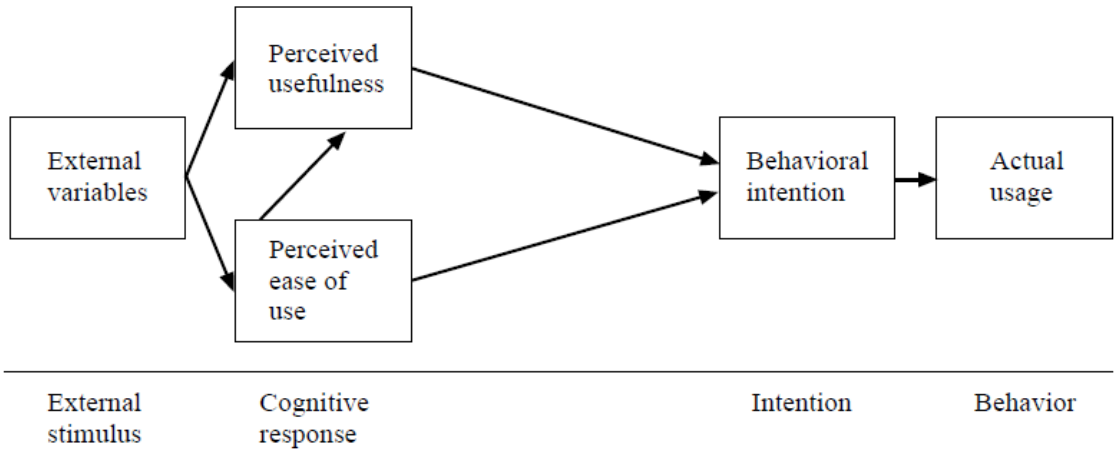

Figure 2. 1: Technology Acceptance Model (TAM)

Source: (Davis, et al, 1996, p. 20)

Numerous researches have been conducted to examine the reliability and validity of TAM. The validity of perceived usefulness and ease of use was tested by Davis (1989). The empirical test conducted by Davis (1989) concluded that the reliability of usefulness and ease of use measurement items were extremely high (Cronbach's alpha .98 and .94 respectively) (p.331). According to this study, both constructs are significantly correlated with usage behavior. Davis et al. (1989) made another study to compare TAM and TRA. The main purpose of this comparison was to assess the ability of each model in forecasting and explaining the use of a specific system. Davis (1989) collected data at two points in time: the first after one hour of using the system and the second after 14 weeks. Regarding TAM, the empirical study from the first period disclosed that both perceived usefulness and ease of use affected behavioral intention. The effect of perceived usefulness was the strongest. According to data analysis from second period, perceived usefulness was the main determinant of behavioral intention. However, ease of use had an indirect effect on intention through usefulness and the direct effect was non-significant (Davis, 1989).

Adams et al. (1992) replicated previous studies conducted by Davis (1989) and Davis et al. (1989) with a focus on three constructs of TAM: perceived usefulness, ease of use and IT usage.

Two empirical studies were conducted by Adams et al. (1992), the first of which dealt with voice and electronic mail and the second one included WordPerfect, Lotus 1-2-3, and Harvard Graphics. The results from the first study confirmed the convergent validity and discriminate validity of both scales (perceived usefulness and ease of use). The results of the second study highlighted that perceived usefulness is a fundamental determinant of system usage. The analysis confirmed that usefulness and ease of use were central indicators of system usage.

Hendrickson et al. (1993, p.228) criticized that "The test-retest reliability of the scales was not reported'. Thus, test-retest reliability was conducted based on the data collected from two samples of 51 students using a spreadsheet package and of 72 students using a database management package. This study found that Davis's (1989) scales have a high level of test-retest reliability.

The data of Adams et al.'s (1992) study was reused and tested using the Confirmatory Factor Analysis (CFA) approach by Segars and Grover (1993). The result of CFA showed that the model with two factors is not sufficient to explain the relationship between 'job performance and effectiveness'. Accordingly, a new factor, 'effectiveness' has been added to the model. Two indicators were eliminated due to low reliability: work more quickly, and clarity and understandability. Based on the results above, the study suggested the Three-factor model that includes usefulness (make job easier, useful and increase productivity); effectiveness (effectiveness and job performance); and ease of use (easy to use, easy to learn and easy to become skillful).

Chin and Todd (1995) criticized these results. These criticisms focused on two issues. The first issue is related to exploratory procedures in the conduct of the study. The second issue is that the substantive reasoning to generate effectiveness as a new construct from usefulness is absent. Adams et al.'s (1992) data were used in this study, as well as data collected from a single organization using voice mail. The empirical study found that the instrument of usefulness has reasonable psychometric aspects. In addition, there is no empirical evidence to support the separation of perceived usefulness into two factors.

Taylor and Todd (1995) pointed out two important issues related to empirical tests of TAM. The first issue is related to the ability of TAM to predict the behavior of inexperienced users. The second and important issue is 'Whether the determinants of IT usage are the same for experienced and inexperienced users of a system' (Taylor & Todd, 1995, p. 561). An empirical investigation has been conducted to address the two issues mentioned above. The data were

collected from 430 experienced and 356 inexperienced users of an information resources center. Two constructs added to TAM in this study were social influence and behavioral control. The empirical study found that the extended TAM is an adequate model to predict information technology usage for both types of users: experienced and inexperienced.

Szajna (1996) employed self-report usage as an objective indicator of technology acceptance. An empirical longitudinal study was conducted on users of an electronic mail system in two periods: pre-implementation (intention to use the system) and post-implementation (usage of a system 15 weeks later). The study confirmed that TAM is a worthy tool to explain the behavioral intention to use information systems. Another finding is that self-reporting may not be a suitable indicator for actual system use. Ongoing testing and developing of TAM by researchers in the information system field has continued. Taylor and Todd (1995) tested three models to identify the best model to understand information technology usage: TAM, Theory of Planned Behavior (TPB) and a third model generated by decomposing the belief structure in the TPB. The findings of empirical examination confirmed that the ability of three models in explaining behavior were roughly alike. Dishaw and Strong (1999) extended TAM through adding Task-Technology Fit (TTF) model. The empirical test was conducted on three models: TAM, TTF and the integrated model. This study found that the explanation provided by the integrated model is superior to the explanation offered by the other two models (TAM, TTF).

Many studies tested the validity and reliability of TAM with a wide range of systems and extended it through adding various constructs from different theories. An important contribution to extend TAM was introduced by Venkatesh and Davis (2000) and they called it TAM2.

Social influence processes such as subjective norm, voluntariness and image and cognitive instrumental processes such as job relevance, output quality, result demonstrability and perceived ease of use are included in TAM2.

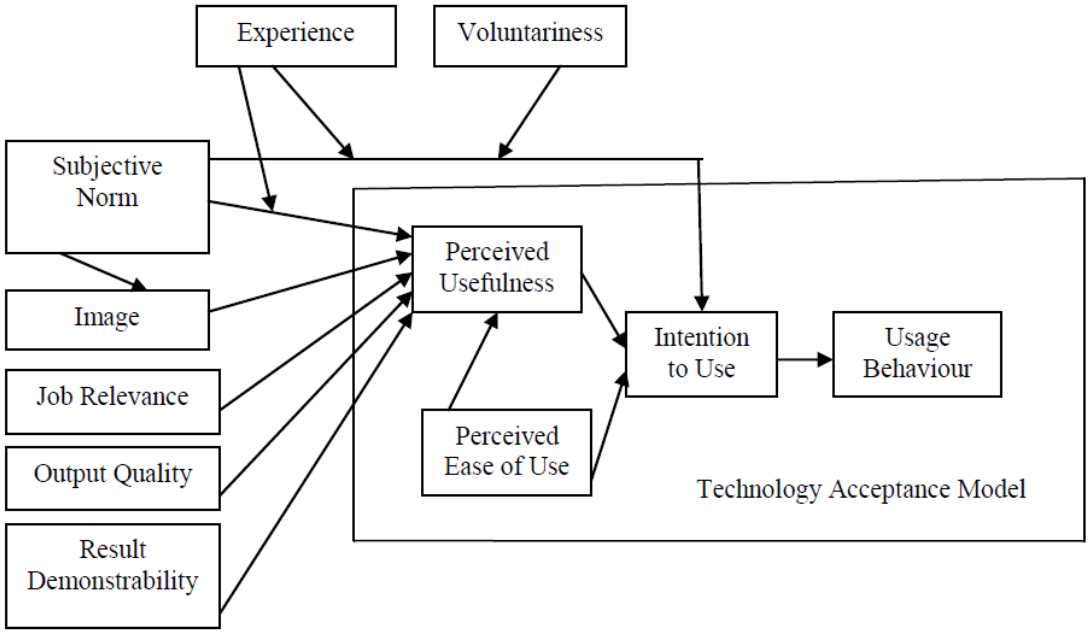

Figure 2. 2: Technology Acceptance Model (TAM2)

(Source: Venkatesh & Davis (2000))

2.4.2. User Satisfaction Approach

Sedera & Tan (2005) considered user satisfaction one of the most important factors in assessing success of information systems. User satisfaction received substantial consideration as a measure of IS success, since the 1980s. The earliest researchers who used user satisfaction to measure ISS are believed to be Bailey and Pearson (1983). "If a formal information system exists, its success at meeting those needs either reinforces or frustrates the user's sense of satisfaction with that source" (Bailey and Pearson, 1983, p. 530).

User satisfaction is used as an essential construct in the models that deal with the issue of ISS. This approach has received significant support for measurement of information success by researchers in the information system discipline such as Doll and Torkzadeh (1988), Melone (1990), Gelderman (1998) and Wang and Liao (2007).

2.4.3. User Involvement Approach

User involvement is thought to be a vital factor in the information systems literature (Doll & Torkzadeh, 1989). Thus, substantial efforts have been exerted to explore the impacts of this factor. The importance of this factor appears in the organizational and users' activities. In this regard, Robey and Farrow state that 'expected benefits include:

- More accurate assessment of user information requirements
- Prevention of costly system features that are unacceptable to user
- Greater user acceptance and support of the system
- Improve user understanding of the system, and
- Granting of democratic rights of organization members' (1982, p. 73).

User involvement is believed to improve the quality of decision making, develop the skills of users, improve the abilities of users to identify the required information and increase user acceptance of the systems and users' commitment to the resultant application (Doll & Torkzadeh, 1989).

Most researches have focused on the main issue of the role of user involvement in the success of information systems. Significant attention has been paid to this issue and the research can be divided into three directions: user involvement in ISS; user involvement in information systems development; and user involvement in the electronic applications of information systems.

2.4.4. DeLone and McLean Approach

Information Systems success is the level to which a system attains the goals for which it was designed (DeLone & McLean, 1992). DeLone &McLean presented their initial IS Success Model as a framework and model for measuring IS success in 1992. This model is the most widely used and cited model since its inception in 1992 (Wang et al, 2007; Al-Sabawy, et al, 2013, p. 92). According to D&M (1992), this model was based on a review of 180 articles. The model classified the outcomes within six dimensions of information system success: system quality, information quality, use, user satisfaction, individual impact and organizational impact (DeLone & McLean, 1992; Wang et al, 2007; Holaspple, 2006; Dorobat, 2014). As DeLone and McLean (1992) recommended, these six dimensions of ISS are interrelated rather than independent. System quality and information quality separately and jointly affect both use and user satisfaction (Wang, 2007). DeLone & McLean (1992) clearly described that the amount of use can influence the degree of user satisfaction. Use and user satisfaction are determining factors for individual impact; and lastly, individual impact on performance will have an impact on the organization (DeLone & McLean, 1992).

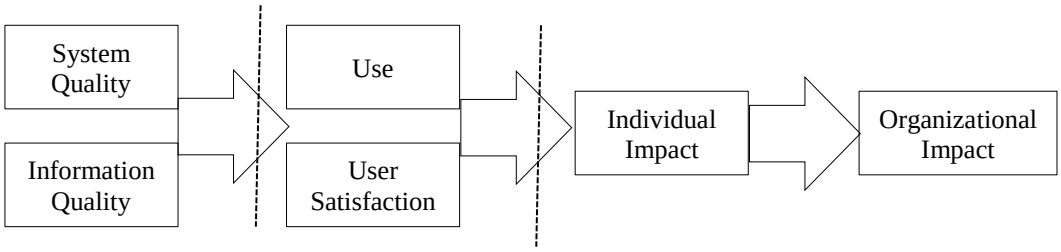

Figure 2. 3: DeLone and McLean IS Success Model (1992)

Source: DeLone and McLean IS Success Model (1992, p.87)

The D&M (1992) model is deemed to be a holistic model as it does not depend on a single construct; it is an effort to create an integrated framework to measure ISS (Al-Sabawy, 2013, p.93).

Several researches have been conducted to test the validity of the D&M (1992) model. Seddon and Kiew (1996) studied the relationships among the four constructs of DeLone and McLean's model: system quality, information quality, usefulness and user satisfaction. As explained by Seddon and Kiew (1996, p. 91), the three differences between DeLone and McLean's model and the model tested by Seddon and Kiew are:

1. The use construct in DeLone and McLean's model has been replaced by usefulness.
2. A new variable, system importance, has been added to the DeLone and McLean model to help explain variations in user perceptions of usefulness and user satisfaction.
3. The simultaneous causality between Use and User satisfaction in DeLone and McLean's model has been replaced by one-way causality (1996, p. 91).

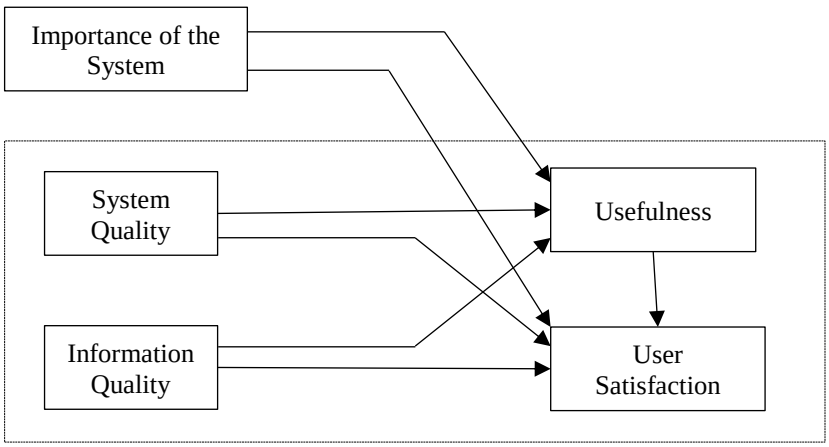

Figure 2. 4: Seddon & Kiew's Tested Model of User Satisfaction

Source: Seddon & Kiew (1996, p. 92)

The empirical test conducted by Seddon and Kiew (1996) provided considerable support for the DeLone and McLean model. Information quality, system quality and usefulness explained 75% of the variance in the overall user satisfaction (Seddon & Kiew, 1996, p. 90).

Seddon (1997) formulated and validated his own model which is a slightly extended version of DeLone and McLean's (1992) model. In Seddon's ISS model (1997), user satisfaction is an

endogenous variable which was dependent upon six the exogenous variables such as System Quality, Information Quality, Perceived Usefulness, Net Benefits to Individuals, Net Benefits to Organizations, and Net Benefits to Society. According to Seddon (1997), Perceived Usefulness was another endogenous variable which was proposed to depend upon the same six variables, excluding itself. Additionally, it was proposed that Perceived Usefulness and User Satisfaction are positively related in such a way that the higher the perceived usefulness the higher the user satisfaction (Seddon, 1997). Seddon (1997) went on further to replace D&M's (1992) IS Use with Perceived Usefulness claiming that IS Use is a behavior, not a measure for success. Both DeLone and McLean's (1992) and Seddon's (1997) models of IS success were empirically and theoretically tested by Rai et al. (2002); and they found out that both models exhibit reasonable fit with the collected data.

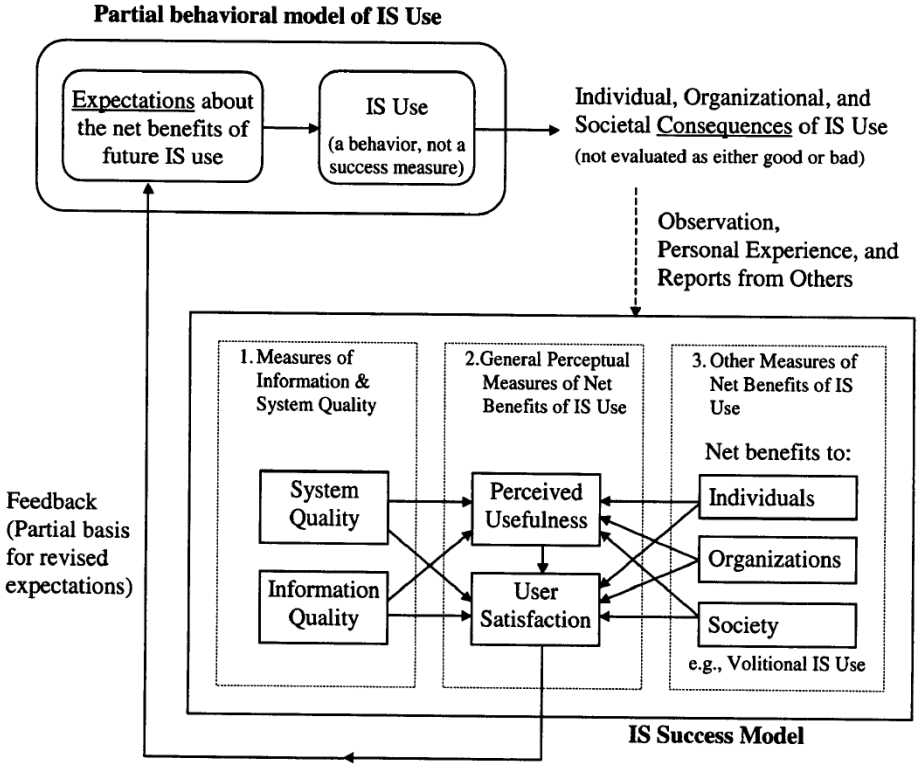

Figure 2. 5: Respecified Version of DeLone and McLean's (1992) IS Success Model

Source: Seddon & Kiew (1997, p. 245)

DeLone and McLean proposed an updated IS success model in 2003 and appraised its usefulness considering the dramatic changes in IS practice, especially the emergence and consequent exponential growth of Internet-based applications. DeLone and McLean (2003) presented this updated ISS model by adding a third quality dimension, which they termed it as "Service Quality" that they proposed to measure a new dimension of the IS success model.

D&M (2003) regrouped “individual impact” and “organizational impact” into a single impact or benefit category, which they coined it as “net benefit’’. According to D&M (2003), the six dimensions of the updated DeLone and McLean IS Success model are: System Quality, Information Quality, Service Quality, Intention to use, actual use, learner satisfaction and net benefits ((DeLone & McLean, 2003; Wang et al., 2007; Wu & Wang, 2006). The revised D&M model (2003) is one of the most widely used models of ISS and has been used for various information systems (Hassanzadeh, 2012, p. 10960).

According to DeLone & McLean (2003), “systems quality” is a measure of technical success; “information quality”, however, measures semantic success; and “use, user satisfaction, individual impacts,” and “organizational impacts” together measure effectiveness or success (p. 10).

In the updated D&M IS Success Model (see figure 2.6), system quality, information quality and service quality are key factors for user satisfaction and behavioral intention to use IS. User satisfaction and behavioral intention to use, in turn, affect net benefits. In other words, system quality, information quality and service quality became the key independent variables whilst usage and user satisfaction were treated as intermediate variables and net benefits was the final endogenous or dependent variable (Sandjojo, 2015, p.2). In this model, the net benefits variable is the most important one as signifies different outcome depending on the research context.

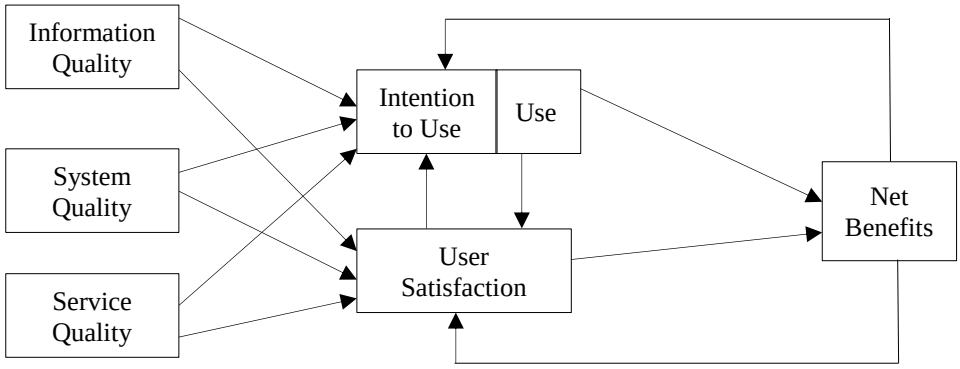

Figure 2. 6: Updated DeLone and McLean IS Success Model (2003)

Source: The DeLone and McLean Model of IS Success: A Ten-Year Update (2003, p.24)

Many efforts have been exerted to test the validity of the updated D&M (2003) model. Bernroider (2008) tested the validity and relationships among four constructs of this model. The four constructs tested by Bernroider (2008) were information quality, system quality,

service quality and net benefits. The test results of Bernroider (2008) confirmed the validity of those four constructs in measuring information systems success in the context of ERP systems.

A test was conducted by Gorla et al. (2010) to measure the impact of system quality, information quality and service quality on organizational performance. The empirical result showed that 29 percent of the variance in organizational impact (R^2=0.29) is explained by system quality, information quality and service quality together; in addition, 49% of the variance of information quality is explained by system quality (Gorla, 2010, p.219).

Wang and Liao (2008) also tested the model in the context of e-government by and the results supported the relationships among six constructs of model, except the relationship between system quality and use was insignificant at 5% confidence level.

The updated DeLone and McLean model (2003) is no longer restricted to traditional systems but extended to include other electronic applications such as e-commerce, e-banking, e-learning, and e-health (Al-Sawaby, 2013, p. 97). Several studies have adopted the DeLone and McLean model to measure the success of these systems. Some studies considered updated DeLone and McLean's model as the main basis to extend and modify to establish new models by adding new constructs and re-specifying existing constructs for assessing information system success (eg. Wang, 2007; Lin, 2007; Wang & Liawo, 2007 & 2008; Gorla et al, 2010; Bernroider, 2008; Sedera & Gable, 2003 & 2004; Sandjojo, et al, 2015; Hassanzadeh, 2012; Holsapple & Lee-post, 2006).

Hence, the DeLone and McLean is the most popular IS success model applied in different IT related fields by several researchers.

2.5. E-Learning Effectiveness Measurement Models

Over 200 journal articles, theses and seminar presentations have been reviewed by the researcher to well understand the available e-learning success models and identify the gap in the existing models.

Before discussing on e-learning success models, let's see what constitutes success in e-learning. Samarasinghe (2012, p.5,) states that the overall e-learning effectiveness consists several constructs such as learner satisfaction, level of perceived or actual learning, quality of the e-learning system, quality of the e-learning content, all reflecting different facets of e-learning systems effectiveness or success.

According to Welsh, et al (2003, p.250), e-learning effectiveness deals with whether adults learn from classes delivered via technology, whether everyone learns equally, if e-learning can be equally effective for all courses and at least whether e-learning is as good as classroom training.

There are several e-learning success measurement models developed by different researchers. According to U. Marjanovic, et al (2015), the major and widely accepted e-learning success models are the IS Success Model by DeLone McLean (1992, 2003), the Technology Acceptance Model (TAM) by Davis (1989) and extended to TAM2 by Venkatesh and Davis (2000) and extensions of either of them by different researchers. The DeLone and McLean (1992) model is one of the most widely used IS success models (Gable, Sedera, & Chan, 2003; Myers, Kappelman, & Prybutok, 1997; Heo & Han, 2003), suggesting that a systematic combination of individual measures from IS success categories can create a comprehensive measurement instrument.

As e-learning is one form of IS, most researchers use one IS success model as a basis to develop their own e-learning success models (Wang, 2007; Hagos, 2016; Alsabawy, 2013)

The most common IS success model is the DeLone and McLean IS Success Model (1992 & 2003) and the Technology Acceptance model (TAM) by Davis (1986). Generally, the e-learning success measurement approaches are classified into four in just the same way as the IS Success models (Al-Sabawy, 2013, p. 100). The four e-learning success measurement approaches are: The Technology Acceptance Model (TAM); User Satisfaction Approach; E-learning quality approach; and the DeLone and McLean approach. Let's see prior studies of e-learning success based on these approaches.

2.5.1. Technology Acceptance Model (TAM) Approach

In the context of e-learning systems, there are some models designed to investigate factors that are considered to be causes affecting the usage and intention to use e-learning systems. The studies that adopted TAM in the e-learning systems field have changed some constructs of this model and extended the model.

Ong et al tested the Technology Acceptance model and added a new construct, which they termed it as "perceived credibility", to examine the applicability of the technology acceptance model (TAM) in explaining the decision of engineers to accept or reject e-learning (2004, p. 795). The results of their research confirmed that the extended TAM is strongly supported in predicting the intention of engineers to use e-learning.

Lee (2006) adopted an extension of the TAM to find out the factors influencing the adoption of an e-learning system. The results of the study confirmed the original TAM findings (Lee, 2006, p. 517). According to this study, computer self-efficacy demonstrated significant influence on perceived ease of use.

As can be seen from the above examples, TAM has been used commonly in the e-learning systems field. Many studies adopted and extended TAM. The main purpose of these extensions is to include a wide range of factors that may affect the acceptance of e-learning systems and to discover the role of these factors in acceptance (Al-Sabawy, 2013, p. 105). Different studies offered evidence about the significant effect of some factors in the acceptance of e-learning systems, for instance, self-efficacy as in the case of Lee (2006). However, there are some factors that need more study to identify their role in the acceptance of e-learning, for example, habit and perceived resources (Al-Sabawy, 2013, p. 105).

2.5.2. User Satisfaction Approach

Several researchers have considered user satisfaction as a measure to assess e-learning systems effectiveness. Sun et al. (2008) found six critical factors that drive successful e-learning: learner, instructor, course, technology, design and environmental. Based on the organizational perspective, Naveh et al. (2010) investigated students' use and satisfaction on learning management systems (LMS). According to Naveh et al. (2010), the three organizational variables which lead to student use and satisfaction on LMS are role definition, commitment to hierarchical degree structures and accreditation processes (2010, p. 128).

2.5.3. E-Learning Quality Approach

The exponential development of the internet helped business organizations, training and educational institutions to deliver training and educational services online using varieties of multimedia (Al-Sabawy, 2013). Despite the widespread adoption of e-learning systems and the significant growth in use, the quality of e-learning remains the main challenge facing the use and adoption of e-learning systems (Al-Sabawy, 2013, p. 106).

2.5.4. The DeLone and McLean Approach

The D&M model is deemed to be one of the most common frameworks used to assess information systems success. Use of this model is not restricted merely to assessing traditional information systems (Lee & Lee, 2008; Wang et al., 2007).

Since e-learning systems are a form of IS (Lee & Lee, 2008; Wang et al., 2007), the Delone and McLean ISS Model can be used for assessing success of e-learning systems. However, identifying and measuring the key success factors of IS, particularly for e-learning systems, is still a challenge especially when trying to apply a measurement model in an international context with several aspects such as culture (Lee & Lee, 2008; Wang et al., 2007). In short, the evaluation of these systems still faces problems, as there is a lack of standardized measurement models to evaluate the success of these projects. Despite these challenges, the DeLone and McLean ISS Model is thought to be one of the most important contributions that can be used to address this issue in the e-learning field (Wang, 2007; Holsapple-Leepost, 2006; Lin, 2007). Accordingly, several previous studies have established the validity of DeLone and McLean's IS success model in the e-learning systems success context from various angles, for example, Holsapple and Lee-post (2006), Lee and Lee (2008), Lin (2007), Wang et al. (2007), Wang and Chiu (2011) and Hassanzadeh et al. (2012).

The studies using the DeLone and McLean ISS model moved in two directions. The first direction focused on the test of validity of the model in evaluating the success of e-learning systems. As an example, Holsapple and Lee-post (2006) tested the DeLone and McLeans updated ISS model and concluded that the model is valid to measure the success of e-learning systems. Lin (2007) used the D&M model excluding the use construct. Lin (2007) assumed that user satisfaction affects behavioral intention to use e-learning system. The net benefit construct was also replaced with actual use of the online learning system. The results of the study found that all the relationships among the model constructs were significant (Lin, 2007).

The second direction focused on a combination of DeLone and McLean's model and the Technology Acceptance Model (TAM). Wang and Wang (2009) formulated a model to by integrating the technology acceptance model (TAM) (Davis, 1989) and the IS success model (DeLone & McLean, 2003) to examine adoption of web-based learning. Figure 2.7 below shows Wang & Wang (2009) proposed research model.

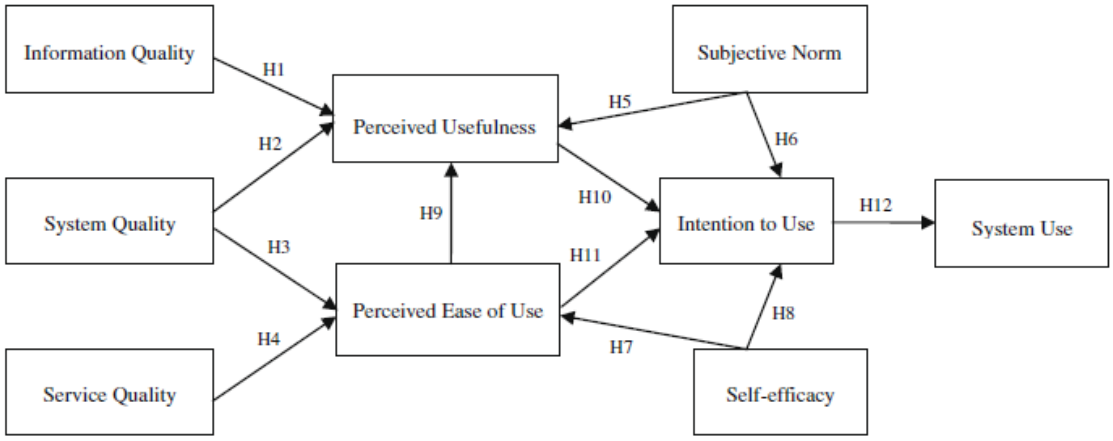

Figure 2. 7: Research Model for the Acceptance of Web-Based Learning Systems

Source: Wang & Wang (2009, p. 764)

The empirical study by Wang & Wang (2009) found out that the coefficient of determination for perceived usefulness was 0.82 implying that 82 percent of the variance in the perceived usefulness was explained by information quality, perceived ease of use and subjective norm (Table 10, p. 771). Subjective norm and perceived usefulness were the main factors of intention to use (Wang and Wang, 2009, Table 10, p. 771). Overall, the whole model explained 56.2 percent of the variance in system use. However, the study found three relationships which were non-significant: system quality and perceived usefulness; perceived ease of use and intention to use; and self-efficacy and intention to use (Wang and Wang, 2009, Table 10, p. 771).

Holsapple and LeePost (2006) and LeePost (2009) formulated an e-Learning success model based on the updated DeLone & McLean (2003) to measure the success of e-learning in the context of American University Education. They posited that the overall success of an e-learning initiative depends on the achievement of success at each stage of an e-learning development process: design, delivery, and outcome, over a number of iterations. They operationalized the constructs in the model with items formulated to fit the specific context of e-learning system development. The reliability of the constructs was confirmed via Cronbach alpha values.

Fig. 2.8 below depicts Holsapple and Lee-post's e-leaning success model which is a direct application of the DeLone & McLean (2003) updated success model with slight modifications in the details of the model.

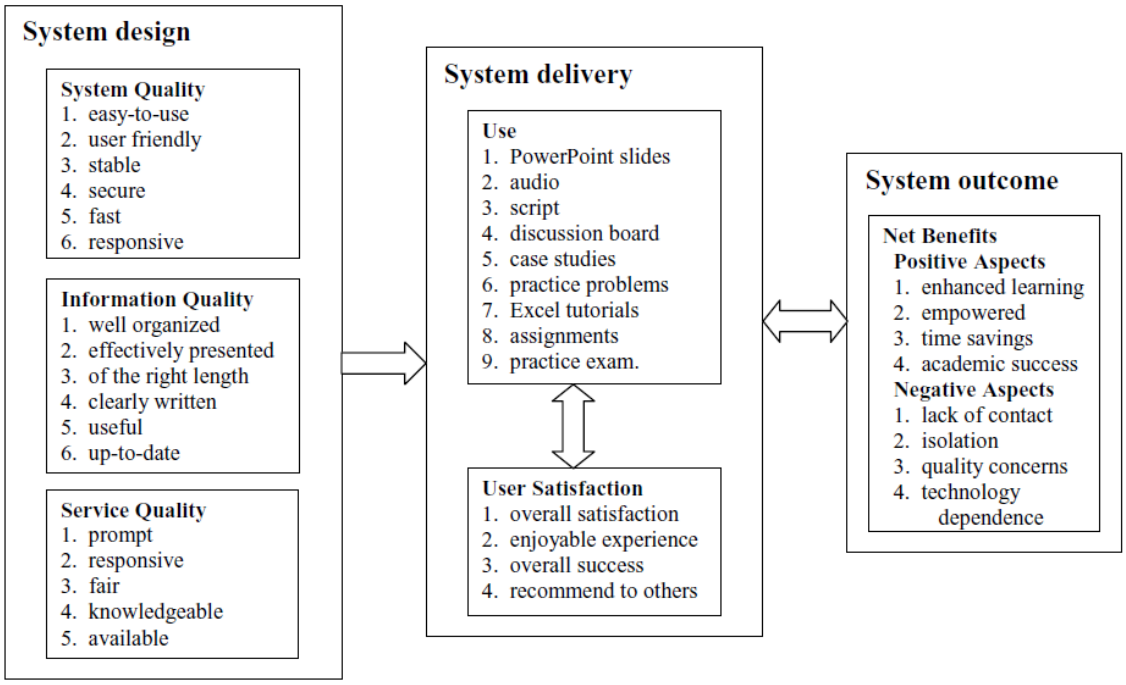

Figure 2. 8: E-Learning Systems Success Model by Holsapple and Leepost

Source: Holsapple and LeePost (2006, p. 71)

The e-learning success model by Holsapple & LeePost (2006) addressed the question of how to guide the design, development and delivery of successful e-learning initiatives based on theories of a user-centered information systems development paradigm.

Chiu, Chiu, et al. (2007) extended the updated D&M (2003) IS success model by adding fairness attributes namely distributed fairness, procedural fairness, and interactional fairness. Net benefits were taken as continuance intention with respect to using the e-learning system. All of the three fairness constructs were proposed to affect both satisfaction and continuance intention.

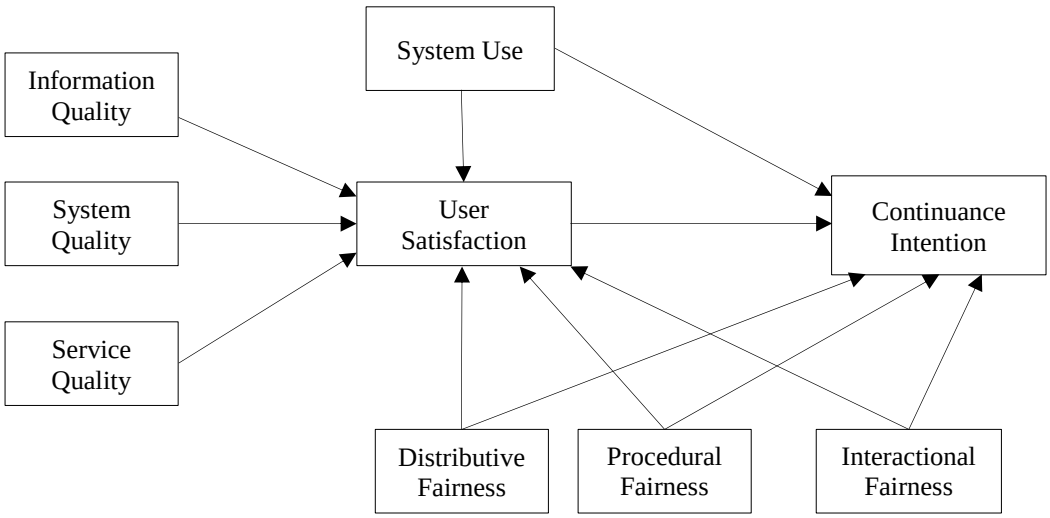

Figure 2. 9: E-Learning Systems Success Model by Chiu, Chiu, et al. (2007, p.273).

Source: Chiu, Chiu, et al. (2007, p.273)

Chiu & Chiu tested the model with students at a university in Taiwan. All the participants had experience of taking at least one web-based course. The study found out that information quality, system quality and system use affected user satisfaction. According to the findings of this study, the magnitude of the effect on satisfaction of information quality (β = .20) and system use (β =. 21) was stronger than the effect of system quality (β = .15). Satisfaction had a strong effect on continuance intention (β = .86). The effect of service quality on satisfaction was not significant. In addition to the IS success model constructs, distributive fairness and interactional fairness affected satisfaction (β = .24 and β = .17, respectively), while procedural fairness affected continuance intention (β = .11).

The strong effect of user satisfaction on continuance intention discovered in the study by Chiu, Chiu et al. (2007) is consistent with the strong effect of user satisfaction on member loyalty discovered in the study by Lin and Lee (2006). Lin and Lee used a model based on the DeLone and McLean (2003) success model to study member loyalty in online communities (asynchronous communication systems used by online communities provide functionality similar to discussion forum functionality provided by LMS). The study was based on a survey of online community members from a range of online communities in Taiwan. User satisfaction affected member loyalty with a strong effect size, and was the strongest effect discovered.

Wang, et al (2007) also used the D & M IS Success model and developed and validated a multi-dimensional model for assessing e-learning systems success (ELSS) from the perspective of the employee (e-learner).

Then Lin (2007) used this model for e-learning systems ignoring net benefits component and all relationships between components of the model, despite their importance (Lin, 2007; Petter & McLean, 2009). & McLean IS success model.

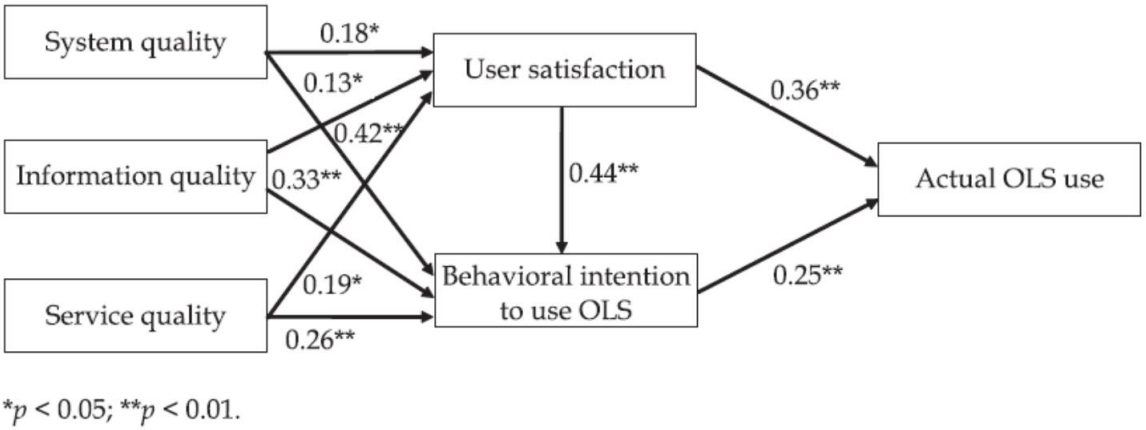

Figure 2. 10: Research Model by Lin (2007, p.819).

Source: Lin (2007, p.819)

Lee and Lee (2008) formulated another prominent research on e-learning effectiveness model from the learner perspective based on the DeLone and McLean (2003) IS success model, in which they added self-regulatory efficacy as a moderating variable. They interpreted net benefits as (self-reported) academic performance (Lee & Lee, 2008).

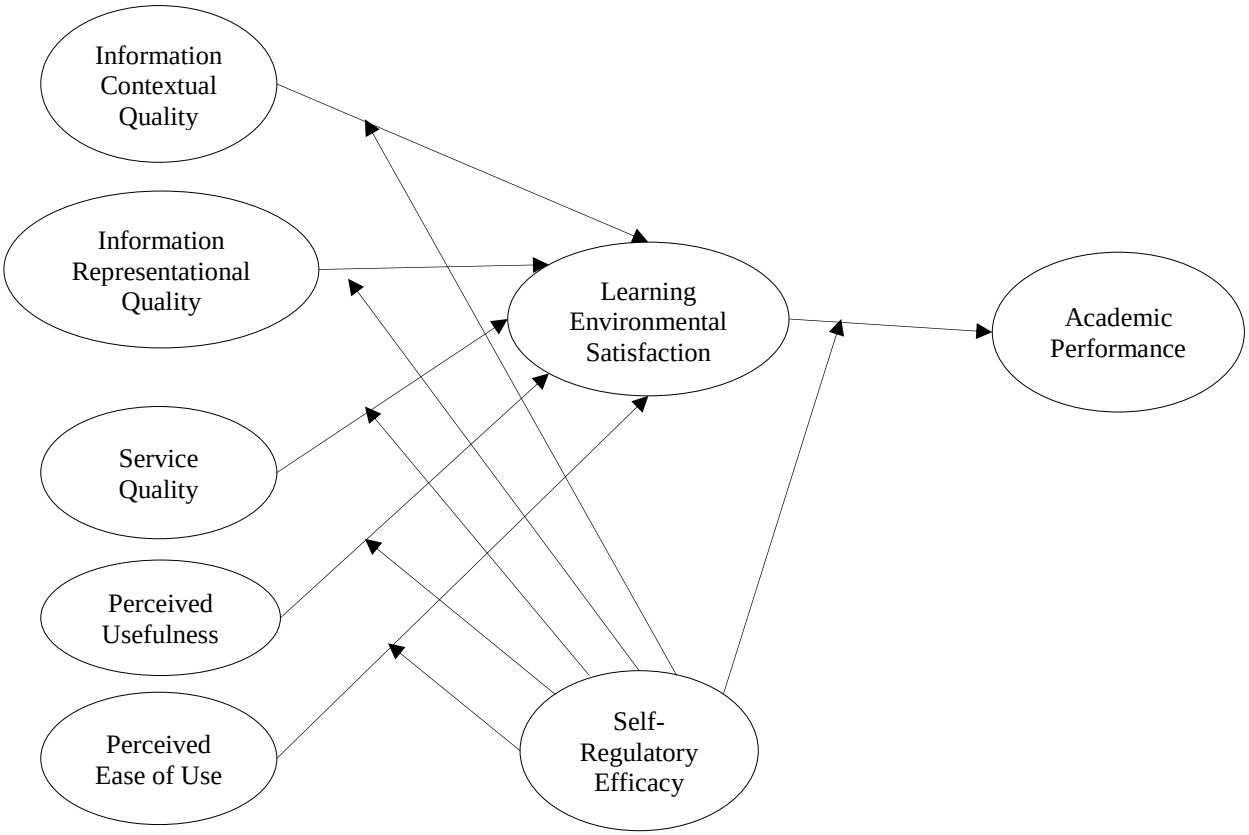

Figure 2. 11: E-Learning Systems Success Model by Lee and Lee (2008, p.36)

Source: Lee and Lee (2008, p.36)

Lee & Lee (2008) tested the model with students enrolled in online courses at a Korean university. Information representational quality, system quality, and perceived usefulness influenced satisfaction. In terms of the effect size, the effect on satisfaction of perceived usefulness (β = .32) was stronger than the effect of information representational quality (β = .20) and system quality (β = .24). Satisfaction had a relatively strong effect on academic performance (β = .39). The study found all of the hypothesized moderator effects for relationships involving satisfaction as a dependent variable to be statistically significant. Furthermore, the study found that the model predicted 15.3% of variance in academic performance (construct used to represent net benefits).

The updated DeLone and McLean IS success model was also validated by Hassanzadeh et al (2012) in the context of Iranian Universities. Hassanzadeh, et al (2012) considered that an instructor also has a vital and important role in e-learning (p. 10960).

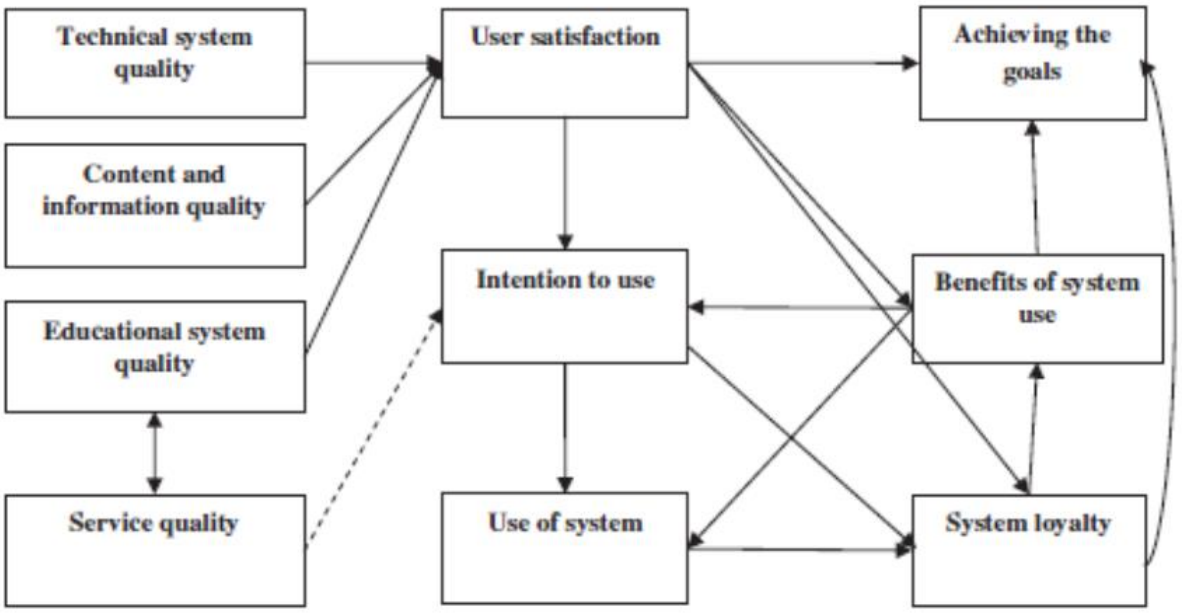

Figure 2. 12: Hassanzadeh E-Learning Effectiveness Conceptual Model

Source: Hassanzadeh, et al, 2012, p. 10964

Hassanzadeh et al (2012) made a survey on 5 universities and presented the above e-learning effectiveness model by analyzing data collected from 369 instructors, students and alumni, who were e-learning system users.

Hassanzadeh et al (2012) concluded that technical system quality, educational system quality, content and information quality, service quality, user satisfaction, intention to use, user loyalty to system, benefits of using system and goals achievement are suitable for measuring e-learning

systems success, and confirmed the fitness of the designed model to measure e-learning systems effectiveness in the context of Iranian Universities and higher education.

2.6. Conceptual Framework

This section discusses the research model, studies that support establishing this model, and selection of the constructs of the model and formulation of the hypotheses based on the relationships among the model constructs.

In order to answer the research questions, an e-learning effectiveness measurement model is derived based on review of literatures. As described in the literature review of this paper, there are several approaches to measure e-learning systems success in previous studies.

In this research, the updated DeLone and McLean (2003) IS success model is used as the basis for the conceptual framework. A number of previous studies have established the validity of the updated DeLone and McLean's (2003) IS success model in the e-learning context, for example, Lee and Lee (2008), Lin (2007), and Wang et al. (2007). Furthermore, Wang, et al (2007) stated that the updated DeLone and McLean's (2003) IS success model can be adapted to the measurement problems of a new e-learning context (p.1975). However, the DeLone and McLean (2003) IS success model doesn't consider the role learners play for the effectiveness of e-learning.

Hence, this is a gap in the DeLone and McLean (2003) IS success model. This research filled this gap by considering learners' motivation and their computer & internet self-efficacy as additional constructs for the assessment of the effectiveness of e-learning at Ethiopian Airlines. In this study, learners' individual characteristics are measured through the learners' computer & internet self-efficacy and motivation to use e-learning. Hence, these constructs are added to the updated DeLone & McLean IS Success model to assess the effectiveness of e-learning at Ethiopian Airlines. The learners' characteristics construct has been supported by the empirical studies of Selim (2007), Soong et al (2001), Hagos, et al (2016), Abbad & Jaber (2014), Chiu & Wang (2008), Chou (2005), Arbaugh (2002), Bhuasiri et al. (2012), Sun, P. -C, et al (2007), Ramayah (2012), Piccoli (2001), Soong (2001), Purnomo (2019), Ozkan (2009), Santhanam (2008), Artino and McCoach (2008); Compaq et al. (1999), Walker (2005), Ong et al (2004)

Several researchers used almost similar theoretical framework. But, they used various constructs, and there is no an agreed categorization of the different critical success factors. For example, Soong et al (2001) categorized the three constructs of D&M (2003) namely information quality, system quality and service quality into a single construct which he termed

as “Perceived IT infrastructure. Yeung et al (2007) added perceived usefulness and perceived ease of use as distinct constructs in addition to System Quality, Information Quality and Service Quality. However, the indicators they used for perceived usefulness are identical to the indicators used by D & M (2003) and many researchers for information quality; and the indicators they employed to measure perceived ease of use are similar to the indicators used for System quality by D & M (2003) and many other researchers.

In this research, perceived usefulness is measured through e-learning content quality and perceived ease of use is measured through the indicators included under System Quality. Indicators related to infrastructure like availability of computers and accessories, ease of use of the Moodle Learning management system, flexibility of the system, etc are taken as measurement items for the System Quality Construct. Anything related to the quality of the e-learning courseware (content) is classified under the construct e-learning content quality. The technical support provided to the learners by the IT department and the Aviation Academy is categorized under Support Quality. This is in line with the majority of researches (DeLone & McLean, 2003; Wang et al, 2007; Wang, 2003; Lin & Lee, 2006; Lin, 2007; Sedera & Gable, 2004; Petter, DeLone & McLean, 2008).

As can be seen from figure 2.13, System Quality, E-learning Content Quality, Support Quality Learner Motivation and Learner Computer & Internet Self-Efficacy are independent variables and learner satisfaction and use of the e-learning system are mediating variables and Perceived Learning is the dependent variable.

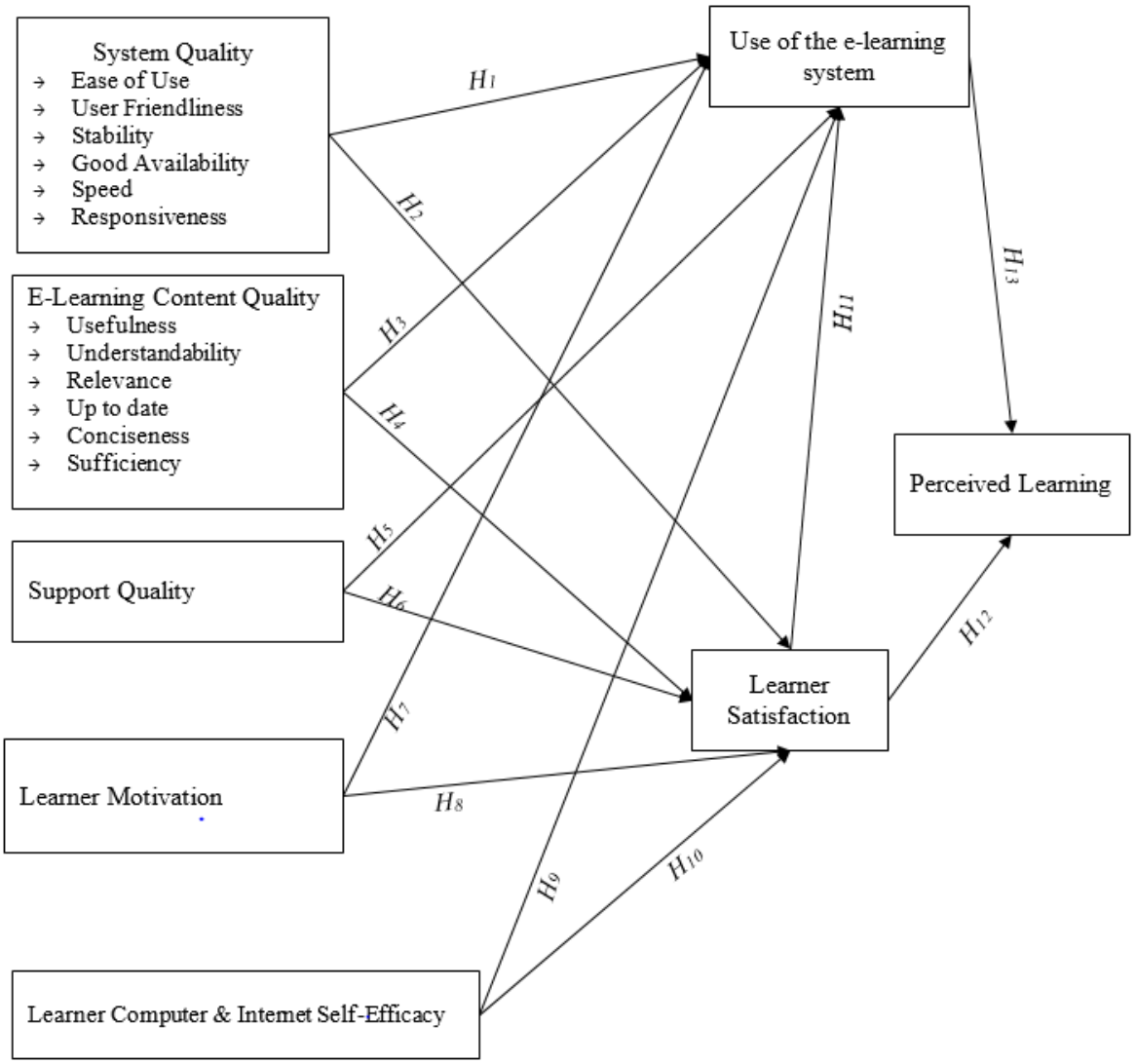

Figure 2. 13: Research Model

As can be seen from the research model, the constructs in the D & M IS success model (2003) have been used as a basis and two more construct have been added to fit the context of e-learning at Ethiopian Airlines. The use of these constructs has also been supported by several researches in prior studies. Table 2.1 below summarizes previous studies which used these constructs in measuring e-learning effectiveness.

Table 2. 1: Study Constructs, D & M ISS Model (2003) & Supporting Prior Studies

D & M ISS Model (2003)	Equivalent Construct in this Research	Supporting Prior Researches
System Quality	System Quality	W. Bhuasiri et al. (2012); Sun, P. -C, (2007); Wang (2007); Wang (2009); Holsapple (2006); Ozkan (2009);Hassanzadeh (2012); Lin, H.F (2007), Lim, (2007)
Information Quality	E-learning content quality	Bhuasiri, (2012); Sun, P. -C, (2007); Chiu, Chiu, (2007); Lee (2008); Wang (2003), Holsapple (2006); Hassanzadeh (2012), Lin (2007); Wang (2007); Ozkan (2009); Lin, H.F (2007), Lim, (2007), Ramayah, (2012)
Service Quality	Support Quality	W. Bhuasiri et al. (2012), Selim (2007), Hassanzadeh (2012), Ozkan (2009), Wang (2007), Holsapple (2006), Lin, H.F (2007)
Intention to use/use	Use of the e-learning system	DeLone and McLean (2003); Wang et al (2007), Hassanzadeh (2012), Chiu, Chiu, et al (2007), Lin, H.F (2007)
User satisfaction	Learner Satisfaction	Chiu, et al. (2007), Chou (2005); Holsapple (2006), Hassanzadeh (2012); Sun, P. -C, et al (2007)
Net Benefits	Perceived Learning	Chu (2010); Eom & Ahill (2018, 2016); Rovai et al. (2009); Lee and Lee (2008)
*	Learner Motivation	Lim (2007); Abbad (2014); Chiu & Wang (2008); Chou(2005); Arbaugh(2002); Bhuasiri (2012); Sun (2007); Piccoli (2001); Soong (2001), Purnomo (2019); Ozkan(2009); Santhanam (2008); Artino (2008,2010); Walker (2005)
*	Learner Computer & Internet Self-Efficacy	Lim (2007); Chiu & Wang (2008); Chou (2005); Arbaugh (2002); Bhuasiri (2012); Sun(2007); Piccoli (2001); Soong (2001); Purnomo (2019); Ozkan (2009); Sun, P. –C (2007); Santhanam (2008); Artino (2008); Walker (2005), Ong (2004)

* Additional Construct

2.7. Study Hypotheses

Based on the research model in figure 2.13 above, the below 13 hypotheses are proposed. These hypotheses are tested and supported or not supported based on the data collected from the learners who have been selected as a sample to represent the target population.

According to Saunders, et al (2009, p. 124), a research hypothesis is a testable proposition about the relationship between two or more concepts or variables) from the theory. In other words, a hypothesis is a proposition that is empirically testable. Hence, when one states a hypothesis, it should be written in a manner that can be supported or shown to be wrong through an empirical test (Saunders, et al, 2009).

The researcher used the theoretical reasoning to develop the following hypothesis:

Table 2. 2: Summary of Hypotheses

No.	Hypotheses	Expected Relationship
H_1	The higher the quality of the e-learning system, the more use of the e-learning system	Higher/More
H_2	The higher the quality of the e-learning system, the more the learner satisfaction	Higher/More
H_3	The higher the e-learning content quality, the more use of the e-learning system	Higher/More
H_4	The higher the e-learning content quality, the more the learner satisfaction	Higher/More
H_5	The higher the support quality to learners, the more use of the e-learning system	Higher/More
H_6	The higher the support quality to learners, the more the learner satisfaction	Higher/More
H_7	The more motivated the learners are, the more use of the e-learning system	Higher/More
H_8	The more motivated the learners are, the more the learner satisfaction	Higher/More
H_9	The higher the computer and internet self-efficacy of the learners, the more use of the e-learning system	Higher/More
H_{10}	The higher the level of learner computer and internet self-efficacy, the more the learner satisfaction	Higher/More
H_{11}	The higher the level of learner satisfaction, the more use of the e-learning system	Higher/More
H_{12}	The higher the level of learner satisfaction, the more the perceived learning	Higher/More
H_{13}	The more use of the e-learning system, the more the perceived learning	More/More

The relationships amongst the constructs in this study are further elaborated and discussed below. Prior studies supporting these relationships are also described and analyzed.

2.7.1. System Quality Versus Use of the E-learning System

Several researchers interpret system quality as performance of the system in terms of its reliability, ease of use and other indicators of systems (Petter & McLean, 2009; Wang & Wang, 2009). In the D&M IS Success Model, "systems quality" measures technical success (DeLone & McLean, 2003, p. 10). According to Holsapple, et al (2006), the system quality dimension measures desirable characteristics of the LMS environment such as ease of use, user friendliness, stability, security, speed, and responsiveness (p.71). According to Wang, et al (2007), the system quality of an e-learning system from the learner perspective is the extent to which the system functions to facilitate learning activities. Hence, system quality is measured using the *Ease of Use, User Friendliness, Stability, Good Availability, Speed* and *Responsiveness* of the MOODLE Learning Management System (LMS) deployed at Ethiopian Airlines.

The different measurement items for system quality include IT infrastructure for e-learning and consists of the availability and strength of internet, access to computers, and other required accessories like headsets. The measurement of system quality is the hardware (available for user) and software application in the perspective of e-learning. Guimaraes, Armstrong &Jones emphasize that accessibility, usability, awareness of user expectations, and learning ease are essential for e-learning success (2009).

Information technology is also a critical success factor for e-learning. As a matter of fact, IT is the engine that drives the e-learning revolution (Selim, 2007, p. 399). The effective and efficient use of IT in distributing online courses is extremely important to the success and learner acceptance of e-learning. Selim (2007) recommends that the IT infrastructure in the university shall be rich, dependable and capable of providing the courses as smooth as possible to ensure the success of e-learning (p.399).

Petter & McLean interpret use of the e-learning system as the actual use of the system or its outputs (2009). The authors further went to explain that intention to use is the choice to use a system before you actually do it and it is forecast to happen in future (Petter & McLean, 2009). In the context of e-learning, the use construct measures the extent to which the course elements are actually used (Holsapple & Lee-post, 2006, p.71).

The relationship between system quality and system use in e-learning systems success study were established by Holsapple & LeePost (2006) and LeePost (2009). This relationship

predicted by the IS success model was confirmed empirically by several researchers; example Holsapple & LeePost (2006) and Menchaca & Bekele (2008).

Based on the above justification, the first hypothesis of this paper is derived and presented as follows:

H1.The higher the quality of the e-learning system, the more use of the e-learning system

2.7.2. System Quality versus Learner Satisfaction

System quality has already been elaborated in the above paragraph. In this section, we will describe about user satisfaction and the relationship between system quality and user satisfaction.

Wang & Wang (2009) describe user satisfaction as users' general idea about system, and it is often used to assess learner's attitude (Wu, Tennyson, & Hsia, 2010). The user satisfaction construct measures opinions of the students about e-learning based on their experience with the course. This is rated on perceptions of satisfaction, enjoyment, success and recommendability (Holsapple & Lee-post, 2006, p.71).

Several researchers have taken user satisfaction as a measure of IS success and effectiveness (DeLone & McLean, 1992, 2003; Seddon & Kiew, 1994; Seddon, 1997; Sun et al., 2008; Baroudi, et al, 1986). Determinants of user satisfaction have been identified as information quality, system quality and service quality (DeLone & McLean, 2003; Seddon & Kiew, 1994; Seddon, 1997; Kettinger & Lee, 1994; Pitt, Watson, & Kavan, 1995; Rai et al., 2002; Seddon & Kiew, 1994). The DeLone and McLean (2003) model proposes that system quality and user satisfaction are positively related, and this relationship has been supported by quantitative empirical studies (McGill, Hobbs, & Kioba, 2003; Rai et al., 2002; Seddon & Kiew, 1994).

Similar to using user satisfaction in IS systems success, learner satisfaction is the degree to which the e-learning system meets the learner's expectations (Samarasinghe, 2012, p.37). Chiu, et al (2007) defined learner satisfaction as perceived difference between prior expectations and the actual performance of the e-learning system. Samarasinghe (ibid) states that learner satisfaction is extensively used as a construct in e-learning systems success research.

As stated in table 2.1 of this paper, user satisfaction has already been replaced with learner satisfaction as the users are the learners of the e-learning course. This is supported by several prior researches (Chiu, et al, 2007; Wang, 2007; Lin, 2007; Sun et al, 2008).

Research results suggest that system quality affects e-learning user satisfaction (Arbaugh, 2002; Chiu et al., 2005; Menchaca & Bekele 2008; Sun et al., 2008; Webster & Hackley, 1997; Piccoli et al., 2001). The higher the quality and reliability of the system, the higher the learner satisfaction would be (Piccoli et al., 2001; Webster & Hackley, 1997).

Based on the above explanation, the following hypothesis is derived.

H2. The higher the quality of the e-learning system, the more the learner satisfaction

2.7.3. E-learning Content Quality Versus Use of the E-learning System

Content and Information quality is the quality of system output (Petter & McLean, 2009; Wang & Wang, 2009) and measures semantic success (DeLone & McLean, 2003, p. 10). The information quality dimension assesses the e-learning course content on aspects such as understandability, relevance, conciseness, sufficiency and usefulness of the courseware (Holsapple & Lee-post, 2006, p.71). Chiu, et al (2007) emphasized that e-learning course content quality is measured through its accuracy, completeness, ease of understanding, and relevance of the online course materials.

In this research, information quality of DeLone & McLean (2003) is customized as e-learning content quality, and e-learning content quality and e-learning course or e-learning courseware quality are used interchangeably.

Samarasinghe, (2012) states that quality of the e-learning content refers to the quality of content provided to learners via the e-learning system. It is a very important e-learning effectiveness dimension commonly used in studies of e-learning systems success (Chen, 2010; Chen, et al., 2009; Sun et al., 2008; Wang et al, Chiu, et al 2007).

Accordingly, the third hypothesis of this research is presented as follows

H3. The higher the e-learning content quality, the more use of the e-learning system

2.7.4. E-learning Content Quality Versus Learner Satisfaction

The relationship between information quality and user satisfaction is strongly supported in several studies (Iivari, 2005; Wu & Wang, 2006). Researchers have found a consistent relationship between information quality and user satisfaction (Seddon & Yip, 1992; Seddon & Kiew, 1996; Rai et al., 2002; McGill et al., 2003; Wixom & Todd, 2005; Chiu et al., 2007). In this paper, information quality of D &M (2003) is replaced with e-learning content quality.

Barbera et al (2013) found that course design and e-learning content are the most powerful variables which affected learner satisfaction and perceived learning (p. 231). Eom et al (2016) also found out that course design is one of the strongest predictors of learner satisfaction and learning outcomes (p. 185).

E-learning content quality has been hypothesized as a factor for learner satisfaction and system use by the learners (Lee & Lee, 2008; Naveh, Tubin, & Pliskin, 2010; Sun et al., 2008; Wang et al., 2007). Wang et al (2007) formulated and validated measurement scales for six IS success constructs (information quality, system quality, service quality, system use, learner satisfaction, and net benefits) in the e-learning systems context. They used the same construct name of information quality in their model to represent e-learning quality provided via the e-learning system. Wang et al. operationalized the information quality construct with six items measuring timeliness, accuracy, and relevance. Holsapple and LeePost (2006) and Lin (2007) tested the IS success model (DeLone & McLean, 2003) in an e-learning context where the e-learning content quality construct was defined in a way similar to Wang et al.

Based on the above prior research findings, the following hypothesis has been posited to explain the relationship between e-learning content quality and learner satisfaction.

H4. The higher the e-learning content quality, the more the learner satisfaction.

2.7.5. Support Quality versus Use of the E-Learning System

Service quality is the quality of the support that system users receive from the IS department and IT support personnel (Petter & McLean, 2009, p. 239). According to Petter & McLean (2009), service quality includes: accuracy, responsiveness, reliability, technical competence, and empathy of the staff providing support to the users of the IS. SERVQUAL, adapted from the field of marketing, is a common measuring instrument for IS service quality (Pitt et al., 1995). In the case of training, it is user support by training unit (Petter & McLean, 2009) and it is effective support for users to use the system (Wang & Wang, 2009).

Wang and Wang (2009) identified service quality as a factor of instructor adoption of e-learning systems. Several studies (Chiu, Chiu, et al., 2007; Holsapple & LeePost, 2006; Lee & Lee, 2008; Wang et al., 2007) conceptualized the service quality construct used in IS literature as the support to learners in the e-learning context. In the Holsapple and Lee-Post study (2006), the researchers tried to develop a multidimensional model of e-learning systems success based on the IS success model. They emphasized the importance support quality to learners in terms of increasing learner motivation to use the e-learning system.

Hence, in this study, the service quality of DeLone & McLean ISS (2003) is modified to represent the Quality of Support to Learners. In other words, Service quality in the DeLone and McLean IS success model (2003) was interpreted as support quality to learners.

Support Quality to learners refers to the quality of the support provided by the different departments of the organization to the learners that are using the e-learning system. The support may involve technical support and support with academic aspects of using the e-learning system (Samarasinghe, 2012 p.25). Selim (2007) identified user support as an important factor of systems success. The finding of Selim was further supported by the study of Ozkan and Koseler (2009). This study concluded that the quality of support to learners is a critical construct influencing e-learning systems success.

Several other studies suggested that user support is a key factor of e-learning system use, eg. Govindasamy (2002). User support was one of the critical success factors for e-learning in Selim's (2007) empirical study.

Therefore, in this research, Support Quality to learners is taken as a dimension of e- learning effectiveness and the following hypothesis has been postulated.

H5. The higher the support quality to learners, the more use of the e-learning system.

2.7.6. Support Quality versus Learner Satisfaction

In this study, service quality (DeLone & McLean 2003) is conceptualized as support quality provided to learners. Service quality in e-learning research is defined as the overall support delivered by the e-learning system to the learners who use the system (Chiu et al., 2007, p.274; DeLone & McLean, 2003, p. 25; Parasuraman et a, (1985); Pitt et al, (1995); Kettinger & Lee (1997).

The better service quality, the higher levels of customer satisfaction (Oliver, 1980; Parasuraman et al., 1985; Zhu, Wymer, & Chen, 2002). The importance of the service quality construct in determining the success of different types of ISs is well established (Holsapple & LeePost, 2006; Lee & Lin, 2005; Park & Gretzel, 2007). Recognizing the importance of service quality in ISs, DeLone and McLean (2003) updated the IS success model to include service quality as a determinant of system use and user satisfaction.

Soong, et al (2001) emphasized that if the technical support is lacking, the e-learning will not be successful. Support to e-learning is essential for its success (Soong, et al, 2001). Soong, et al (2001) identified almost the same critical success factors as Selim (2007). Soong, et al

asserted that the critical success factors that need to be considered are: human factors pertaining to the instructors; the technical competencies of the instructors and students; the mindsets of instructors and students about learning; and the level of perceived IT infrastructure and technical support (2001, p. 101).

Lee and Lee (2008) stressed the importance of learner support provided by both a dedicated IT support department and by instructors. Yet, at the same time, they suggested that because the learners come first to the instructor, whether it is for technical or learning content support, the quality of the instructor service to learners plays a more important role than that of the IT support department in a business organization. On the other hand, Govindasamy (2002), who suggested benchmarks for successful implementation of e-learning, introduced institutional support as a quality benchmark for e-learning systems success. Moreover, the Selim (2007) study suggested that institutional support is a critical success factor for learner acceptance and usage of e-learning systems.

Based on the above theoretical foundation, the following hypothesis is proposed:

H6. The higher the support quality to learners, the more the learner satisfaction

2.7.7. Learner Motivation versus Use of the E-Learning System

Learners are the primary stakeholders of e-learning systems (Eom, et al, 2007, p. 216). According to Eom (Ibid), online learning systems put more responsibilities on learners than traditional face-to-face learning systems. A different learning strategy referred to as self-regulated learning is essential for online learning systems to be effective. Self-regulated learning necessitates changing roles of students from passive to active learners. Learners must manage the learning process themselves. According to Smith (2001), the key factor for self-regulated learning is self-motivation. Zimmerman (1985, 1994) defined self-motivation as the self-generated energy that gives behavior direction toward a particular goal.

Learners' motivation is a critical factor for students to use the e-learning system (Abbad, 2014; Lim 2007; Venkatesh, 2001). Abbad (2014, p.29) states that students need a significant motivation for them to use the e-learning system.

Lim (2007, p. 23) defined motivation as the extent to which a person is willing to make efforts to advance his or her achievement both on training and at work. There are two types of motivation: intrinsic and extrinsic (Davis, 1992; Bhuasiri, 2012: Zhang, 2008). Intrinsic motivation refers to doing an activity for pleasure and interest while extrinsic motivation refers

to doing an activity for a specific purpose or outcome (Ryan & Deci, 2000a; Vallerand, 2000; Meyer & Gagné, 2008).

According to Lim (2007), trainees showed more positive emotional responses when they had higher motivation. Selim (2007) found out that student motivation construct indicated high level of validity as a critical success factor of e-learning effectiveness.

Law, Lee & Yu studied the effect of motivation in an e-learning context (2010). Their study found that learning is significantly affected by the extrinsic motivation of students. Intrinsic and extrinsic motivations are key drivers of behavioral intention to use e-learning (Davis, 1992; Zhang, et al, 2008). Davis et al. (1992) conceptualized extrinsic motivation to use a specific new technology in the workplace by relating it to execution of job-related activities more productively. Davis et al. (1992) stated that individuals are often rewarded for good and productive performance with salary increases, bonuses, etc. Therefore, if a person perceives the technology is useful in facilitating productivity, she/he is likely to have extrinsic motivation to use that given technology (Davis, 1989; Davis et al., 1992). Similarly, at Ethiopian Airlines, taking and successfully completing required courses is a requirement for promotion of staff to the next level and to remain current and work (Ethiopian Airlines HR Progression manual and quality manuals). This implies that there is sufficient extrinsic motivation for employees to use the e-learning system of the airline. Hence, this study emphasizes on the effect of intrinsic motivation on the use and satisfaction of the e-learning system as the extrinsic motivation is already clear.

Mathieu et al (1992) empirically found out that trainees who are more motivated learn course materials better than those with lesser motivation. Santhanam (2008) found out that motivation to learn is a critical success factor for e-learning. According to Venkatesh et al (2002), learners who are more intrinsically motivated to use computer technologies are anticipated to indulge in using a new technology just for the sake of using it, in addition to using it for specific positive outcomes related with use. Such individuals may tend to underestimate the difficulty associated with using a new technology because they enjoy the process and do not perceive it as being difficult compared to those who have less intrinsic motivation. More specifically, people with higher levels of intrinsic motivation tend to have more willingness to spend more time on the task.

Based on the above arguments, the below hypothesis is proposed for this study.

H7. The more motivated the learners are, the more use of the e-learning system

2.7.8. Motivation versus Learner satisfaction

Learners' satisfaction with e-learning is a significant factor in measuring the effectiveness of e-learning (Levy, 2007, p. 189). According to Ryan and Deci (2000, p. 56), intrinsic motivation is a personalized psychological feature that makes a person perform an activity for its inherent satisfaction, for pleasure, or the challenge in it, rather than for some separable value. Extrinsic motivation, on the other hand, causes a person to take an action to attain some specified goal such as a salary increase, recognition or reward (Ryan and Deci, 2000). There is sufficient extrinsic motivation at Ethiopian Airlines as employees are required to complete their mandatory courses online to remain current and maintain their active work status (Ethiopian Airlines HR Progression manual and quality manuals). Employees who fail to complete required trainings will lose their authorizations to accomplish their normal duties (Ethiopian Airlines quality manuals).

Hence, the below hypothesis is proposed:

H8. The more motivated the learners are, the more the learner satisfaction

2.7.9. Computer and Internet Self-efficacy vs Use of E-Learning System

One of the most important learner characteristics essential for the effectiveness of e-learning is their digital literacy and the resulting computer self-efficacy (Samarasinghe, 2012; Soong, 2001). According to Soong (2001, p.106), if the students suffer from inadequate competency of the technology they are supposed to use, they would not make use of such resources well since they lack the proficiency to do so. Wu & Lee (1999) also found out that a major factor in the success of any computer facilitated communication program is the computer literacy of its users.

Bandura (1986, p. 391) defined self-efficacy as the judgements of people about their capabilities to organize and perform courses of action required to achieve a designated level of performance. Learner self-efficacy refers to the extent to which the learner believes that he/she can effectively use the e-learning system (Piccoli et al, 200, p.410; Samarasinghe, 2012, p.42; Venkatesh, et al, 2003; Purnomo, et al, 2019, p.86,). Several studies have validated that learner self-efficacy affects the learners' use of the e-learning system (Piccoli, 2010; Wu, et al, 2010; Joo, Bong, & Choi, 2000). The results suggested that learner self-efficacy is an important determinant of success in e-Learning.

Computer self-efficacy refers to an individual's self-evaluation of his/her ability to independently accomplish internet tasks (Torkzadeh et al., 2006). Bandura (1994, p. 20) states that self-efficacy beliefs are critical determinants of how well knowledge and skill are acquired.

Computer self-efficacy is an important learner characteristic for e-learning use (Selim, 2007, Soong, 2001, Lim, 2007). A number of previous quantitative studies found that self-efficacy has a strong positive relationship with system usage. For example, Park (2009) found that e-learning self-efficacy as a strong predictor of behavioral intention to use e-Learning. The model developed by Park was tested with undergraduate students who had an experience of participating in at least one web based course at a university in Korea.

A higher level of individual computer self-efficacy is positively associated with a higher level of learning performance which increases the use of e-learning (Wu, Tennyson, & Hsia, 2010, p. 844; Lim, 2007; Soong, 2001; Selim, 2007, Piccoli, 2001). Computer self-efficacy is an important learner dimension for e-learning (Chau & Wang, 2000). Hill, Smith, and Mann (1987) confirmed that college students' computer self-efficacy influences their decision to use computers.

So, learners' computer self-efficacy is added to the updated DeLone & McLean (2003) IS Success model to assess the effectiveness of e-learning at Ethiopian Airlines.

Hence, this paper extends the D&M (2003) model by adding the learners' computer and internet self-efficacy construct. The learners' self-efficacy construct has been supported by the empirical studies of Bhuasiri, et al (2010) and Hagos, et al (2016).

Based on the above justification, the following hypothesis is proposed:

H9. The higher the computer and internet self-efficacy of the learners, the more use of the e-learning system

2.7.10. Computer Self-Efficacy Versus Learner Satisfaction

A number of studies investigated how learner ability and confidence in using e-learning systems affect their satisfaction and learning (Pajares & Millers, 1994; Wu et al., 2010). Artino et al. examined the impact of medical students' motivational beliefs on their academic achievement (2010). The results suggested that learner self-efficacy is an important factor of academic achievement in e-learning. The finding of Artino et al (2010) is in line with several other prior studies (Joo, Bong, & Choi, 2000). Lin et al. (2008) and Park (2009) also found out that self-efficacy is a determinant of learner satisfaction.

Learners with higher internet self-efficacy are more confident in accomplishing e-learning activities and improving their satisfaction (Sun et al, 2007, p.4; Lee & Lee, 2008, p. 39; Walker, 2005, p.65). Several studies have validated that learner self-efficacy affects the learners' satisfaction (Piccoli, 2010; Wu, et al, 2010; Joo, Bong, & Choi, 2000).

Based on the justification above, the below hypothesis has been postulated.

H10. The higher the level of learner computer and internet self-efficacy, the more the learner satisfaction

2.7.11. Learner Satisfaction versus Use of the E-Learning System

DeLone and McLean (1992) debated that use and user satisfaction are interrelated and that greater user satisfaction will lead to more use. Petter et al. (2008) states that user satisfaction refers to the degree to which users are pleased with IS and support services. The updated IS success model assumes that system use precedes user satisfaction which leads to an increased satisfaction which sequentially results in a higher intention to use (Petter et al., 2008). Satisfaction has been confirmed to have a significant positive effect on intention towards use and actual use of e-learning services (Chang, 2013; Hassanzadeh et al., 2012; Petter et al., 2008; Roca et al., 2006). Hassanzadeh et al. (2012) in their study exposed the positive effect of satisfaction on actual use of an e-learning system. Therefore, satisfaction is assumed to have a positive impact on actual use of the Moodle e-learning system.

The studies of Wu & Wang (2006) and Chiu & Chiu (2007) with university students in Taiwan and Hong Kong confirmed a positive relationship between user satisfaction and continuance intention in the context of using e-learning systems. This relationship was also confirmed in relation to employee perceptions of e-learning continuance intention by Roca et al (2008) and Yeung and Jordan (2007), in the context of business organizations.

Based on the above justification, the following hypothesis is proposed:

H11. The higher the level of learner satisfaction, the more use of the e-learning system

2.7.12. Learner Satisfaction versus Perceived Learning

The relationship between user satisfaction and net benefits was well recognized in IS literature (DeLone & McLean, 2003). Furthermore, in IS studies, it was proved that higher performance is achieved by more satisfied users rather than unsatisfied ones (Bailey & Pearson, 1983).

In e-learning success research, one of the measures of the net benefits construct was student perceived learning (Chu & Chu, 2010; Eom & Ashill, 2006, 2016, 2018; Rovai, 2009; Ferguson & DeFelice, 2010; Holsapple & LeePost, 2006; Wang et al., 2007). Student learning outcomes were defined in terms of knowledge, skills and abilities learners achieve as the result of their participation in a particular set of educational experiences (Anderson, 2001).

Chu (2010, p. 148) defined perceived learning as the degree to which individual students perceive the gains from taking the e-learning course. The gains were concerned with the intellectual development or process knowledge of the online learning. Rovai (2009) states level of perceived learning as the magnitude of the knowledge, skills and abilities that learners believed to have gained by engaging in e-learning. Chou & Liu (2005) defined student learning as the level to which learning goals have been achieved by students.

Student perceived learning is a construct frequently used in examining the success of online learning systems (Eom, 2006, Chu, 2010, Rovai, 2009, Arbaugh, 2000, 2001; Ferguson & DeFelice, 2010; McGorry, 2003; Santhanam, Sasidharan, & Webster, 2008; Sher, 2009; Wang, 2003; Wu, Tennyson, & Hsia, 2010; Yukselturk & Bulut, 2007).

Different researchers measure the student learning construct differently. Some e-learning researchers typically assess student learning or learning effectiveness by looking at student performance (Arbaugh, 2000; Chou & Liu, 2005; Piccoli, Ahmad, & Ives, 2001). Eom, Wen, and Ashill (2006) measured the student perceived learning construct with three items to gather student opinions about whether they had learnt more in online learning and the learning experience gained when compared to a face-to-face version of the course. Some other researchers used test scores to measure learning effectiveness. Chou and Liu (2005) measured learning performance with final test grades in their study to appraise learning effectiveness in e-elarning systems.

Eom et al. (2006) established a positive relationship between student satisfaction of an e-leaning system and student perceived learning. Eom et al. (2006) declared that learning is undoubtedly the most important benefit an individual student can obtain through a training or an educational activity. This argument provides the basis for the relationship between learner satisfaction and level of perceived learning.

Therefore, in this research, student learning is conceptualized following Rovai et al. (2009) and Eom (2006) emphasizing on the level of learning learners perceived they have achieved.

Based on the above justification, the following hypothesis is proposed:

H12. The higher the level of learner satisfaction, the more the perceived learning

2.7.13. Use of the E-Learning System Versus Perceived Learning

System use is an important measure of system success (DeLone and McLean). On the other hand, as stated above, learning is unarguably the most important net benefit an individual student can achieve through an educational activity (Chu & Chu, 2010; Eom & Ashill, 2006, 2016, 2018; Rovai, 2009; Ferguson & DeFelice, 2010; Holsapple & LeePost, 2006; Wang et al., 2007). Success of a system depends on continued usage of a system rather than the initial use (Bhattacherjee, 2001; Roca & Gagne, 2008; Wu, et al., 2006; Yeung & Jordan, 2007). According to Freeze, et al, system use is considered a necessary precondition for systems/technologies to affect individual learning. Such research pinpoints the importance of the use construct for assessing a system in terms of its effectiveness. System use, for this research, was defined as the extent and nature of using the Moodle e-learning system.

Bhattacherjee (2001) developed and empirically validated a model based on the justification that the final success of a new technology is affected by the continued usage of the system. Several researchers have found out that perceived learning is the key success of any learning system (Chu & Chu, 2010; Eom & Ashill, 2006, 2016, 2018; Rovai, 2009; Ferguson & DeFelice, 2010; Holsapple & LeePost, 2006; Wang et al., 2007).

Based on the above justification, the following hypothesis is proposed:

H13. The more use of the e-learning system, the more the perceived learning

3. Research Methodology

3.1. Research Design and Approach

This research follows a positivist philosophy as it presents all the research based on scientific literature, deduces research hypotheses based on literature review, and validates the proposed hypotheses using data collected from the sample (Aparicio, M., 2016, p. 5).

The research uses a cross-sectional research design to study the relationships among the different critical factors of e-learning effectiveness at Ethiopian Airlines.

The research is mainly quantitative, and the data collection method employed in this research is the survey method. According to Saunders, et al (2009, p. 144), surveys are commonly used as they allow the collection of a huge data from a sizeable population in a highly economical way. Stangor (2011, p.107) states that surveys are popular in data collection methods due to its ability to collect a wide range of data about different variables in a relatively short timeframe. The main techniques used in survey research are questionnaires, interviews and observation.

Oppenheim (1992, p.13) identified two types of survey research: descriptive survey and analytical survey. For this study, the analytical survey method is used. Analytical Survey research explains the causal relationships between the variables and constructs (Oppenheim, 1992.p21). The analytical survey fits with the research approach to be adopted in this study.

The survey data was collected using the internet using Google Forms. Link for the survey questionnaires was sent to the samples with valid emails on the learning management system (LMS) and they were requested to respond for the survey within 14 days. The selected sample respondents were followed up through their operational and HR managers to respond to the survey within the allotted time frame.

3.2. Target Population and Sampling Frame

The total population of this study is all ET staff enrolled for online courses at Ethiopian Airlines. From the total population, only the e-learning participants who have taken and completed at least one course on the online learning management system of Ethiopian Airlines in the last two years from January 1, 2019 to December 31, 2020 were selected as a sampling frame for this study. E-learning participants who didn't complete an online course in the last two years were purposely excluded as they couldn't give reliable information on the research topic.

The following table demonstrates the number of total active participants who have been enrolled as well as participants who have completed at least one course in the last two years on the online learning management system of the Ethiopian Airlines. This means that participants can be counted more than once as most of the participants take more than one e-learning course on the online learning management system. Table 3.1 shows the total population in each stratum and table 3.2 shows unique sampling frame by removing overlaps and sample size. Overlaps are removed by removing the participants in the General stratum if they are also in any of the other strata. Overlaps on aircraft technicians, cabin crew and Commercial categories are removed by removing the participants based on their area of work and specialization.

Table 3. 1: Total enrolled and certified Population

No	Job category (Strata)	Total enrolled	Certified on at least one course (Jan 1, 2019-Dec. 31, 2020)
1	Aircraft Technicians	3204	2911
2	Cabin Crew	2909	352
3	Commercial	5249	1508
4	Others (General Courses)	10774	7879
	Total	22136	12650

Source: Ethiopian Airlines Online Management System from January 1, 2019 to December 31, 2020 (Extracted on January 1, 2021)

The Ethiopian Airlines online learning management system shows that there were a total of 22136 participants enrolled for at least one e-learning course (December 31, 2020). Of these, 12650 participants completed at least one course; but 9486 participants either started and not completed a course or never accessed the online learning system in the last two years. Hence, 12650 participants who successfully completed at least a course were taken as a sampling frame for this study.

3.3. Sampling Technique

The units of analysis for this study are e-learning participants of the e-learning system of Ethiopian Airlines.

Brace (2008) stresses that the research sampling is an essential stage in social research. The study sample has to be determined accurately as it plays a key role in answering the research question(s) and achieving the study objectives (Brace, 2008). Brace (2008) further explains that the essential objective of social science studies is to test theories and hypotheses. However, it is often difficult and sometimes impossible to reach all population members to include them in a study (Healey, 2009). To solve this problem, researchers are required to select a sample from the population of study. In this regard, Elsheikh states that the researcher may chose for a small group of people who are representatives of a large group and therefore the results could be generalized more accurately for a larger group of population (2011, p. 187).

The study population is all the users of the e-learning system at Ethiopian Airlines. However, most of the e-learning participants on the e-learning system of Ethiopian Airlines do not have valid e-mails to contact them for this survey. Hence, only participants with valid e-mail addresses on the e-learning system were selected as samples for this study. Accordingly, the sampling method used in this study is convenience sampling. Zikmund et al. define convenience sampling as a means of getting those people or units that are most conveniently reachable (2009, p. 396). Regarding the reason behind using this method, Denscombe (2010) states that as researchers have limited funds and time for the project, it is sensible that the researchers choose the most conveniently available samples whenever there is choice between two or more equally valid possibilities for inclusion in the sample (2010, p. 38). The use of a convenience sample is appropriate when the researcher can easily access potential respondents through existing contacts, and the sample is a typical representative (Saunders et al., 2012).

The justification for the adoption of this method are as follows:

- The survey was done via the internet by sending the link for the questionnaire on Google Forms via e-mail addresses. However, getting the e-mail addresses of all e-learning participants is cumbersome and would be prohibitively costly and time-consuming and selecting those with valid e-mail addresses on the e-learning system can assist in minimizing the constraints of time and finance.
- The researcher has had ready access to the e-learning system of Ethiopian Airlines to easily get the e-mail addresses of the participants

3.4. Data Collection Method

The research is quantitative, and the data collection method employed in this research is the survey method. According to Saunders, et al (2009, p. 144), surveys are popular as they permit

the collection of a large amount of data from a large population in a highly inexpensive way. Stangor (2011, p.107) states that surveys are commonly used data collection methods due to its ability to collect a wide range of data about different variables in a relatively short timeframe. The technique used in this research is questionnaire.

Data can be collected using different methods, for instance, telephone interview, door-to-door personal interview, mail survey, internet survey and mall intercept personal interview (Zikmund et al., 2009).

The reasons for using the internet survey for this study are:

- E-learning participants must use the internet to take their courses, and hence they are familiar with using computers and that makes completion of the questionnaire simple for them (Alsabawy, 2012, p. 145).
- The respondent can complete the questionnaire form anywhere at any time providing him geographical and temporal freedom (Alsabawy, 2012, p. 145).
- Internet survey enables researchers automated data transfer to the statistical software package directly rather than enter it manually (Stangor, 2011, p. 339). This removes a very awkward task of the need to enter the data manually and avoids mistakes in entering the data.
- Low internet cost and a fast response (Alsabawy, 2012, p. 145).

3.5. Data Collection Instrument

The researcher has selected a questionnaire as an instrument to collect the data. Questionnaire is a suitable instrument to collect the data for the research method selected for this study. Connaway and Powell (2010, p. 146-147) describes that many benefits can be gained from using a questionnaire such as: eliminating interviewer bias; facilitating collection and analysis of data; encouraging participants to answer frankly; eliminating variation in the questioning process; collecting large amount of data in a short timeframe; and it is economical to manage. Questionnaires can be sent to many people who live anywhere regardless of time and place constraints (Leedy & Ormrod, 2015, p.160; Oppenheim, 1992, p. 108). This is considered the key advantage of using questionnaires in this study because the study sample, particularly trainees, are distributed in different countries around the world where Ethiopian Airlines Operates. In this study, the items comprising the questionnaires are adopted from previous studies.

3.6. Measurement Scale

Likert scale is the most popular scale to measure people's attitude and perceptions about topics under study (Stangor, 2011, p.75). Zikmund et al. define Likert scale as "A measure of attitude to allow respondents to rate how strongly they agree or disagree with carefully constructed statements, ranging from very negative to very positive attitudes toward some object" (2009, p. 318). Likert scale is suitable for this study because its main purpose is to evaluate e-learning effectiveness via the attitude and opinions of trainees. The 5-point Likert scale is used in the questionnaires of the study with a scale of: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree.

3.7. Measurement of Constructs

Table 3. 2: Measurement of Constructs

No	Construct	Measurement Items	Sources
1	System Quality	SQ1: The e-learning system is easy to use SQ2: The e-learning system is easy for me to navigate and learn	Shee (2008), Al-Sabawy (2013), Wang 2007, Lin 2007; Yeung (2007), Petter et al (2008)
		SQ3: The e-learning system is user-friendly	Shee (2008), (Wang 2007)
		SQ4: The on-line course was available whenever I needed it SQ5: The e-learning system is available most of the time SQ6: There are enough computers to use and practice SQ7: There is an easy access to internet at ET compounds	Shee (2008), Wang (2007), Lin (2007); Yeung (2007), Soong, et al, (2001), Selim (2007)
		SQ8: The e-learning system gives me flexibility as to time and place of use	Samarasinghe (2012), Wang (2007)
		SQ9: The e-learning system provides high-speed information access SQ10: Browsing speed for e-learning was satisfactory	Samarasinghe (2012), Wang (2007), Yeung (2007), Selim (2007)
		SQ11: The e-learning system is reliable SQ12: The rate at which the e-learning system displays information is enough SQ13: The network connection to internet has been satisfactory while accessing	Lin (2007), Yeung (2007) Samarasinghe (2012), Wang (2007)
		SQ14: The response time of the e-learning system is very good	Yakubu (2018)
2	E-learning Content Quality	CQ1: The e-learning system provides me useful content CQ2: I find e-learning to be useful in my job	Shee & wang 2008; Yeung & Jordan, 2007
		CQ3: The e-learning system provides content that is easy to understand	Wang 2007, Ozkan 2009, Wang (2003)
		CQ4: The e-learning system provides content that is relevant to my job CQ5: The e-learning system provides content that exactly fits my needs	Yeung (2007); Lin 2007, Wang 2007, Wang 2003, Freeze

No	Construct	Measurement Items	Sources
		CQ6: The e-learning course content is up-to-date enough for my purpose	Shee (2008), Ozkan (2009), Wang (2007), Samarasinghe 2012; Lin (2007)
		CQ7: The e-learning course content is accurate CQ8: The course content is covered to an appropriate degree of breadth	Lin (2007), Ozkan 2009, Shee 2008, Wang 2007
		CQ9: The e-learning system provides sufficient content	Ozkan 2009, Shee & wang 2008, Wang (2003)
3	Support Quality	SUQ1: I get satisfactory support to use the e-learning system	Wang 2007, Selim 2007
		SUQ2: The academy responds to my requests in a timely manner	Lee (2008); Holsapple & Lee-Post (2006)
		SUQ3: The staff in charge of e-learning has the technical ability to answer my requests	Lee (2008)
		SUQ4: I get prompt responses for my e-learning support requests	Holsapple & Lee-Post (2006)
		SUQ5: The e-learning support staff are available to support my e-learning queries whenever I needed them	Holsapple & Lee-Post (2006)
4	Learner Motivation	LM1: I find the e-learning system enjoyable LM2: The actual process of using the e-learning system is pleasant LM3: I have fun using the system	Venkatesh (2002)
		LM4: I think what I learn through e-learning is useful for my promotion LM5: I think what I learn through e-learning is useful to increase my knowledge LM6: I think what I learn through e-learning is helpful for me to remain current on my job	Chiu & Wang (2008)
5	Computer & Internet Self Efficacy	SE1: I enjoy using personal computers SE2: I was comfortable with using the PC and software applications before I took up e-learning courses SE3: I am not intimidated by using the e-learning based courses SE4: I feel confident using a computer to learn about and apply new concepts SE5: Using a computer is an efficient way for me to learn new things SE6: I can apply new concepts that I learned from the e-learning system	Selim (2007) Santhanam et al (2008)

No	Construct	Measurement Items	Sources
		SE7: I am comfortable using the e-learning system SE8: I can successfully use the e-learning system SE9: It is easy for me to become skillful at tasks learned from the e-learning system	
6	Use of E-Learning System	US1: I use the e-learning system frequently to study different courses US2: In most cases, I use the e- learning system, because I choose to, not because I have to. US3: I use the e-Learning system a lot	Samarasinghe (2012), wang (2007)
7	Learner Satisfaction	LS1: I am satisfied with the performance of the e-learning system LS2: The online courses serve my needs well LS3: The e-learning system is useful LS4: I am pleased with the experience of using e-learning LS5: I think the decision to use e-learning is a wise one LS6; I am very satisfied with the information I receive from the e-learning system LS7: As a whole, the e-learning system is successful LS8; As a whole, I am satisfied with the e-learning system	Al-Sabawy2013, Samarasinghe 2012 Wang (2007); Lin 2007
8	Perceived Learning	PL1: The e-learning system helps me improve my job performance PL2: The e-learning system helps me think through problems PL3: The e-learning system helps me remain current PL4: The e-learning system improves my knowledge PL5; I feel more self-reliant as the result of what I learned in the e-learning system PL6: The e-learning system helps me save time to study required courses PL7: The e-learning system gives me more convenience for my studies	Wang (2007); Samarasinghe (2012)

3.8. Data Analysis Technique

Different statistical methods are used to describe the constructs of the study and to test the study hypotheses. Structural Equation Modelling (SEM) Technique was used to test the research model and hypotheses for this research.

Hair, et al defined Structural Equation Modelling (SEM) as "Multivariate technique combining aspects of factor analysis and multiple regression that enables the researcher to simultaneously examine a series of interrelated dependence relationships among the measured variables and latent constructs (variates), as well as between several latent constructs" (2019, p.606).

According to Saunders, et al (2009, p. 140), Structural Equation Modelling is helpful to study and create causal relationships between variables. Stangor (2010, p.176) states that structural equation analysis allows to draw conclusions about the possible causal relationships among measured variables. Hence, the causal relationships among the constructs is analyzed using the structural equation modeling technique.

The reason for selecting SEM for data analysis for this study are:

- SEM enables concurrent estimation of multiple and interrelated dependence relationships (Hair, et al, 2019, p. 607)
- SEM enables to represent unobserved concepts in these relationships and account for measurement error in the estimation process (Hair, et al, 2019, p. 607)
- SEM enables testing of the whole model fit and provides comprehensive statistical indicators for assessing and modifying the models (Kline, 2011).
- SEM Enables estimation of latent variable scores for follow-up analyses (Hair, et al, 2019, p.5)
- SEM offers solutions with small sample sizes when models consist several constructs and many items (Hair, et al, 2019, p.5)

SEM includes two main sub-models: the measurement model and the structural model (Byrne, 2010). SEM provides a better way of empirically investigating a theoretical model by involving both the measurement and the structural models in one analysis (Hair, et al, 2019, p.699).

The latent variables cannot be measured directly because they are theoretical constructs, therefore, the observed or indicator variables should be identified (Zulu, 2007). In other words, latent variables can be measured through observed variables and the significance of each

indicator in measuring these constructs can be examined. The measurement model can be represented by using Confirmatory Factor Analysis (CFA) (Byrne, 2010). CFA is commonly used in establishing and testing the measurement models that are used to study specific phenomena. According to Marsh (1985), there are three motives why CFA is considered better than exploratory factor analysis. The first reason is that Confirmatory Factor Analysis allows researchers to design models that are to be inspected, whereas in exploratory factor analysis the researcher has little control over the model. Second, parameter estimates from CFA are unique so long as the proposed model is identified (Marsh, 1985, p. 432). Third, all required goodness of fit indicators are provided by the CFA. According to Marsh (1985), researchers can use these goodness-of-fit indicators to assess different models using the same data and testing the fitness of the same model with data from different groups. In this regard, Doll et al. state that "Confirmatory factor analysis involves the specification and estimation of one or more assumed models of factor structure, each of which proposes a set of latent variables (factors) to account for covariance among a set of observed variables" (1994, p. 454). Finally, CFA enables the testing of convergent and discriminant validity (Kline, 2011).

IBM SPSS 26 has been used as a descriptive data analysis tool at a few points in this study. However, SMARTPLS 3.0 is the main statistical data analysis software used in this study (Ringle, C. M., Wende, S., and Becker, J.-M. 2015). Partial Least Squares (PLS) technique is used to test the measurement and the structural models. There are reasons on why PLS is used to analyse the data in this study. First, Goodhue, et al (2006) recommended the use of PLS with large models. Hence, PLS is the most viable approach for this study as the model tested in this research is relatively large and complex with 8 latent variables (constructs) and 61 measurement items. Second, PLS results are easy to compare with other existing e-earning studies so that the meaning of the results is better understood in the context of existing research.

The other two alternatives to PLS most commonly used in MIS research are linear regression and covariance-based SEM (Gefen & Straub, 2000). The use of linear regression is not appropriate because of the complexity of the model in this study as there are 8 interdependent constructs and about 61 measurement items. On the other hand, covariance-based SEM is not also appropriate because of the size of the model. Moreover, covariance-based techniques are recommended for use with well established models, while PLS is seen to be more appropriate for new models (Hensler, Ringle, & Sinkovics, 2009).

3.8.1. Data Screening

As per Mujis (2004), missing data often occurs as respondents do not fill a particular item or fill it incorrectly. However, only very few missing data is expected in this research as the Google Forms software does not allow respondents to skip an item. Despite the extremely low missing data expectation, missing data identification procedure is performed. Hair et al (2019, p. 72) recommends using any of the imputation methods whenever the extent of the missing data is less than 10%.

After estimating the missing data, the existence of outlying values should be identified in the set of data. Pallant defined outliers as observations with values well above or below the mainstream of other observations (2011, p. 64). Uncorrected miscoding can be considered the most obvious cause of outliers (Holmes-Smith, 2011), which is not possible in this study as data is transferred to the analysis software electronically.

However, no outliers are expected in this study as the instrument used is a 5-point Likert scale, where the respondents will only select any of the values between 1 and 5.

3.8.2. Data Distribution

Smart PLS does not need any distributional assumptions; and works well with non-normal data, which definitely is an advantage for using PLS-SEM. (Hair, et al, 2019, p.6). Since this study uses SEM-PLS, testing for normally of data was not required.

3.9. The Structural Equation Modeling

The Structural Equation Modeling has two components: the measurement model that contains the indicators and their relationships with the constructs; also called the outer model and the structural model (the inner model) containing a series of interrelated dependence relationships (equations) where the dependent construct in one relationship may be a predictor construct in another relationship (Hair, et, al, 2019). The measurement model shall be first tested for reliability and validity of the measurement items and the constructs before proceeding to the structural model.

3.9.1. Testing the Measurement Model

The reliability and validity tests are performed to establish the robustness of the measurement instruments for this research. The strength of the measurement models is tested by means of item reliability, internal consistency reliability, convergent validity and discriminant validity.

3.9.1.1. Item reliability

As per Gefen & Straub (2000), the reliability of an item reflects the degree to which the item value reflects the value of the estimate of the underlying construct provided by the measure, and is given by the factor loading for the measurement variable. Hair et al recommended a 0.5 cut-off value for standardized factor loadings, and this cut-off value is used in this research (2019, p.663).

3.9.1.2. Internal Consistency Reliability

Internal consistency reliability refers to the extent to which the set of the items intended to measure a construct varies in concert, indicating that the items are likely to reflect a single underlying construct. Cronbach alpha and composite reliability are commonly used in SEM analysis to estimate internal consistency reliability. A Cronbach alpha coefficient above .7 indicates an acceptable level of reliability (Nunally & Bernstein, 1994). In this research, Cronbach alpha values were used to assess the internal consistency reliability of the measurement items, with the cut-off value of .7.

3.9.1.3. Construct Validity

Validity of a measurement instrument refers to the ability of the measurement items to actually measure the constructs they are supposed to measure (Hair et al., 2019). As the true values of latent constructs cannot be obtained in principle, the validity cannot be assessed directly. On the other hand, there are a number of properties a measure can possess that can be seen as evidence (but not proof) of validity. In this research, as it is a common practice in SEM, convergent validity and discriminant validity are assessed to provide evidence of the measure validity.

3.9.1.4. Convergent Validity

Convergent validity refers to the extent to which the measurement items of a construct are similar to the other measurement items of the same construct (Phang,et al, 2006; Hair, 2019). Item reliability and internal consistency reliability constitute evidence of convergent validity. Further evidence is provided by average variance extracted (AVE), which corresponds to the average (across the items of the measure) variance in item value predicted by the underlying construct, as it is estimated in the model (Hair et al., 2019).

3.9.1.5. Discriminant Validity

Discriminant validity, on the other hand, refers to the extent to which measurement items of a particular construct reflect its own construct, rather than other constructs in the same measurement model (Hulland, 1999). One way of demonstrating discriminant validity is by considering the factor loadings of measurement items on all constructs in the model. If the factor loadings of an item higher on its constructs than on other constructs, it is an evidence of discriminant validity (Thompson, Higgins, & Howell, 1991).

Another way to test the discriminant validity of measurement items is to check if the square root of AVE value for each construct is greater than correlations of the construct with other constructs (Fornell & Larcker, 1981). If this condition is met, constructs of the model explain more variance in their items than they share with each other.

3.9.2. Testing the Structural Model

Th researcher needs to assess the structural model after verifying that all the criteria for the measurement model are met (Hair, et al, 2019, p.7). After validating the measurement model, the subsequent step is to test the structural model to determine the model's overall explanatory power and to test the specific proposed hypotheses regarding cause-effect relationships between constructs.

As per Hair, et al (2019), the explanatory power of the research models was evaluated by examining the coefficient of determination (R^2) values. R^2 value is the fraction variance in a dependent variable explained by the factors affecting it. Cohen (1988) suggested that R^2 values of around 67% correspond to substantial explanatory power, R^2 values of around 33% correspond to average explanatory power, and values of around 19% correspond to weak explanatory power. However, Falk and Miller (1992) suggested that R^2 values above 10% correspond to substantive explanatory power.

Path coefficients indicate the strength of a cause-effect relationship among different interrelated variables (Hair, 2019; Wang & Chiu, 2011). Each hypothesised relationship corresponds to a path in the formulated structural model. In SMARTPLS, the bootstrapping procedure is used to evaluate the significance of path coefficients β values (Hair, 2019; Chin, et al, 2003). The bootstrapping procedure generates a number of random samples of data based on the original sample. One Thousand bootstrap samples were used in this research, as recommended by Chin et al. (2003). The statistical significance of path coefficients was

calculated using t-tests for bootstrap samples. The statistical significance level was set at 5% ($p < .05$), unless explicitly stated otherwise. Pallant (2011) and Tabachnick and Fidell (1996) recommended that path coefficients should be above 0.2 for the relationship to have a practical significance, setting a more stringent requirement.

3.10. Ethical Considerations

Saunders, et al (2009, pp. 183-201) states that numerous types of ethical issues arise to individuals and organizations at all stages of the research process while planning, data collection, analysis and reporting phases of the research. Accordingly, a researcher must take suitable ethical considerations throughout all the stages of the research (Saunders, et al, 2009, pp. 183-201).

Hence, appropriate ethical considerations are taken in all stages of this research. In this research, the selected samples were invited to respond to the survey questionnaires anonymously using Google Forms. The participants were clearly informed and ensured that their responses are anonymous, and the data obtained is to be used only for research purposes. The cover letter also stated that they have a right not to participate or not to answer any or all of the questions in the questionnaire. Besides, the cover letter stated that the data obtained from each participant will be processed, stored, analysed and reported in a way confidentiality is strictly maintained at all times. The letter also described the objectives of the research clearly and ensured them that it will only be used for research purposes. In addition, the cover letter clearly specified that the data collected, the way it is collected or any information the participants shared will not cause any harm to the respondents in any way.

Further to the above ethical considerations, Google Forms was disabled not to collect their emails and identity to keep it anonymous.

In addition, all the questions, except their departments, are close-ended and there is no option for the participants to provide unsolicited details via the survey instrument.

4. Data Analysis and Interpretation

4.1. Introduction

The purpose of this chapter is to present the results of the data analysis of the research. The chapter begins with a discussion of data screening, response rate and the results of testing for non-response bias followed by the descriptive statistics of the characteristics of the respondents. This is followed by the analysis of the Structural Equation Model (SEM) at two levels.

IBM SPSS (version 27) and the respondent responses of Google Forms were used to analyze the descriptive statistics and SMARTPLS 3.0 was used to test non-response bias and the structural equation model. The model was tested at two dimensions: the measurement model and the structural model.

4.2. Data Screening

For this study, outliers are not expected to occur as the data is collected electronically with a 1-5 Likert Scale using Google Forms. The final electronic data is downloaded from Google Forms as Comma Delimited Values (.csv) and uploaded to SPSS and SMARTPLS softwares. Hence, no manual intervention in handling the data from data collection until the end result. Therefore, there is very little chance of errors and/or outliers. In spite of these, the data was checked for outliers via the SPSS frequency distributions and the values were confirmed to be between 1 and 5 (the range of scale used in this study).

There were only 9 missing data out of 1289 respondents as the Google Forms don't allow respondents to pass a question. According to Hair (2019, p. 60), such missing data are called ignorable data and no remedial action was required.

Hair et al (2019) states that SmartPLS does not require normal distribution of the data. Hence, normality has not been checked in this study as SmartPLS is employed for the main analysis of the data.

4.3. Response Rate

Convenience sampling was used as described on section 3.3 of this paper. Data collection was carried out over a one-month period from March 31 to April 30, 2021. As shown on table 4.1 below, there were only 7650 valid emails on the e-learning system from a total of 12,136 active e-learning users who have taken at least one course in the last two years from January 1, 2019

to December 31, 2020. An email invitation along with link for the survey questionnaires was sent to all of those e-learning participants with a valid email address at once using the Ethiopian airlines outlook mail merge system.

A huge number of the sent e-mails (3738) bounced back as a significant number of the participants were registered to the online learning management system by IT by just generating a fictitious email in the absence of the participants. The participants require only a username and password to login to the e-learning system. Hence, the effective sample for whom email was sent was 3912.

The participants were requested to respond for the survey within 30 days from March 31 to April 30, 2021. During this period, 1289 responses were received on Google Forms; and the survey was closed from accepting responses effective April 30, 2021. Of the responses received, only 9 of them were incomplete. As per the recommendations of Hair et al (2019), these missing data were discarded and treated as ignorable. The reason for not having substantive number of missing data on this survey is that Google Forms was tied not to allow respondents bypass a question without marking their responses. Hence, there are 1280 usable responses.

The following table summarizes the response rate of the survey.

Table 4. 1: Sampling Frame and Sample Size

No	Description	Sampling Frame
1	Total Population (A)	12136
2	Attendees with email address (B)	7650
3	# Bounced back emails (Undeliverable) due to invalid emails (C)	3738
4	Sample (D) (A-(B+C)	3912
8	# Responses (E)	1289
9	Response rate (%) (E/D)	32.95%

As shown in the above table, the response rate is 32.95%, and this is considered a satisfactory response rate as it exceeds the reasonable level for mail and e-mail surveys (Hart, 1987; Nachmias, 1987; Rao, 2003). Hart (1987) suggested that the common response rate in a business population is between 18 and 27 percent. Nachmias (1987) proposed between 20 percent and 40 percent as a typical response rate of mail survey. However, several studies confirmed that the response rate for Internet surveys is lower than a hard copy survey (Kaplowitz, et al 2004; Ranchhod & Zhou, 2001; Shih & Fan, 2008).

Tse et al. (1995) conducted a research to compare the response rates of two methods methods of communication: email versus mail. The results exhibited that the response rate from e-mail was 6 percent as compared to 27 percent from mail. Similar results were obtained by the same author in another study in 1998: 7 percent response from e-mail as compared to 52 percent from a mail survey. The response rate for this study is 32.9%, which is an excellent response rate based on the findings of the above studies on internet surveys.

While one might prefer to use a small sample to improve the appearance of fit, such justification of a small sample is against the notion of using as large a sample as possible to ensure representativeness and generalizability (Hair, et, al, 2019, p.641). The respondents for this study come from all areas of the airline as evidenced from their responses for question item A.7, which asks their department. In addition to the representativeness of the sample, the sample size is very large which enhances generalizability of the findings and recommendations of this research paper.

4.4. Testing for Non-Response Bias

Non-response bias is the difference between the potential respondents who responded and those who did not. De Vaus (2002) expressed that a low response rate in a study might bias the results of a study and mail surveys have been criticized for this problem. Study results could suffer from non-response bias even with high participation rates in case the non-respondent group is distinctly different from the respondents (Kotaniemi, et a, 2001).

According to Hair, et (2019), the study sample is not representative of the target population whenever there is a non-response bias, and this hinders the ability to make generalisations of the study. The commonly suggested method for guarding against non-response bias is to assess the effect of non-response (Wayne, 1975). To check that the sample in this study was representative of the larger population, an examination of non-response bias was conducted by

comparing early respondents with late respondents, male with female respondents, respondents with different work experience levels.

SmartPLs 3.0 Multi-Group Analysis was used to examine the non-response bias using t-tests at 5% significance level ($p < .05$) to compare early respondents with late respondents, females with males, respondents with 1-5 years work experience with 20+ years of work experience and those respondents with work experiences of 11-15 against 16-20. The first 640 respondents were considered early respondents, and the second half of the respondents were considered late respondents. Besides, basic demographic data (gender, age and experience) were used for the comparison, as suggested by Hair et al (2019, p. 782). As shown on tables, 4.2, 4.3, 4.4 & 4.5, there are no statistically significant differences amongst the majority of the different comparison groups especially on the hypotheses supported in this study. Hence, there is no non-response bias and the sample can be considered as a representative for the population.

Table 4. 2: Comparison of Early versus Late respondents

Relationship	Path Coefficients-diff (Late-Early Respondents)	t-Value (|Late vs Early Respondents|)	p-Value (Late Respondents vs Early Respondents)	Decision
Content Quality -> Learner Satisfaction	-0.002	0.027	0.978	Insignificant
Content Quality -> Use	-0.172	1.902	0.057	Insignificant
Learner Motivation -> Learner Satisfaction	-0.109	1.633	0.103	Insignificant
Learner Motivation -> Use	-0.148	1.472	0.141	Insignificant
Learner Satisfaction -> Perceived Learning	0.005	0.117	0.907	Insignificant
Learner Satisfaction -> Use	0.156	1.532	0.126	Insignificant
Self-Efficacy -> Learner Satisfaction	0.03	0.487	0.626	Insignificant
Self-Efficacy -> Use	-0.01	0.114	0.909	Insignificant
Support Quality -> Learner Satisfaction	-0.04	0.686	0.493	Insignificant
Support Quality -> Use	0.189	2.708	0.007	Significant
System Quality -> Learner Satisfaction	0.112	2.075	0.038	Significant
System Quality -> Use	-0.01	0.136	0.892	Insignificant
Use -> Perceived Learning	-0.058	1.065	0.287	Insignificant

Source: SmartPLS 3 Multi-Group Analysis Parametric Test Result

Table 4. 3: Comparison of Female versus male respondents

Relationship	Path Coefficients-diff (Female - Male)	t-Value (|Female vs Male|)	p-Value (Female vs Male)	Decision
Content Quality -> Learner Satisfaction	-0.007	0.111	0.912	Insignificant
Content Quality -> Use	-0.14	1.395	0.163	Insignificant
Learner Motivation -> Learner Satisfaction	-0.123	1.694	0.091	Insignificant
Learner Motivation -> Use	-0.094	0.872	0.383	Insignificant
Learner Satisfaction -> Perceived Learning	0.003	0.069	0.945	Insignificant
Learner Satisfaction -> Use	0.12	1.107	0.269	Insignificant
Self-Efficacy -> Learner Satisfaction	-0.028	0.41	0.682	Insignificant
Self-Efficacy -> Use	0.095	1.071	0.284	Insignificant
Support Quality -> Learner Satisfaction	0.022	0.379	0.705	Insignificant
Support Quality -> Use	0.091	1.244	0.214	Insignificant
System Quality -> Learner Satisfaction	0.14	2.364	0.018	Significant
System Quality -> Use	-0.128	1.668	0.096	Insignificant
Use -> Perceived Learning	-0.083	1.476	0.14	Insignificant

Source: SmartPLS 3 Multi-Group Analysis Parametric Test Result

Table 4. 4: Comparison of 1-5 years versus 20+ years' work experience

Relationship	Path Coefficients-diff (1-5 years - 20+ years)	t-value (|1-5 years vs 20+ years|)	p-value (1-5 years vs 20+ years)	Decision
Content Quality -> Learner Satisfaction	0.019	0.159	0.874	Insignificant
Content Quality -> Use	-0.026	0.164	0.87	Insignificant
Learner Motivation -> Learner Satisfaction	-0.351	3.042	0.002	Significant
Learner Motivation -> Use	-0.052	0.258	0.796	Insignificant
Learner Satisfaction -> Perceived Learning	-0.089	0.979	0.328	Insignificant
Learner Satisfaction -> Use	-0.14	0.742	0.459	Insignificant
Self-Efficacy -> Learner Satisfaction	0.105	0.96	0.337	Insignificant
Self-Efficacy -> Use	0.011	0.08	0.936	Insignificant
Support Quality -> Learner Satisfaction	0.128	1.24	0.215	Insignificant
Support Quality -> Use	0.222	1.617	0.106	Insignificant
System Quality -> Learner Satisfaction	0.081	0.887	0.376	Insignificant
System Quality -> Use	-0.125	0.844	0.399	Insignificant
Use -> Perceived Learning	0.073	0.705	0.481	Insignificant

Source: SmartPLS 3 Multi-Group Analysis Parametric Test Result

Table 4. 5: Comparison of 11-15 years versus 16-20 years' work experience

Relationship	Path Coefficients-diff (11-15 Years - 16-20 years)	t-Value(|11-15 Years vs 16-20 years|)	p-Value (11-15 Years vs 16-20 years)	Decision
Content Quality -> Learner Satisfaction	-0.019	0.141	0.888	Insignificant
Content Quality -> Use	0.13	0.629	0.53	Insignificant
Learner Motivation -> Learner Satisfaction	0.1	0.775	0.439	Insignificant
Learner Motivation -> Use	0.256	1.266	0.207	Insignificant
Learner Satisfaction -> Perceived Learning	-0.118	1.235	0.218	Insignificant
Learner Satisfaction -> Use	-0.214	0.996	0.32	Insignificant
Self-Efficacy -> Learner Satisfaction	-0.187	1.447	0.149	Insignificant
Self-Efficacy -> Use	-0.046	0.272	0.786	Insignificant
Support Quality -> Learner Satisfaction	-0.149	1.497	0.136	Insignificant
Support Quality -> Use	0.012	0.083	0.934	Insignificant
System Quality -> Learner Satisfaction	0.233	1.899	0.059	Insignificant
System Quality -> Use	-0.226	1.314	0.19	Insignificant
Use -> Perceived Learning	0.089	0.805	0.421	Insignificant

Source: SmartPLS 3 Multi-Group Analysis Parametric Test Result

As can be seen in the above tables (Tables 4.2-4.5), there are no significant differences amongst the different groups of respondents categorized as early respondents versus late respondents, females versus males, different levels of experiences. Hence, there is no non-response bias and the sample can be considered as a representative of the population.

4.5. Descriptive Statistics

Zikmund et al. define descriptive statistics as 'Statistics which summarize and describe the data in a simple and understandable manner' (2009, p. 413). The main purpose of descriptive statistics is to check variables for any violation of the assumptions that are the basis of the statistical techniques used to address research questions (Pallant, 2011).

Appendix C summarizes the number of valid responses, number of missing data, mean, standard deviation, skewness and kurtosis for each measurement item.

The minimum mean across all measurement items is 3.37 for "In most cases, I use the e-learning system, because I choose to, not because I have to", which is well above the mid point evaluation of 2.5 in a scale of 5. A further analysis of this item shows that 7.2% of the respondents strongly disagree (rated it 1), 19.1% of the respondents disagreed and 52.3% of the respondents are neutral. This shows that a relatively significant portion of the e-learning participants believe that they use the e-learning system because it is required for their job, not because they choose to use it.

The measurement item “I find e-learning to be useful in my job” is the highest rated with a mean of 4.31 which shows that e-learning participants highly believe in the importance of e-learning for their job: about 50% of the respondents rated it 5 and 36% rated it 4.

4.5.1. Respondent Demographics

An analysis of the characteristics of the sample is presented in this section based on gender, age, level of education, work experience in Ethiopian Airlines and number of online courses taken since employment.

A. Gender

As shown in the Figure 4.1, the majority (65.7%) of the respondents were males. Thus, the number of male respondents was almost double than that of female respondents.

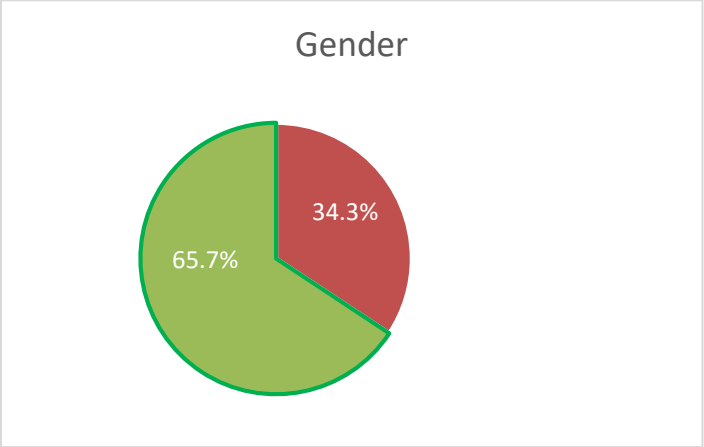

Figure 4. 1: Gender Distribution
Source: IBM SPSS 27 Output

B. Age

As shown on figure 4. 2 below, the majority of the respondents (85%) were below the age of 40. Close to 50% of the respondents are below 30 years old and only 4.3% of the respondents are above 50 years old.

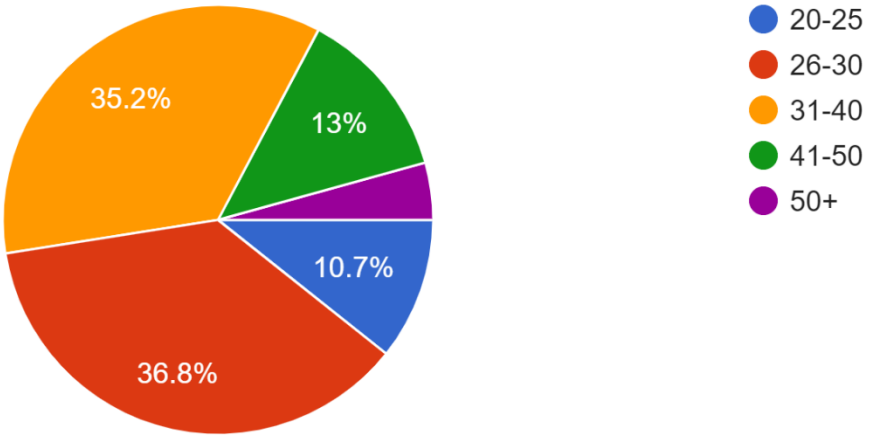

Figure 4. 2: Age Distribution of Respondents

Source: Google Forms output

Based on the data from Ethiopian Airlines, 85% of the workforce of Ethiopian Airlines Employees are younger than 30 years old. Hence, the above sample is a representative of the total Ethiopian Airlines employees' population.

C. Level of Education

The survey on the educational level of respondents shows that about 64% of the respondents do have a first degree and about 16% of the respondents do have a masters degree. The rest of the respondents do have varying levels of education as indicated on figure 4. 3 below.

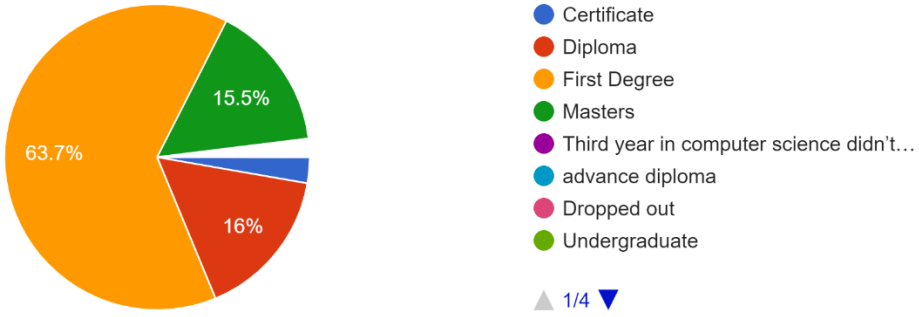

Figure 4. 3: Educational level of respondents
Source: Google Forms Output

D. Work Experience

Most participants of the e-learning system at Ethiopian Airlines do have a work experience of less than 10 years as shown on the below bar graph (73%) and only 9% of the respondents have a work experience of over 20 years amongst the 1280 valid respondents received. This is in line with the distribution of the total employees of Ethiopian Airlines. Hence, the sample is a

very good representative of not only e-learning participants but also the total population of Ethiopian Airlines employees.

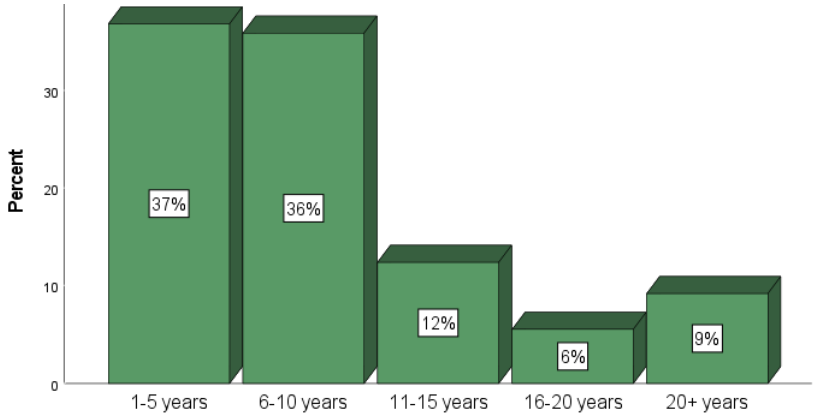

Figure 4. 4: Work experience of the respondents
Source: IBM SPSS 27 output

E. Number of E-learning Courses

The survey indicates that the majority of the respondents have taken several online courses. The following table summarizes the number of courses the respondents took since their employment. As can be seen, about 47% of the respondents took over 10 courses and 28% of the respondents have taken 4-6 courses. This shows that a huge proportion of the respondents took over 10 e-learning courses.

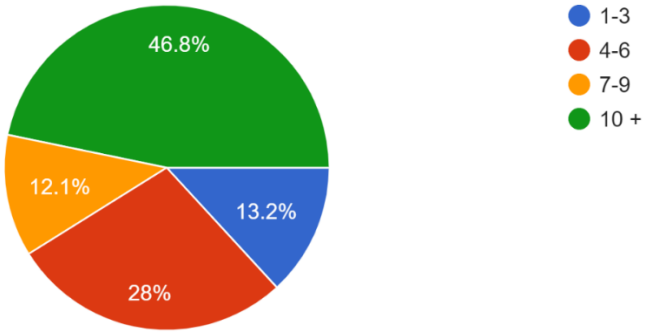

Figure 4. 5: Number of e-learning courses respondents took since employment
Source: Google Forms Output

4.6. The Structural Equation Model (SEM)

As described in chapter 3 of this paper, the main data analysis technique used for this study is the structural equation modeling (SEM) technique. The structural equation modelling technique has two parts: the measurement model and the structural model (Hair, et al, 2019, p. 28). The first stage in applying the SEM is the Confirmatory Factor Analysis model also

referred to as the outer model or the measurement model (Hair, et al, 2019, p. 28). Hair et al states that the CFA model identifies the contribution of each measured variable to its construct as well as evaluating the reliability and validity of the measurement models (p. 28).

Hence, this study tested the measurement model before proceeding to the structural model.

4.6.1. Testing the Measurement Model

The research model comprises of eight constructs with 61 measurement items. Five of the eight constructs are exogenous and the other three are endogenous. The key measurement of the relationship between the observed variables and the latent variable is the factor loading for each indicator against the factor. In other words, factor loading is the correlation between the measurement items and the factors, and it is the key to understanding the nature of a particular factor (Hair et al, 2019, p. 123). Hair (2019) further explains that the squared factor loadings indicate what percentage of the variance in an observed variable is explained by a factor.

4.6.1.1. Construct Reliability and Validity

Table 4.6 below depicts the results of the reliability and validity analysis made with the data collected from the e-learning participants using SmartPLS version 3.0 software ((Ringle, et al 2015). The Partial Least Square (PLS) measurement model results for this study are discussed in the following sections.

As shown on table 4. 6, all Cronbach alpha values and composite reliability values are greater than 0.7, which Nunnally (1978) suggested as a threshold for adequate internal consistency reliability.

Internal consistency reliability checks can be also seen as assessing convergent validity (Nunnally, 1978; Hair et al, 2019). Hence, the high internal consistency results obtained in this research with a much higher value than the .7 cut-off point for both Cronbach alpha and composite reliability shows a high convergent validity. Average Variance Extracted (AVE) values can also be used as evidence of convergent validity (Hair et al, 2019). According to Hair (2019), AVE values greater than .5 indicate acceptable levels of convergent validity. Table 4.6 below demonstrates that all constructs had AVE values greater than .5 except System Quality, which is slightly lower than 0.5 (0.466). Fornell–Larcker (1981, p.46) states that if AVE is less than .50, the variance due to measurement error is larger than the variance captured by the construct. It further explains that, however, AVE is a more conservative than the construct reliability measure (composite reliability). For this reason, Fornell-Larcker (1981, p.46)

suggests that the researcher may conclude that the convergent validity of the construct is adequate, even though more than 50% of the variance is due to error.

As shown on Table 4.6 below, the AVE value for System Quality is 0.466 which is close to .5 and all the other tests of reliability, Cronbach's alpha and composite reliability supported the reliability of all the constructs. Hence, as per the recommendations of Fornell-Larcker (1981, p.46), the researcher concluded that the convergent validity of the Systems Quality Construct is adequate as evidenced by the composite reliability and Cronbach alpha coefficient. As a result, the systems quality construct is retained.

Table 4. 6: Internal Consistency Reliability and Convergent Validity Test Results

Construct Name	No. of Items	Cronbach's Alpha	Composite Reliability	AVE
Content Quality	9	0.932	0.943	0.646
Learner Motivation	6	0.892	0.918	0.651
Perceived Learning	7	0.937	0.948	0.696
Learner Satisfaction	8	0.942	0.953	0.743
Self-Efficacy	9	0.905	0.922	0.571
Support Quality	5	0.913	0.935	0.744
System Quality	14	0.911	0.924	0.466
Use	3	0.81	0.888	0.726

Source: SMARTPLS 3.0 Output (2021)

4.6.1.2. Discriminant Validity Analysis

Discriminant validity is the level to which a construct or variable is truly discrete from other constructs or variables (Hair, et al, 2019). Thus, high discriminant validity provides evidence that a construct explains more of the variance in its item measures than it shares with another construct (Hair et al, 2019, p. 677). That is, each measured item loads more on its own construct than it cross-loads on other constructs.

Hair et al (2019, p.788) asserts that the Fornell-Larcker test provides initial evidence whether the model’s constructs meet the discriminant validity criteria. Table 4.7 reports the discriminant validity results of the measurement model. The square roots of AVE values (diagonal elements) were higher than correlation values in the off-diagonal elements of corresponding rows and columns.

Table 4. 7: Fornell–Larcker Discriminant Validity Results

Constructs	CQ	LM	PL	LS	SE	SUQ	SQ	US
CQ	**0.804**							
LM	0.772	**0.807**						
PL	0.768	0.792	**0.834**					
LS	0.728	0.795	0.830	**0.862**				
SE	0.672	0.671	0.729	0.685	**0.756**			
SUQ	0.639	0.613	0.607	0.55	0.532	**0.862**		
SQ	0.658	0.61	0.641	0.534	0.607	0.654	**0.682**	
US	0.472	0.565	0.585	0.589	0.477	0.412	0.455	**0.852**

Source: Smart PLS 3.0 Output (2021)

CQ-Content Quality; LM- Learner Motivation; PL- Perceived Learning; LS- Learner Satisfaction; SE- Learner Computer & Internet Efficacy; SUQ: Support Quality; SQ- System Quality; US- Use of the e-learning system.

A further recommended method for assessing discriminant validity with PLS-SEM is the HTMT test (Hair, et al, 2019, p. 788). The HTMT (heterotrait–monotrait ratio of the correlations) is the ratio of the between trait correlations to the within trait correlations.

Table 4.8 below shows the HTMT discriminant validity test. The rule of thumb threshold for the HTMT is a value of 0.90 if the path model constructs are conceptually similar; and a lower threshold value of 0.85 when the constructs in the path model are conceptually different (Hair, et al, 2019, p. 788). An HTMT value above 0.90 suggests a lack of discriminant validity and ratios below 0.85 provide a strong evidence of discriminant validity.

As can be seen from 4.8 below, all ratios are below the 0.9 level providing an evidence of discriminant validity for all the constructs in the path model.

Table 4. 8: HTMT Discriminant Validity Results

	CQ	LM	LS	PL	SE	SUQ	SQ	US
Content Quality								
Learner Motivation	0.845							
Learner Satisfaction	0.821	0.863						
Perceived Learning	0.777	0.866	0.893					
Self-Efficacy	0.72	0.725	0.767	0.719				
Support Quality	0.69	0.677	0.653	0.592	0.578			
System Quality	0.7	0.662	0.676	0.561	0.656	0.711		
Use	0.54	0.664	0.668	0.673	0.544	0.476	0.52	

CQ-Content Quality; LM- Learner Motivation; PL- Perceived Learning; LS- Learner Satisfaction; SE- Learner Computer & Internet Efficacy; SUQ: Support Quality; SQ- System Quality; US- Use of the e-learning system.

To additionally ensure the discriminant validity of each variable, the below cross loading table is displayed. As you can see from Table 4.9 below, each variable loads more on its own construct than on any other construct. The factor loadings of each observed variable on its corresponding latent construct is shown in **Bold**. This further confirms that the model has good discriminant validity.

Thus, the measurement model met all reliability and validity requirements justifying to proceed to the testing of the structural model.

Table 4. 9: Factor Loadings and Cross Loadings

Item	CQ	LM	LS	PL	SE	SUQ	SQ	US
CQ1	**0.778**	0.601	0.607	0.559	0.554	0.507	0.564	0.337
CQ2	**0.791**	0.641	0.624	0.609	0.546	0.44	0.474	0.37
CQ3	**0.793**	0.61	0.613	0.551	0.558	0.497	0.577	0.346
CQ4	**0.802**	0.623	0.594	0.613	0.58	0.437	0.451	0.397
CQ5	**0.832**	0.662	0.641	0.635	0.523	0.537	0.518	0.46
CQ6	**0.808**	0.626	0.615	0.587	0.491	0.529	0.516	0.411
CQ7	**0.806**	0.594	0.606	0.567	0.54	0.548	0.562	0.363
CQ8	**0.794**	0.596	0.615	0.559	0.55	0.553	0.567	0.35
CQ9	**0.829**	0.632	0.644	0.585	0.525	0.573	0.542	0.371
LM1	0.614	**0.836**	0.638	0.61	0.538	0.528	0.543	0.456
LM2	0.612	**0.835**	0.671	0.592	0.556	0.556	0.557	0.474
LM3	0.547	**0.79**	0.563	0.55	0.501	0.49	0.517	0.497
LM4	0.581	**0.753**	0.582	0.626	0.484	0.461	0.448	0.432
LM5	0.692	**0.829**	0.704	0.728	0.603	0.487	0.473	0.4
LM6	0.684	**0.795**	0.664	0.737	0.559	0.443	0.419	0.479
LS1	0.64	0.648	**0.805**	0.624	0.586	0.585	0.624	0.512
LS2	0.676	0.683	**0.821**	0.707	0.599	0.549	0.554	0.54
LS3	0.614	0.637	**0.793**	0.686	0.59	0.425	0.449	0.404
LS4	0.631	0.671	**0.849**	0.696	0.622	0.511	0.543	0.48
LS5	0.569	0.612	**0.805**	0.696	0.605	0.418	0.472	0.462
LS6	0.686	0.683	**0.864**	0.766	0.63	0.514	0.52	0.503
LS7	0.655	0.665	**0.855**	0.696	0.606	0.51	0.538	0.481
LS8	0.649	0.682	**0.878**	0.729	0.63	0.53	0.57	0.512
PL1	0.664	0.71	0.741	**0.879**	0.59	0.477	0.453	0.53
PL2	0.617	0.685	0.713	**0.866**	0.581	0.492	0.462	0.531
PL3	0.637	0.686	0.705	**0.861**	0.591	0.448	0.453	0.522
PL4	0.651	0.728	0.756	**0.891**	0.61	0.454	0.45	0.472
PL5	0.641	0.709	0.749	**0.881**	0.587	0.482	0.468	0.524
PL6	0.561	0.599	0.66	**0.794**	0.553	0.48	0.448	0.456

Item	CQ	LM	LS	PL	SE	SUQ	SQ	US
PL7	0.618	0.674	0.735	**0.856**	0.618	0.49	0.486	0.513
SE1	0.384	0.359	0.36	0.355	**0.62**	0.308	0.364	0.26
SE2	0.425	0.385	0.401	0.372	**0.679**	0.394	0.451	0.286
SE3	0.377	0.359	0.366	0.342	**0.621**	0.297	0.354	0.282
SE4	0.479	0.457	0.514	0.483	**0.778**	0.422	0.454	0.309
SE5	0.476	0.463	0.527	0.481	**0.768**	0.39	0.44	0.358
SE6	0.562	0.567	0.587	0.61	**0.803**	0.42	0.453	0.395
SE7	0.599	0.652	0.705	0.639	**0.86**	0.449	0.546	0.437
SE8	0.567	0.555	0.649	0.563	**0.832**	0.449	0.537	0.383
SE9	0.611	0.633	0.684	0.663	**0.798**	0.456	0.488	0.46
SQ1	0.448	0.423	0.439	0.376	0.439	0.442	**0.684**	0.254
SQ10	0.431	0.394	0.412	0.309	0.384	0.46	**0.76**	0.29
SQ11	0.589	0.527	0.576	0.469	0.489	0.512	**0.739**	0.365
SQ12	0.567	0.474	0.516	0.442	0.45	0.471	**0.714**	0.373
SQ13	0.367	0.347	0.344	0.259	0.358	0.438	**0.694**	0.235
SQ14	0.496	0.468	0.502	0.4	0.431	0.528	**0.77**	0.357
SQ2	0.453	0.442	0.45	0.372	0.45	0.405	**0.667**	0.283
SQ3	0.464	0.446	0.447	0.377	0.445	0.423	**0.668**	0.273
SQ4	0.347	0.289	0.333	0.262	0.32	0.37	**0.579**	0.289
SQ5	0.368	0.315	0.339	0.28	0.354	0.374	**0.652**	0.291
SQ6	0.288	0.287	0.3	0.255	0.324	0.415	**0.594**	0.239
SQ7	0.37	0.315	0.334	0.29	0.334	0.403	**0.594**	0.267
SQ8	0.401	0.438	0.443	0.387	0.46	0.45	**0.652**	0.347
SQ9	0.546	0.521	0.534	0.477	0.474	0.506	**0.75**	0.401
SUQ1	0.602	0.547	0.567	0.517	0.506	**0.798**	0.595	0.368
SUQ2	0.553	0.531	0.518	0.467	0.451	**0.878**	0.583	0.355
SUQ3	0.563	0.53	0.518	0.476	0.47	**0.873**	0.568	0.337
SUQ4	0.526	0.515	0.522	0.465	0.449	**0.899**	0.551	0.358
SUQ5	0.501	0.512	0.485	0.439	0.41	**0.86**	0.512	0.353
US1	0.42	0.492	0.52	0.507	0.441	0.354	0.417	**0.868**
US2	0.414	0.496	0.502	0.511	0.397	0.387	0.355	**0.812**
US3	0.368	0.452	0.469	0.484	0.379	0.306	0.39	**0.874**

Source: Smart PLS 3.0 Output (2021)

4.6.2. Testing the Structural Model and the Hypotheses

After ensuring the measurement model for its reliability and validity, the next step is testing the structural model to determine the relationship amongst the different latent constructs as well as the overall explanatory power of the model and test for the proposed hypotheses (Hair, et al, 2019, p.779).

Figure 4.6 below shows the path coefficients, which explain the strength of the relationships between constructs and the amount of variance explained by the model (R^2). As can be seen from figure 4.6 below, the coefficient of determination also referred to as the amount of

variance explained (R^2) for each endogenous variable is shown inside each corresponding latent construct.

As indicated in the figure, the model explains 37.9% of the variance in the use of the e-learning system, 73.2% of the variance in the learner satisfaction and 72% of the variance in the perceived learning. This shows that, overall, the model has a substantial explanatory power.

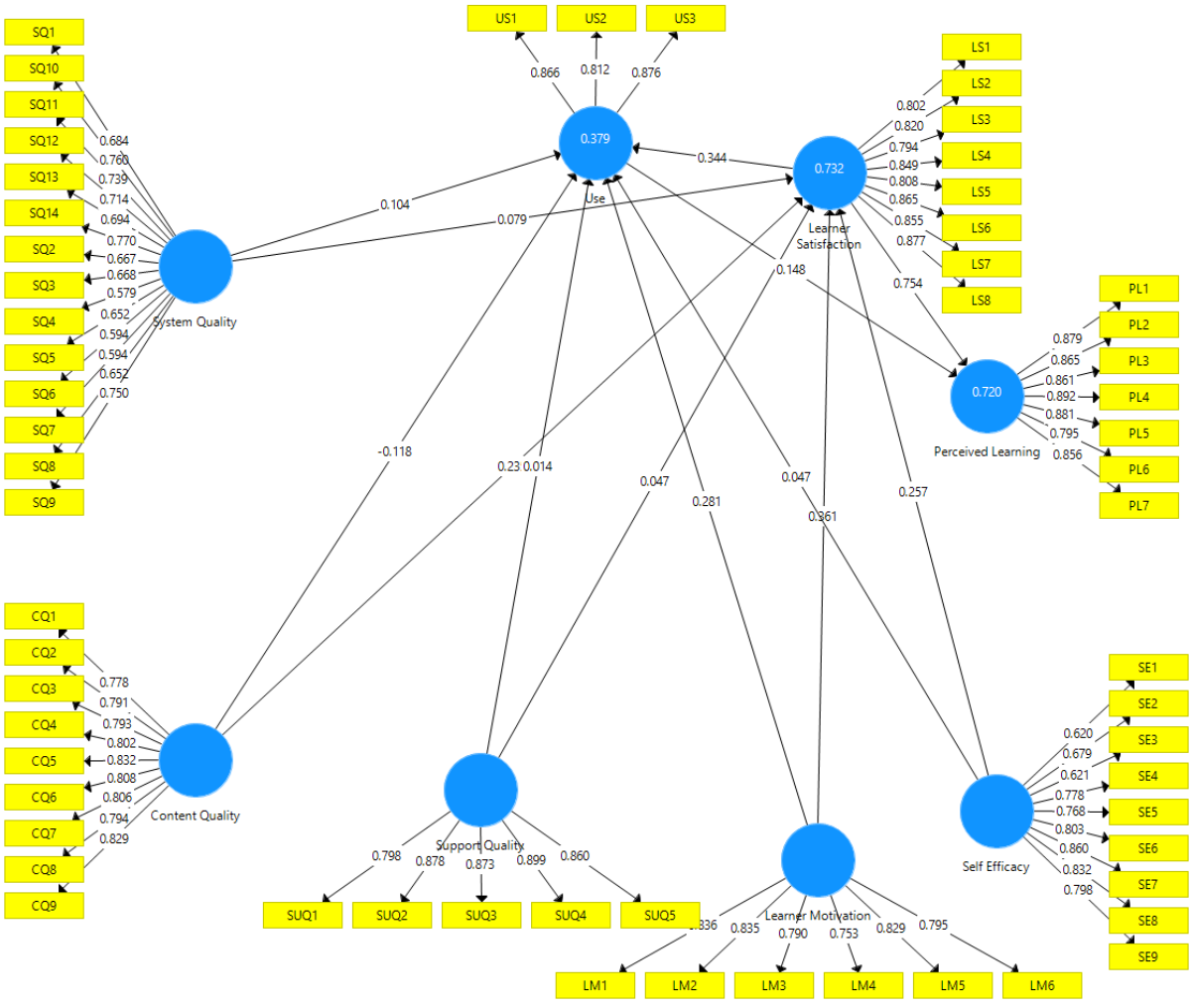

Figure 4. 6: The Research Model Test Results

The amount of variance explained R^2 for each of the constructs is also given on table 4.10 below. As can be seen from this table, the model explained 72 % of the variance in Perceived Learning, 73.2% of the variance in Learner Satisfaction and 37.9% of the variance in learner use of the e-learning system. All R^2 values were above 10%, the threshold value suggested by Falk and Miller (1992), indicating that the model has a substantive explanatory power.

Table 4. 10: Coefficient of Determination (R^2) for Dependent Variables

Construct	R^2	Standard Deviation	T Statistics	P Values	Predictive Power
Perceived Learning	0.720	0.017	41.247	0.000	Substantial
Learner Satisfaction	0.732	0.015	48.889	0.000	Substantial
Use of the e-learning System	0.379	0.024	16.118	0.000	Moderate

Source: Smart PLS 3.0 Output (2021)

R^2 values of 0.67, 0.33, or 0.19 for endogenous latent variables are described as substantial, moderate, or weak by Chin (1998, p. 323)

The following table presents the results of the bootstrapping PLS algorithm of the SMARTPLS 3.0 software to determine the relationships amongst the hypothesized constructs. A complete Partial Least Squares bootstrapping procedure was performed with 1000 random subsamples at the 95% confidence interval. Table 4.11 below shows the results of this procedure on SMARTPLS 3.0

Table 4. 11: Structural Model Hypothesis Testing

Hypothesis	Direct Effects (Paths)	Path Coefficient (β)	Path Coefficient Strength	Standard Deviation	T Value	P Values @95% CI	Decision
H_1	System Quality -> Use	0.104	small	0.036	2.898	0.004	Supported
H_2	System Quality -> Satisfaction	0.079	small	0.028	2.815	0.005	Supported
H_3	Content Quality -> Use	-0.118	small	0.045	2.606	0.009	Supported
H_4	Content Quality -> Satisfaction	0.235	medium	0.031	7.627	0.000	Supported
H_5	Support Quality -> Use	0.014	small	0.035	0.387	0.699	Not Supported
H_6	Support Quality -> Satisfaction	0.047	small	0.029	1.625	0.104	Not Supported
H_7	Learner Motivation -> Use	0.281	medium	0.05	5.568	0.000	Supported
H_8	Learner Motivation -> Satisfaction	0.361	medium	0.036	10.048	0.000	Supported
H_9	Self-Efficacy -> Use	0.047	small	0.044	1.062	0.288	Not Supported
H_{10}	Self-Efficacy -> Satisfaction	0.257	medium	0.032	7.949	0.000	Supported
H_{11}	Satisfaction -> Use	0.344	medium	0.052	6.613	0.000	Supported
H_{12}	Satisfaction -> Perceived Learning	0.754	large	0.022	34.446	0.000	Supported
H_{13}	Use -> Perceived Learning	0.148	small	0.026	5.6	0.000	Supported

Source: Smart PLS 3.0 Output (2021)

Henseler, et al states that the individual path coefficients of the PLS structural model can be interpreted as standardized beta coefficients of ordinary least squares regressions (2009, p. 304). According to Kline (2011), path coefficients with β less than .1 were considered to correspond to small effects, paths with β around .3 were considered to correspond to medium effects, and paths with β greater than .5 were considered to correspond to large effects

The following subsections present the results for individual hypotheses introduced in section 2.7. A level of significance, p = .05 is used as the threshold for statistical significance. As shown in table 4.11 above, ten out of the thirteen hypotheses in the model are supported. The details of the test results for structural model are discussed in the following subsections of this paper.

4.6.2.1. System Quality versus Use of the E-Learning System

Table 4. 12: System Quality Versus Use of the E-Learning System

Hypothesis	Description	Path Coefficient	P Value	Conclusion
H_1	The higher the quality of the e-learning system, the more use of the e-learning system	0.104	0.004	Supported

As shown in Table 4.12, the quality of the e-learning system affected the use of the e-learning system with a relatively small effect size (path coefficient of 0.104).

As per Kline (2011), a path coefficient less than 0.2 indicates a small effect. This means that quality of the e-learning system has a small effect to influence the participants' use of the e-learning system. The finding is in line with prior e-learning systems effectiveness researches. The relationship between system quality and use of the e-learning system was confirmed empirically by prior studies (Holsapple & LeePost, 2006; Menchaca & Bekele, 2008). Rai et al (2002) found a similar positive relationship between these two constructs with a weak effect size in a study to validate the IS success model (DeLone & McLean, 1992).

4.6.2.2. System Quality versus Learner Satisfaction

Table 4.13 below shows the relationship of system quality and learner satisfaction as proposed in hypothesis 2 of this study.

Table 4. 13: System Quality versus Learner Satisfaction

Hypothesis	Description	Path Coefficient	P Value	Conclusion
H_2	The higher the quality of the e-learning system, the more the learner satisfaction	0.079	0.005	Supported

As shown in the above table, the quality of the e-learning system affected learner satisfaction with a small effect size. This finding is consistent with previous e-learning systems success studies (Wang, 2007; Lin, 2007; Sun et al, 2008; Chiu, Chiu, et al., 2007; Roca et al., 2006). Roca et al (2006) found a similar relationship with a medium effect size; and Lin (2007) found a similar relationship with a weak effect size in a study to validate an e-learning system success model based on the IS success model (DeLone & McLean, 2003). The finding of Lin (2007) is exactly the same as that of this research in that both studies found a weak relationship.

4.6.2.3. Content Quality versus Use of the E-learning System

Table 4. 14: Content Quality versus Use of the E-Learning System

Hypothesis	Description	Path Coefficient	P Value	Conclusion
H_3	The higher the e-learning content quality, the more use of the e-learning system	-0.118	0.009	Supported

The path coefficient for the relationship between content quality and use of the e-learning system turned out negative. Tesfaselassie (2019) also found out a negative path coefficient and confirmed that e-learning content quality has direct effect on Systems Usage. Hence, the finding of this study is in line with the finding of Tesfaselassie (2019), which was conducted in the context of students from 10 Ethiopian Universities.

4.6.2.4. Content Quality versus Learner Satisfaction

Table 4. 15: Content Quality versus Learner Satisfaction

Hypothesis	Description	Path Coefficient	P Value	Conclusion
H_4	The higher the e-learning content quality, the more the learner satisfaction	0.235	0.000	Supported

As shown in Table 4.15, content quality resulted in a moderate effect on learner satisfaction. This implies that the content quality has a direct effect on learner satisfaction with a moderate 0.235 effect size. Hence, this path coefficient of 0.235 indicates that for a unit improvement in

the e-learning content quality score, there will be some 0.235 points increase in the satisfaction level of leaners, keeping all other factors constant.

This is in line with the findings of several prior researches in the same context of e-learning effectiveness. Prior studies also confirmed that content quality positively affected learner satisfaction (Wang, et al, 2007; Barbera et al, 2013; Lee & Lee, 2008; Naveh, Tubin & Pliskin, 2010; Sun et al., 2008; Chiu, Chiu, et al., 2007; Freeze et al, 2010).

4.6.2.5. Support Quality Versus Use of the E-learning System

Table 4. 16: Support Quality versus Use of the E-Learning System

Hypothesis	Description	Path Coefficient	P Value	Conclusion
H_5	The higher the support quality to learners, the more use of the e-learning system	0.014	0.699	Not Supported

As shown in Table 4.16, the effect of the support quality to learners on the extent of learners' use of the e-Learning system was not statistically significant (p = .699). The finding contradicted some of the previous e-learning systems success researches (Selim, 2007, Ozkan & Koseler, 2009; Govindasamy, 2002).

However, Samarasinghe (2012), in her thesis for Doctor of Philosophy in MIS, found out the same insignificant result. Her study was in the context of university instructors in New Zealand Universities.

The insignificant result obtained on this relationship may be due to the relatively unsatisfactory support learners claim to get from the academy, as it is one of the second lowest rated constructs with a mean of 3.82.

4.6.2.6. Support Quality versus Learner Satisfaction

Table 4. 17: Support Quality versus Learner Satisfaction

Hypothesis	Description	Path Coefficient	P Value	Conclusion
H_6	The higher the support quality to learners, the more the learner satisfaction	0.047	0.104	Not Supported

As shown in Table 4.17, the hypothesis that proposes "The higher the support quality to learners, the more the learner satisfaction" has not been supported in this study and the relationship is found to be weak. This finding is against the hypothesis and most prior studies

(Lee and Lee, 2008; Govindasamy, 2002; Wang, 2007; Tesfaselassie, 2019; Holsapple & LeePost, 2006). However, Samarasinghe (2012), in her thesis for Doctor of Philosophy in MIS, found out the same insignificant result.

The insignificant result in this study can also be attributed to the unsatisfactory support learners claim to receive from the academy and from the instructors as demonstrated with the lowest rating of this construct with the lowest mean of 3.82.

4.6.2.7. Learner Motivation versus Use of the e-learning System

Table 4. 18: Learner Motivation versus Use of the e-learning System

Hypothesis	Description	Path Coefficient	P Value	Conclusion
H_7	The more motivated the learners are, the more use of the e-learning system	0.281	0.000	Supported

As shown in Table 6.18, leaners motivation affected the extent of use of the e-learning system with a medium effect size. This indicates that when learners are more motivated, they are likely to use the e-learning system more. This finding is in line with the findings of other prior researches (Eom, 2006; Lim, 2007; Venkatesh, 2002).

4.6.2.8. Learner Motivation versus Learner Satisfaction

Table 4. 19: Learner Motivation versus Learner Satisfaction

Hypothesis	Description	Path Coefficient	P Value	Conclusion
H_8	The more motivated the learners are, the more the learner satisfaction	0.361	0.000	Supported

As shown in Table 4.19, learners' motivation affected the level of learners' satisfaction with a medium effect size. This indicates that when the learners are more motivated, they will be more satisfied with the e-learning system. A unit increase in the learners' motivation score will lead to some 0.361 units increase in the level of learners' satisfaction keeping all other factors constant.

This finding is similar to the findings of prior researches (Mathieu et al, 1992; Santhanam, 2008; Eom, 2006; Lim, 2007; Venkatesh, 2002).

4.6.2.9. Computer & internet self-efficacy vs use of the e-learning system

Table 4. 20: Computer & internet self-efficacy vs use of the e-learning system

Hypothesis	Description	Path Coefficient	P Value	Conclusion
H_9	The higher the computer and internet self-efficacy of the learners, the more use of the e-learning system	0.047	0.288	Not Supported

The effect of computer and internet self-efficacy of the learners on amount of use of the e-learning system was not statistically significant (p = .288) (see Table 4.20). The finding is implying that learners' computer and internet self-efficacy does not affect the extent of learners' use of the e-learning system.

This finding is not consistent with the findings of some of the previous researches (Selim, 2007; Santhanam et al, 2008; Soong, 2001; Park, 2009). This finding may probably be attributed to the idea that respondents believed to have a very high computer and internet self-efficacy, which is demonstrated with the highest rating of this construct (mean 4.08) and they did not believe they have any gap in internet and computer usage.

4.6.2.10. Computer & internet self-efficacy vs Learner Satisfaction

Table 4. 21: Computer & internet self-efficacy vs learner satisfaction

Hypothesis	Description	Path Coefficient	P Value	Conclusion
H_{10}	The higher the computer and internet self-efficacy of the learners, the more the learner satisfaction	0.257	0.000	Supported

As shown in Table 4.21, learners' computer and internet self-efficacy affected the extent of the learners' satisfaction with the e-learning system with a moderate effect size. This indicates that when learners have more confidence in using the e-learning system, they are likely to be more satisfied.

The finding is consistent with previous e-learning researches (Soong, 2001; Selim, 2007; Chau & Wang, 2000; Lin, 2008; Park, 2009; Sun et al, 2007; Lee & Lee, 2008; Piccoli, 2010; Wu, et al, 2010; Joo, Bong, & Choi, 2000).

As shown in the above paragraphs, the effects of System Quality, Content Quality, Learner Motivation and Self Efficacy are statistically significant to varying degrees. The Smart PLS

3.0 analysis result for the value of Coefficient of Determination (R^2) showed that 73.2 percent of the variance in user satisfaction is explained by the direct effects of these factors of the model (see Figure 4.6). Accordingly, this value of R^2 is regarded as Substantial and hence the effects of the factors is substantial.

4.6.2.11. Learner Satisfaction versus Use of the e-learning System

Table 4. 22: Learner Satisfaction versus Use of the e-learning System

Hypothesis	Description	Path Coefficient	P Value	Conclusion
H_{11}	The higher the level of learner satisfaction, the more use of the e-learning system	0.344	0.000	Supported

The effect of learner satisfaction on use of the e-learning system is supported with a moderate effect size (see Table 4.22). The finding is consistent with a view that the level of learner satisfaction affects the extent of use of the e-learning system with a moderate effect size. That confirms the hypothesis that proposes "the higher the level of learner satisfaction, the more use of the e-learning system" is statistically significant and supported very well. This indicates that when the learners are satisfied with the e-learning system, they are more likely to use the e-learning system.

The finding is consistent with previous e-learning systems success researches where studies reported a positive relationship between learner satisfaction and e-learning system use (Holsapple & LeePost, 2006; Lin, 2007; Chang, 2013; Hassanzadeh et al, 2012; Petter et al, 2008; Roca et al, 2008; Tesfaselassie, 2019; Wu & Wang, 2006; Chiu & Chiu, 2007; Yeung & Jordan, 2007).

Lin (2007) found a similar relationship between learner satisfaction and e-learning system use, with a medium effect size. The Holsapple and LeePost study suggested a positive relationship between learner satisfaction and use of e-learning system.

The studies of Wu & Wang (2006) and Chiu & Chiu (2007) with university students in Taiwan and Hong Kong confirmed a positive and direct relationship between user satisfaction and continuance intention of using e-learning systems. This relationship was also confirmed in relation to employee perceptions of e-learning continuance intention by Roca et al (2008) and Yeung & Jordan (2007), in the context of business organizations.

As shown in figure 4.6, the coefficient of determination (R^2) for the use of the e-learning system is 0.379 implying that 37.9 percent of the variance in the use of the e-learning system is

explained by the direct effects of the constructs linked to it in the structural model. This is a moderate effect size as per Hair et al (2019, p. 780; Chen, 1988; Kline, 2011).

4.6.2.12. Learner Satisfaction versus Perceived Learning

Table 4. 23: Learner Satisfaction versus Perceived Learning

Hypothesis	Description	Path Coefficient	P Value	Conclusion
H_{12}	The higher the level of learner satisfaction, the more the perceived learning	0.754	0.000	Supported

As shown in Table 4.23, learner satisfaction affected the level of perceived learning with a strong effect size. This indicates that when learners are satisfied with the e-learning system, they are more likely to achieve a higher level of perceived learning. This finding is consistent with the findings of previous researches (Eom et al., 2006; Samarasinghe, 2012; Lee & Lee, 2008). Eom et al. studied the factors of perceived learning outcomes and learner satisfaction in online education with university undergraduate students who were enrolled in totally online courses. They found a similar relationship, with a large effect size, between learner satisfaction and student learning.

4.6.2.13. Use of the E-Learning System versus Perceived Learning

Table 4. 24: Use of the e-learning system versus Perceived Learning

Hypothesis	Description	Path Coefficient	P Value	Conclusion
H_{13}	The more use of the e-learning system, the more the perceived learning	0.148	0.000	Supported

As shown in Table 4.24, the relationship between learner use of the e-learning system affected the level of perceived learning with a small effect size. This finding is consistent with previous e-learning systems success researches (Holsapple & LeePost, 2006; Lee & Lee, 2008).

As can be seen from the research model (Figure 4.6) and hypotheses H_{12} and H_{13}, the effects of Learner Satisfaction and Use of the e-Learning System on Perceived Learning are statistically significant. The coefficient of determination for the endogenous construct (Perceived Learning) is 0.720 (see Figure 4.6). This implies that 72% of the variance in Perceived Learning is attributed to the direct effects of learner satisfaction and Use of the E-Learning System. In other words, the model explains 72% of the variance in perceived learning, which is categorized as substantial.

As a whole, the R^2 values (variance explained) for each of the variables are given in Table 4.9 and in Figure 4.6. The model explained 37.9% of the variance in the use of the e-learning system, 73.2% of the variance in learner satisfaction and 72% of the variance in level of Perceived Learning. All R^2 values were above 10%, the threshold value suggested by Falk and Miller (1992), indicating that the model has a substantive explanatory power.

4.6.3. Effect Size and Predictive Relevance

Predictive relevance and effect size of the structural model aspects are also used to evaluate its inner model.

4.6.3.1. Predictive Relevance (Q^2)

Table 4.25 below table shows the values obtained for the predictive relevance (Q^2) from the blindfolding procedure in SMARTPLS 3.0. As shown on table 4.25 below, all of the values obtained for the mediating and dependent variable are well above zero. Q^2 values greater than zero give evidence that the observed values are well reconstructed and that the research model has sound predictive relevance (Henseler, et al, 2009; Hair, et al, 2019; Kline, 2011; Gefen et al, 2000; Chin, 1998, p.318).

Table 4. 25: Predictive Relevance (Q^2)

Construct	Predictive Relevance (Q^2)
Learner Satisfaction	0.505
Perceived Learning	0.530
Use	0.269

Source: SMARTPLS 3.0 output (2021)

4.6.3.2. Effect Size (f^2)

Table 4.26 below shows the effect size (f^2) values of the three endogenous constructs and their corresponding effect sizes. All of the three causal relationships are statistically significant.

Table 4. 26: Effect Size (f^2)

Causal Relationship	Effect size (f^2)	P Values	Effect
Learner Satisfaction -> Perceived Learning	1.336	0.000	Large
Learner Satisfaction -> Use	0.051	0.002	Small
Use -> Perceived Learning	0.051	0.007	Small

Source: SMARTPLS 3.0 output (2021)

Note:

.02<f^2<0.15=small effect size; .15< f^2<0.35= medium effect size and f^2>0.35 large effect size (Gefen et al., 2000; Henseler, et al, 2009, p.303; Chin, 1998, p.317)

5. Conclusions and Recommendations

5.1. Introduction

This chapter presents the key findings of the study. In this study, the key factors affecting e-learning effectiveness were identified based on thorough review of literature. Then, these identified factors were placed in a holistic model and tested using data collected from 1280 e-learning participants. Structural Equation Modeling was used to test the validity and reliability of the measurement items, the constructs and the interrelationships amongst the constructs. SMARTPLS 3.0 is the main data analysis software employed for this study. The key findings and results of this study are presented in the following sections.

5.2. Summary of Key Findings

The objectives of this research are to develop an appropriate conceptual model for the measurement of effectiveness of e-learning and identify the key factors affecting e-learning effectiveness. To address these objectives, the study posed the following research questions:

1. What are the key factors that determine satisfaction and perceived learning of e-learning participants at Ethiopian Airlines?
2. How do the key factors affecting the e-learners' satisfaction and level of perceived learning relate to each other in the case of Ethiopian Airlines?

In line with these research questions, the study identified the key factors that determines e-learning effectiveness and placed them in the formulated conceptual model. The basis for the model is the updated DeLone & McLean IS success model. A thorough literature review was conducted to formulate an appropriate model that can measure the effectiveness of e-learning at Ethiopian Airlines. In the model development, two constructs were added, and the other constructs were modified to suit the context in this study. Hence, the DeLone & McLean Information Systems Success Model (2003) was extended. The following table compares the constructs in the Updated DeLone & McLean ISS (2003) with those in the current study.

Table 5. 1: Comparison of Constructs in D&M (2003) & this study

Construct in D & M ISS Model (2003)	Equivalent Construct in this Research	Remark
System Quality	System Quality	No change except more measurement items were added to reflect the context in the study
Information Quality	E-learning content quality	Modified to suit e-learning & the context in the study
Service Quality	Support Quality	Modified to suit e-learning & the context in the study
Intention to use/use	Use of the e-learning system	Modified to suit e-learning & the context in the study
User satisfaction	Learner Satisfaction	Modified to suit e-learning & the context in the study
Net Benefits	Perceived Learning	Redefined to solicit a single net benefit in the context of e-learning
*	Learner Motivation	Additional Construct
*	Learner Computer & Internet Self-Efficacy	Additional Construct

A survey over the internet was used to collect data from the selected samples. A convenience sampling technique was used for sample selection. The respondents were requested to complete the survey questionnaire by sending the Google Forms link to the questionnaire via their email addresses. A total of 1289 responses were received, of which 1280 were usable with no missing data.

A total of eight constructs were identified as the key determinant factors for the effectiveness of e-learning. These constructs, each of them with different number of measurement items, were placed in a model. Please refer to Table 3.2 for the details of the measurement items for each construct. The model was then evaluated using structural equation modeling in two stages: the first stage is the measurement model also referred to as outer model in SEM PLS path analysis, which tests the validity and reliability of the constructs and each of the 61 measurement items used in this study. In this study, all the constructs and measurements items are found to be reliable and valid to proceed with the second stage of the structural equation

model. Please refer to sections 4.6.1 of this study for more details on the reliability and validity of the constructs and the measurement items.

The second stage of the SEM PLS model is the structural model, also referred to as the inner model, which measures the interrelationships amongst the factors.

The following sections present the details of the measurement and structural models and the key findings in a way that answers the research questions.

5.2.1. The Measurement Model

SMARTPLS 3.0 was used to check the reliability and validity of each of the 8 constructs and their measurement items.

5.2.1.1. System Quality

System quality was identified as one of the determinant factors of e-learning systems effectiveness. It measures the ease of use, user friendliness, stability, availability, speed and responsiveness of the online learning management system. Smart PLS 3.0 software package test results showed that five of the fourteen items used to measure this construct have a factor loading of over .7 and the remaining 9 have factor loadings between .579 and .694. This is the construct with the lowest AVE of 0.466 in this study. However, it is accepted to have an adequate validity and reliability as the Cronbach's alpha and composite reliability for this construct are 0.911 and 0.924 respectively.

Similar other studies also confirmed this construct as a valid measure of e-learning systems effectiveness (Shee, 2008; Al-Sabawy, 2013; Wang, 2007; Lin, 2007; Yeung, 2007; Petter et al, 2008; Ozkan & Koseler, 2009; Selim, 2007; DeLone and McLean, 2003; Soong, et al, 2001; Samarasinghe, 2012).

5.2.1.2. E-learning Content Quality

E-learning Content quality was modified from Information quality construct of the D&M ISS (2003) model. It was identified as one of the determinant factors of the e-learning systems effectiveness. It measures usefulness, understandability, relevance, currency, conciseness and sufficiency of the e-learning course content. In this study, e-learning content quality was measured using 9 indicators.

Smart PLS software package test results of the e-learning content quality construct revealed that all the 9 measurement items are valid and reliable to measure this construct. Similar other

studies also confirmed this construct as a valid measure of e-learning systems effectiveness (Shee & wang, 2008; Yeung & Jordan, 2007; Wang,2007; Ozkan, 2009; Lin, 2007; Samarasinghe, 2012; Yakubu, 2018).

5.2.1.3. Support Quality

The service quality of DeLone & McLean ISS (2003) is modified to represent the quality of support provided to learners from IT and the academy. It is identified as one of the factors for e-learning systems effectiveness and it measures the responsiveness, accuracy, reliability, technical competence, and empathy of the staff providing support to the users of the online learning management system. It is measured with 5 measurement items in this study.

Smart PLS software package test results of the support quality construct indicated that all the 5 measurement items are valid and reliable to measure this construct. Similar other studies also confirmed this construct as a valid measure of e-learning systems effectiveness (Ozkan, 2009; Selim, 2007; Samarasinghe, 2012; Lee, 2008; Holsapple & Lee-Post, 2006).

5.2.1.4. Learner Motivation

Learner motivation is a new construct to the D&M ISS model identified in this study as a key determining factor for e-learning effectiveness. Six measurement items are used to measure this construct. All the measurement items are reliable and valid to measure this construct. The validity and reliability of this construct in measuring e-learning effectiveness have also been confirmed by Venkatesh (2002) and Chiu & Wang (2008).

5.2.1.5. Learners' Computer & Internet Self-Efficacy

This is a new construct identified in this study as a key determining factor for e-learning effectiveness. The D&M ISS model didn't consider the learners' computer and internet self-efficacy for IS success. This construct is measured with 9 measurement items. Six of the nine items have a factor loading of over 0.7, and the remaining 3 have factor loadings between 0.620 and 0.679 which are close to the 0.7 recommended factor loading. However, the construct and all the items are accepted to have an adequate validity and reliability as the Cronbach's alpha and composite reliability for this construct are 0.905 and 0.922 respectively. Several other studies have also found the same result (Samarasinghe, 2012; Soong, 2001; Wu & Lee, 1999; Piccoli et al, 2000; Venkatesh, et al, 2003; Purnomo, et al, 2019; Park, 2009; Bhuasiri, et al, 2010).

5.2.1.6. Learner Satisfaction

This construct is renamed from the user satisfaction of the D&M ISS model. It is identified as a central construct of the e-learning effectiveness model mediating the e-learning usage and perceived learning constructs. Eight items are employed to measure the learner satisfaction construct. SMARTPLS 3.0 software package indicates that all the items do have well above the 0.7 implying that the construct is a reliable and valid measure of e-learning effectiveness.

These findings are consistent with the results of studies by Arbaugh (2000a), Chiu et al. (2005), Eom et al. (2006), Lee and Hwang (2007), Sun et al. (2008), Shee and Wang (2008), Wu et al. (2010), Lin and Chen (2012) and Ramayah and Lee (2012) which confirm that user satisfaction is a significant construct to measure e-learning system success.

5.2.1.7. Use of the E-Learning System

The quantity data analysis result of the study indicates that use of the e-learning system construct is a valid and reliable measure of e-learning systems effectiveness. A similar result has also been obtained by other researchers such as Apparicio et al. (2016b), Hassanzadeh et al (2012), Lin and Wang (2012), Freeze eta l. (2010), Ozkan & Koseler (2009) and Wang (2007).

5.2.1.8. Perceived Learning

Perceived learning is a modified and customized construct representing the net benefits construct of the D&M ISS model. This construct is measured with 7 measurement items in this study. The SMRTPLS 3.0 software package analysis of the measurement model revealed that it is a valid and reliable measure of e-learning systems effectiveness. Many prior researchers used perceived learning as a valid and reliable measure of e-learning systems effectiveness (Chu & Chu, 2010; Eom & Ashill, 2006, 2016, 2018; Rovai, 2009; Ferguson & DeFelice, 2010; Holsapple & LeePost, 2006; Wang et al., 2007; Arbaugh, 2000, 2001; McGorry, 2003; Santhanam, Sasidharan, & Webster, 2008; Sher, 2009; Wang, 2003; Wu, Tennyson, & Hsia, 2010; Yukselturk & Bulut, 2007).

5.2.2. The Structural Model and Hypotheses

The structural model focuses on testing the relationships between the constructs based on the conceptual model. Thirteen hypotheses were formulated to investigate the interrelationships amongst the 8 constructs identified as key determinants of e-learning effectiveness.

5.2.2.1. System Quality

Two hypotheses were formulated to investigate the impact of System Quality on the research model.

H1.The higher the quality of the e-learning system, the more use of the e-learning system

Hypothesis (H1) is supported by the research finding implying that the quality of the e-learning system affected the use of the e-learning system with a relatively small effect size (path coefficient of 0.104). The finding is in line with prior e-learning systems effectiveness researches. The relationship between system quality and use of the e-learning system was confirmed empirically by prior studies (Holsapple & LeePost, 2006; Menchaca & Bekele, 2008). Rai et al (2002) found a similar positive relationship between these two constructs with a weak effect size in a study to validate the IS success model (DeLone & McLean, 1992).

H2.The higher the quality of the e-learning system, the more the learner satisfaction

The study finding shows that H2 is also supported with a small size effect implying that the quality of the e-learning system affected learner satisfaction with a small effect size. This finding is consistent with previous e-learning systems success studies (Wang, 2007; Lin, 2007; Sun et al, 2008; Chiu, Chiu, et al., 2007; Roca et al., 2006). Roca et al (2006) found a similar relationship with a medium effect size; and Lin found a similar relationship with a weak effect size in a study to validate an e-learning system success model based on the IS success model (DeLone & McLean, 2003). The finding of Lin (2007) is exactly the same as that of this research in that both studies found a weak relationship.

5.2.2.2. E-Learning Content Quality

Another critical factor identified to affect the effectiveness of e-learning in this model is e-learning content quality with two hypotheses proposed to affect use of the e-learning system and learner satisfaction.

H3.The higher the e-learning content quality, the more use of the e-learning system

The path coefficient for the relationship between content quality and use of the e-learning system turned out negative. Tesfaselassie (2019) also found out a negative path coefficient and confirmed that e-learning content quality has direct effect on Systems Usage. Hence, the finding of this study is in line with the finding of Tesfaselassie (2019), which was conducted in the context of students from 10 Ethiopian Universities.

H4.The higher the e-learning content quality, the more the learner satisfaction

This study found out that content quality resulted in a moderate effect on learner satisfaction. This implies that the leaners will be more satisfied whenever the content quality of the e-learning system is high.

Prior studies also found out that content quality positively affected learner satisfaction (Wang, et al, 2007; Barbera et al, 2013; Lee & Lee, 2008; Naveh, Tubin & Pliskin, 2010; Sun et al., 2008; Chiu, Chiu, et al., 2007; Freeze et al, 2010).

5.2.2.3. Support Quality

The support quality provide to the e-learning users from IT and academy staff was proposed to affect use of the e-learning system and learner satisfaction. However, this study found out that both of the below hypotheses were not statistically significant.

H5.The higher the support quality to learners, the more use of the e-learning system

H6.The higher the support quality to learners, the more the learner satisfaction

Mixed results were obtained in similar prior researches. Selim (2007), Ozkan & Koseler (2009) and Govindasamy (2002) found out a significant positive relationship. However, Samarasinghe (2012), in her thesis for Doctor of Philosophy in MIS, found out the same insignificant result. Her study was in the context of university instructors in New Zealand Universities.

5.2.2.4. Learner Motivation

Learner motivation is a new construct added to the D&M ISS model for the measurement of e-learning effectiveness at Ethiopian Airlines. The below two hypotheses were proposed in the research.

H7.The more motivated the learners are, the more use of the e-learning system

H8.The more motivated the learners are, the more the learner satisfaction

Both of these hypotheses were supported with a medium effect size. This finding of the study is in line with several prior studies (Mathieu et al, 1992; Santhanam, 2008; Eom, 2006; Lim, 2007; Venkatesh, 2002).

5.2.2.5. Computer and Internet Self-Efficacy

Computer and internet self-efficacy is another new construct related to the learner introduced to the conceptual model for the assessment of e-learning effectiveness. The below two hypotheses were formulated based on a thorough review of literature.

H9. The higher the computer and internet self-efficacy of the learners, the more use of the e-learning

H10. The higher the computer and internet self-efficacy of the learners, the more the learner satisfaction

In this study, H9 was not supported; which is not consistent with the findings of some of the previous researches (Selim, 2007; Santhanam et al, 2008; Soong, 2001; Park, 2009). However, H10 was supported which reached to the same results as these studies.

5.2.2.6. Learner Satisfaction

Learner satisfaction is identified as a mediating variable for use of the e-learning system and perceived learning which is identified to represent the net benefits construct of the D&M ISS model.

H11. The higher the level of learner satisfaction, the more use of the e-learning system

H12. The higher the level of learner satisfaction, the more the perceived learning

Both of these hypotheses formulated have been supported in this study. The relationship between learner satisfaction and use of the e-learning system has a medium effect and that of between learner satisfaction and perceived learning is a large effect size. These findings are in line with several prior studies in both the IS and e-learning success studies (Holsapple & LeePost, 2006; Lin, 2007; Chang, 2013; Hassanzadeh et al, 2012; Petter et al, 2008; Roca et al, 2008; Tesfaselassie, 2019; Wu & Wang, 2006; Chiu & Chiu, 2007; Yeung & Jordan, 2007; Eom et al., 2006; Samarasinghe, 2012; Lee & Lee, 2008).

The coefficient of determination (R^2) for the use of the e-learning system is 0.379 implying that 37.9 percent of the variance in the use of the e-learning system is explained by the direct effects of the constructs linked to it in the structural model. Similarly, 73.2% of the variance in learner satisfaction is explained by the constructed connected to it. This is a substantial explanatory power, implying that the model has been reconstructed well.

5.2.2.7. Use of the E-Learning System

Use of the e-learning system is a construct formulated to represent the intention to use and actual use constructs of the D&M ISS model. This construct is a mediating variable for perceived variable. The hypotheses proposed for the relationship of use of the e-learning and perceived learning is supported in this study as in most other studies (Holsapple & LeePost, 2006; Lee & Lee, 2008).

H13. The more use of the e-learning system, the more the perceived learning

5.2.2.8. Perceived Learning

This is the construct customized to represent the net benefits construct of the D&M ISS model. The level of perceived learning is designed to indicate the level of effectiveness of e-learning system. The coefficient of determination (R^2) for perceived learning in this study is 0.72 implying that 72% of the variance in perceived learning is explained by the variance in learner satisfaction and use of the e-learning system.

The following table summarizes the test results of the structural model.

Table 5. 2: Summary of the structural model test results

Construct	Code	Hypothesis	Decision
System Quality	H1	The higher the quality of the e-learning system, the more use of the e-learning system	Supported
	H2	The higher the quality of the e-learning system, the more the learner satisfaction	Supported
Content Quality	H3	The higher the e-learning content quality, the more use of the e-learning system	Supported
	H4	The higher the e-learning content quality, the more the learner satisfaction	Supported
Support Quality	H5	The higher the support quality to learners, the more use of the e-learning system	Not Supported

Construct	Code	Hypothesis	Decision
	H6	The higher the support quality to learners, the more the learner satisfaction	Not Supported
Learner Motivation	H7	The more motivated the learners are, the more use of the e-learning system	Supported
	H8	The more motivated the learners are, the more the learner satisfaction	Supported
Computer & Internet Self-Efficacy	H9	The higher the computer and internet self-efficacy of the learners, the more use of the e-learning	Not Supported
	H10	The higher the computer and internet self-efficacy of the learners, the more the learner satisfaction	Supported
Learner Satisfaction	H11	The higher the level of learner satisfaction, the more use of the e-learning system	Supported
	H12	The higher the level of learner satisfaction, the more the perceived learning	Supported
Use of the e-learning system	H13	The more use of the e-learning system, the more the perceived learning	Supported

5.3. Conclusions

This section provides conclusions based on the key findings of this research along the research questions. The research tries to answer the two major questions posed in section 1.3 of this research paper. To answer these questions, data was collected from the selected samples of e-learning participants at Ethiopian Airlines.

The key findings for each research question are discussed as follows.

To answer the first research question, "What are the key factors that determine satisfaction and perceived learning of e-learning participants at Ethiopian Airlines?", a thorough literature review was conducted. The updated DeLone & McLean (2003) IS success model was used as the basis for the search for the factors affecting effectiveness of e-learning systems. Accordingly, the six constructs: systems quality, information quality, service quality, systems usage, user satisfaction, and net benefits were taken from the updated ISS model (DeLone &McLean, 2003) and adopted to the context in this study. They were adopted as System Quality, Content Quality, Support Quality, Use of the E-learning System, Learner Satisfaction and Perceived Learning respectively. Perceived Learning is assumed to fall under the Net Benefit Construct in the DeLone &McLean (2003) Please refer to section 2.6 of this research paper for the adoption of these constructs. Further literature reviews revealed that learner motivation and computer & internet self-efficacy are essential factors for the effectiveness of e-learning. Please refer to section 2.7 of this research paper for more details. Hence, the updated DeLone & McLean (2003) IS Success model is extended by adding two new constructs (Learner Motivation and Computer & Internet Self-Efficacy) which emerged from the review of literature for this study. Accordingly, the final constructs to examine the effectiveness of e-learning at Ethiopian Airlines are: System Quality, Content Quality, Support Quality, Learner Motivation, Computer & Internet Self-efficacy, Learner Satisfaction, Use of the E-learning System and Perceived Learning. Therefore, research question #1 has been answered as the key factors that determine the effectiveness of e-learning at Ethiopian Airlines have already been identified.

To answer the second question, "How do the key factors affecting the e-learners' satisfaction and level of perceived learning relate to each other in the case of Ethiopian Airlines?", the key factors identified to achieve the first research question were placed in a model based on literature review. Thirteen hypotheses were proposed to signify the relationships between the constructs of the model. The constructs of the model and their interrelationships were tested

using Structural Equation Modeling (SEM) using data collected from 1280 e-learning participants.

Confirmatory Factor Analysis (CFA) was used to examine the measurement model to identify the reliability and validity of each construct in measuring the effectiveness of the e-learning system. The measurement models were tested using SEM-PLS for their validity and reliability. Accordingly, all the eight constructs were found out to be valid and reliable measures of effectiveness of e-learning systems in the context of Ethiopian Airlines. Once the validity and reliability of the constructs have been verified, the researcher proceeds to test the relationships among the constructs of the research model using the structural model tests as represented by the thirteen hypotheses. Furthermore, the explanatory power of the model was tested with structural model analysis using PLS. Based on the variance explained by the research model, it was concluded that the model has substantial overall explanatory power.

The followings are the key conclusions of testing the structural model.

1. System Quality of the e-leaning system significantly and directly affected learner satisfaction and use of the e-learning system
2. Content Quality of the e-leaning system significantly and directly affected learner satisfaction and use of the e-learning system
3. The effects of the Support Quality provided to e-learning participants from the academy and the instructors on Learner Satisfaction and Use of the E-learning System were not statistically significant in this study.
4. Learner Motivation significantly and directly affected learner satisfaction and use of the e-learning system
5. The proposed effect of Computer and Internet Self-efficacy on use of the e-learning system was not statistically significant and hence this causal relationship was not supported. However, it has been found that Computer and Internet Self-efficacy significantly and directly affected learner satisfaction with a medium path coefficient.
6. Learner Satisfaction significantly and directly affected use of the e-learning system and perceived learning
7. Use of the e-learning system significantly and directly affected perceived learning
8. Use of the e-learning system construct is the lowest rated construct with a mean of 3.513 in a rating scale of 5 as per the data collected from 1280 e-learning participants

in this study. This indicates that the level of use of the e-learning system by the respondents to study their courses is not yet to the expected level as all the 3 measurement items used for measuring this construct are rated the lowest though the usefulness of the e-learning courses is rated the highest in this study.

9. A moderate predictive power was observed on the endogenous construct Use of the E-Learning System by the combined effects of five exogenous constructs and one endogenous construct: System Quality, Content Quality, Support Quality, Learner Motivation, Computer & Internet Self-Efficacy and Learner Satisfaction.
10. A substantial predictive power was observed on the endogenous construct Learner Satisfaction by the combined effects of five exogenous constructs: System Quality, Content Quality, Support Quality, Learner Motivation and Computer & Internet Self-Efficacy
11. A substantial predictive power was observed on the endogenous construct Perceived Learning by the combined effects of two exogenous constructs: user satisfaction and use of the e-learning system
12. Sound predictive relevance and effect size were observed on the three system outcomes: learner satisfaction, use of the e-learning system and perceived learning.

Hence, research question 2 has been answered based on the results of tests of the structural model.

In general, this study identified the key factors affecting the effectiveness of e-learning systems taking the case of Ethiopian Airlines. Furthermore, the identified factors were placed in a model which undergoes further validation employing Structural Equation Modeling to determine the explanatory and predictive power of the model to measure e-learning effectiveness in the context of Ethiopian Airlines. Accordingly, the following main conclusions are forwarded based on the key findings of the research:

1. The measurement of e-learning systems effectiveness is complex in that it involves multi-dimensional factors like user factors expressed as ‘learner motivation’ and ‘computer & internet self-efficacy of users’, technology and IT infrastructure factors stated here as ‘system quality’ and institutional factors represented in this research as ‘support quality’ and ‘content quality’. This research provided a reliable and validated key determinant factors of e-learning effectiveness in the context of Ethiopian Airlines.

This provides an opportunity for Ethiopian Airlines and other similar organizations a structured way of assessing the effectiveness of their e-learning systems.

2. The study found eight latent variables (six of them adopted from the D & M ISS Model, 2003) and two additional constructs which evolved from the literature review and validated in this study. Unlike the updated ISS model, these findings implied that e-learning effectiveness is multi-factorial which is not only a function of technology alone, but also learner and institutional factors.
3. The study provided a holistic model by placing the identified key factors of e-learning effectiveness in the model. This holistic model will help organizations evaluate their e-learning systems effectiveness to sustainably implement their e-learning systems and realize benefits of the investments outlaid on the system.
4. This research confirmed that the endogenous latent variables in the model have sound predictive power, path coefficients, predictive relevance and effect size signifying confidence for future users of the model in similar contexts.

5.4. Contributions of the Study

This research contributes both for theory and practice. The below subsections presents the contributions of the study to theory and practice.

5.4.1. Contributions to Theory

The study provided the following contributions to theory:

1. The main contribution of this research is the identification of the key factors that determine satisfaction and perceived learning of e-learning participants at Ethiopian Airlines and placed them in a model. The results of the study model confirm the validity and reliability of the model to measure e-learning systems effectiveness. To this end, the study contributes a model to assess the effectiveness of e-learning systems in the context of Ethiopian Airlines, which can also be applied to similar organizations.
2. The study also confirmed the validity and reliability of the updated ISS model with some modifications to evaluate e-learning systems effectiveness in the context of Ethiopian Airlines.
3. The study modified three of the updated ISS model (2003) constructs to suit the context of the examination of the effectiveness of e-learning at Ethiopian Airlines and validated

these modified constructs in the current context. The modified constructs of the updated ISS model (2003) model are information quality, service quality and net benefits which are reconstructed as e-learning content quality, support quality and perceived learning in the current study.

4. The study extended the updated ISS model (2003) by adding two new constructs: Learner Motivation and Learner Computer & Internet Self-Efficacy.

5. According to Johns (2006), Alvesson, et al (2007) and Tesfaselassie (2019), new settings can result in changing the original hypothesized relationships to be non-significant, altering the direction of relationships among the constructs and creating new relationships. To this end, other than extending the updated ISS model (2003) by adding two new constructs, the study found new relationships. Therefore, four new relationships were identified in contrast to the updated ISS model:

    - Learner Motivation versus Use of the E-Learning System
    - Leaner Motivation versus Learner Satisfaction
    - Computer & Internet Self-Efficacy versus Use of the E-Learning System
    - Computer & Internet Self-Efficacy Learner Satisfaction

The below are available in the updated ISS model (2003) but failed to be supported in this study as the constructs are modified to suit the context and the context is different.

- Support quality to learners on Use of the e-learning system
- Support quality to learners on Learner Satisfaction

5.4.2. Contributions to Practice

The study provided the following contributions to practice:

1. The study provided key factors that determine the effectiveness of e-learning at Ethiopian airlines which can also be applied to other similar organizations.

2. The study also provided a reliable and valid model that would help Ethiopian Airlines and other similar organizations to practically assess their e-learning systems current status and a guide to structured implementations.

3. The study brings the key factors that determine e-learning effectiveness to the attention of the management of the organizations.

4. The study provides the required courses of actions to improve support quality, e-learning systems quality, e-learning content quality, learner motivation, computer & internet self-efficacy to improve learner satisfaction, use of the e-learning system and ultimately the perceived learning.
5. The key factors that determine e-learning systems effectiveness are identified in a causal framework that enables management of the organizations easily understand the cause and effect relationships amongst the different latent variables
6. Ethiopian Airlines and other similar organizations are provided with readymade e-learning systems effectiveness model and measurement items that would serve as quality assurance mechanisms while evaluating their current status of e-learning systems

5.5. Recommendations

A model to assess the effectiveness of e-learning was proposed and tested. Based on the findings and conclusions of this study, the following recommendations are offered.

1. As this study has already identified the key factors affecting e-learning effectiveness with about 73% explanatory power, emphasizing and making improvements on the already identified factors in this study will bring a large effect on the performance of the e-learning system. Hence, Ethiopian Airlines and other similar organizations seeking to implement e-learning to train their staff or students shall spend their resources on the improvement of system quality and support quality as these were the lowest rated in this research.
2. Organizations implementing e-learning should assess effectiveness of their e-learning system from time to time using the model developed in this study and intervene on the key factors based on the findings of the measurement effort to keep their e-learning system a viable solution for their employees or students.
3. This study found out that support quality was the least rated contributing to dissatisfaction and low perceived learning. Hence, the level of support provided to learners from IT and from the academy shall be reviewed for remedial action.
4. System quality is also found to be a hindrance for learner satisfaction and use of the e-learning system. Availability of enough computers to use and practice and easy access to internet are the least rated ones. Hence, special attention is recommended to resolve these issues to increase the effectiveness of e-learning.

5. Participants feel that they have a very high computer and internet self-efficacy. This is supported in this study for this construct got the highest rating. This implies that the organization can train more of its staff using e-learning as there is no frustration or hindrance on using the e-learning system. Participants responded that they are confident, comfortable and they can successfully use the e-learning system.

6. Participants strongly believe that e-learning is useful for their job. This is evidenced with the highest rated measurement item "I find e-learning to be useful in my job" with a rating of 4.31 in a rating scale of 5 as per the data collected from 1280 e-learning participants. This shows that there is a strong belief in the importance of e-learning for the job participants are supposed to perform. This is a very good indication for the management that the e-learning contents currently provided are effective and it will continue to be so if it pursues to develop and implement more e-learning courses in the same way. Hence, the researcher recommends for Ethiopian Airlines' management and other similar organizations to grow their e -learning course development and implementation capability to reap more from the benefits e-learning provides.

7. Current use of the e-learning system is not at the expected level as indicated with the lowest rating for all the 3 measurement items used for this construct as opposed to the highest rating for the usefulness of e-learning courses. This further substantiates that the management should move for more e-learning courses as recommended on item 6 here above.

5.6. Limitation and Implications for Further Research

1. The participants were only employees of Ethiopian airlines enrolled in the e-learning system of the airline. Hence, care shall be taken when generalizing the results of the study to other populations with different characteristics.

2. The data collected and analyzed for this study is purely quantitative. A study with qualitative questions for respondents to express their views and ideas on the items being measured or researched is an area for further research. and options for respondents to bypass or respond not applicable or don't know is required

3. Only learners are surveyed for this research, and the result of this study is based on the analysis of the responses of learners. However, the responses and inputs of employees' supervisors, executive management and instructors may bring a change to the results of

this study. Hence, future research including these stakeholders of e-learning effectiveness is required.

4. The study is based on MOODLE Learning Management System, currently in use at Ethiopian Airlines. Accordingly, the study findings are based on the usage of this specific LMS. The results, therefore, map into this specific LMS. Further studies on users of other types of LMS might be another area of research to validate the reliability and representativeness of the model across different LMS

5. The study is made in the context of Ethiopian Airlines. However, the researcher strongly believes that other organizations also share similar contexts implying that the research model might also be applicable across different organizations. Accordingly, testing and validating the model across different organizations is another area of future research.

6. Higher levels of e-learning outcome such as transfer of the learned skills to the job, performance improvement as a result of e-learning and return on investment (ROI) of e-learning were not considered as constructs or factors of e-learning effectiveness in this study. This is a huge future research area to make the study complete

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List of Appendices

Appendix A: Survey Invitation Letter

Dear Colleagues,

I would like to invite you to participate in this survey, which is an important part of my MBA study on "Effectiveness of E-Learning at Ethiopian Airlines". The purpose of this study is to assess the effectiveness of e-learning at Ethiopian Airlines and the factors affecting it. This study is conducted in partial fulfillment of the requirements for the Master's in Business Administration at Addis Ababa University.

You are under no obligation to accept this invitation. However, your response is vital to the outcome of my study and you are kindly requested to completely and objectively answer all questions. The information you provide will be kept confidential and be used only for academic purposes. The research is going to be carried out based on your responses and other relevant data that could support it.

The questions are designed to enable quick and easy responses. The questions can be answered simply by clicking the appropriate circle. Completing the questionnaire should take less than 10 minutes. The questionnaire focuses on the e-learning system at Ethiopian Airlines.

The questionnaire has 19 sections numbered A, B, C,..... Under each section, there are a few questions. Please respond to all the questions objectively.

Please note that your responses are anonymous.

Thank you in advance for your time to respond to the below questions.

Appendix B: Survey Questionnaire

A. Demographic and General Questions

A.1. Gender Male ☐ Female ☐

A.2. Age 20-25 ☐ 26-30 ☐ 31-40 ☐ 41-50 ☐ 50+ ☐

A.3. What is your level of Education?

Certificate ☐ Diploma ☐ First Degree ☐ Masters ☐ Other (Please specify) ☐

A.4. Work experience in Ethiopian Airlines

1-5 years ☐ 6-10 years ☐ 11-15 years ☐ 16-20 years ☐ 21+ years ☐

A.5. How many times/courses have you taken training from your current organization since your employment?

1-3 ☐ 4-6 ☐ 7-9 ☐ 10+ ☐

A.6. When was the last time (year), you have undertaken e-learning courses from your current organization?

2021 ☐ 2020 ☐ 2019 ☐ 2018 ☐ I never took any ☐

A.7. Your department in the airline: _____

The following are 5-point Likert scale questions with a scale of: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree. All of the questions can be answered by clicking only on one best response for you. There is no right or wrong answer.

A. System Quality

The following statements describe the capabilities (e.g. ease of use, user friendliness, availability, flexibility, speed reliability and responsiveness) of the e-learning system at Ethiopian Airlines. Please tick the answer which best reflects your opinion about the system capabilities in relation to your learning activities.

System Quality						
Please tick one answer to describe your response to each statement						
Item #	Statement	1	2	3	4	5
SQ1	The e-learning system is easy to use	1	2	3	4	5
SQ2	The e-learning system is easy for me to navigate and learn	1	2	3	4	5
SQ3	The e-learning system is user-friendly	1	2	3	4	5
SQ4	The on-line course was available whenever I needed it	1	2	3	4	5
SQ5	The e-learning system is available most of the time	1	2	3	4	5
SQ6	There are enough computers to use and practice	1	2	3	4	5
SQ7	There is an easy access to internet at ET compounds	1	2	3	4	5
SQ8	The e-learning system gives me flexibility as to time and place of use	1	2	3	4	5
SQ9	The e-learning system provides high-speed information access	1	2	3	4	5
SQ10	Browsing speed for e-learning was satisfactory	1	2	3	4	5
SQ11	The e-learning system is reliable	1	2	3	4	5
SQ12	The rate at which the e-learning system displays information is enough	1	2	3	4	5
SQ13	The network connection to internet has been satisfactory while accessing	1	2	3	4	5
SQ14	The response time of the e-learning system is very good	1	2	3	4	5

B. E-learning Content Quality

The following statements characterize the e-learning content quality in terms of usefulness, understandability, relevance, up-to-datedness, consciousness and sufficiency of the e-learning system at Ethiopian Airlines. Please tick the answer which best reflects your opinion.

E-Learning Content Quality						
Please tick one answer to describe your response to each statement						
Item #	Statement	1	2	3	4	5
CQ1	The e-learning system provides me useful content	1	2	3	4	5
CQ2	I find e-learning to be useful in my job	1	2	3	4	5
CQ3	The e-learning system provides content that is easy to understand	1	2	3	4	5
CQ4	The e-learning system provides content that is relevant to my job	1	2	3	4	5
CQ5	The e-learning system provides content that exactly fits my needs	1	2	3	4	5
CQ6	The e-learning course content is up-to-date enough for my purpose	1	2	3	4	5
CQ7	The e-learning course content is accurate	1	2	3	4	5
CQ8	The course content is covered to an appropriate degree of breadth	1	2	3	4	5
CQ9	The e-learning system provides sufficient content	1	2	3	4	5

C. Support Quality

The following statements describe the support services provided to you in relation to e-learning from IT and the Ethiopian Aviation Academy. Please tick the answer which best reflects your opinion.

Support Quality						
Please tick one answer to describe your response to each statement						
Item #	Statement	1	2	3	4	5
SUQ1	I get satisfactory support to use the e-learning system	1	2	3	4	5
SUQ2	The academy responds to my requests in a timely manner	1	2	3	4	5
SUQ3	The staff in charge of e-learning has the technical ability to answer my requests	1	2	3	4	5
SUQ4	I get prompt responses for my e-learning support requests	1	2	3	4	5
SUQ5	The e-learning support staff are available to support my e-learning queries whenever I needed them	1	2	3	4	5

D. Learner Motivation

The following statements characterize the motivation of learners for the e-learning system at Ethiopian Airlines. Please tick the answer which best reflects your opinion.

Learner Motivation						
Please tick one answer to describe your response to each statement						
Item #	Statement	1	2	3	4	5
LM1	I find the e-learning system enjoyable	1	2	3	4	5
LM2	The actual process of using the e-learning system is pleasant	1	2	3	4	5
LM3	I have fun using the system	1	2	3	4	5
LM4	I think what I learn through e- learning is useful for my promotion	1	2	3	4	5
LM5	I think what I learn through e-learning is useful to increase my knowledge	1	2	3	4	5
LM6	I think what I learn through e- learning is helpful for me to remain current on my job	1	2	3	4	5

E. Computer & Internet Self Efficacy

The following statements characterize your belief on how effectively you can use a computer and the e-learning system at Ethiopian Airlines. Please tick the answer which best reflects your opinion.

Computer & Internet Self Efficacy						
Please tick one answer to describe your response to each statement						
Item #	Statement	1	2	3	4	5
SE1	I enjoy using personal computers	1	2	3	4	5
SE2	I was comfortable with using the PC and software applications before I took up e-learning courses	1	2	3	4	5
SE3	I am not intimidated by using the e-learning based courses	1	2	3	4	5
SE4	I feel confident using a computer to learn about and apply new concepts	1	2	3	4	5
SE5	Using a computer is an efficient way for me to learn new things	1	2	3	4	5
SE6	I can apply new concepts that I learned from the e-learning system	1	2	3	4	5
SE7	I am comfortable using the e-learning system	1	2	3	4	5
SE8	I can successfully use the e-learning system	1	2	3	4	5
SE9	It is easy for me to become skillful at tasks learned from the e-learning system	1	2	3	4	5

F. Use of E-Learning System

The following statements characterize the extent to which you use the e-learning system at Ethiopian Airlines. Please tick the answer which best reflects your opinion.

Use of E-Learning System						
Please tick one answer to describe your response to each statement						
Item #	Statement	1	2	3	4	5
US1	I use the e-learning system frequently to study different courses	1	2	3	4	5
US2	In most cases, I use the e- learning system, because I choose to, not because I have to.	1	2	3	4	5
US3	I use the e-Learning system a lot	1	2	3	4	5

G. Learner Satisfaction

The following statements characterize the degree of your satisfaction with e-learning system at Ethiopian Airlines. Please tick the answer which best reflects your opinion.

Learner Satisfaction						
Please tick one answer to describe your response to each statement						
Item #	Statement	1	2	3	4	5
LS1	I am satisfied with the performance of the e-learning system	1	2	3	4	5
LS2	The online courses serve my needs well	1	2	3	4	5
LS3	The e-learning system is useful	1	2	3	4	5
LS4	I am pleased with the experience of using e-learning	1	2	3	4	5
LS5	I think the decision to use e-learning is a wise one	1	2	3	4	5
LS6	I am very satisfied with the information I receive from the e-learning system	1	2	3	4	5
LS7	As a whole, the e-learning system is successful	1	2	3	4	5
LS8	As a whole, I am satisfied with the e-learning system	1	2	3	4	5

H. Perceived Learning

The following statements describe the level of perceived learning that you achieved by using the e-learning system at Ethiopian Airlines. Please tick the answer which best reflects your opinion.

Perceived Learning						
Please tick one answer to describe your response to each statement						
Item #	Statement	1	2	3	4	5
PL1	The e-learning system helps me improve my job performance	1	2	3	4	5
PL2	The e-learning system helps me think through problems	1	2	3	4	5
PL3	The e-learning system helps me remain current	1	2	3	4	5
PL4	The e-learning system improves my knowledge	1	2	3	4	5
PL5	I feel more self-reliant as the result of what I learned in the e-learning system	1	2	3	4	5
PL6	The e-learning system helps me save time to study required courses	1	2	3	4	5
PL7	The e-learning system gives me more convenience for my studies	1	2	3	4	5

Appendix C: Statistical Descriptive and Normality Test

Appendix C1: Statistical Descriptives of System Quality

Code	Measurement Items	Valid Responses	Missing Data		Mean	Std. Dev	Skewness	Kurtosis
			N	%				
SQ1	The e-learning system is easy to use	1280	9	0.7%	4.29	0.817	-1.286	2.059
SQ2	The e-learning system is easy for me to navigate and learn	1280	9	0.7%	4.30	0.840	-1.307	1.844
SQ3	The e-learning system is user-friendly	1280	9	0.7%	4.17	0.860	-1.014	0.963
SQ4	The online course was available whenever I needed it	1280	9	0.7%	3.72	1.123	-0.634	-0.350
SQ5	The e-learning system is available most of the time	1280	9	0.7%	3.93	0.990	-0.774	0.158
SQ6	There are enough computers to use and practice	1280	9	0.7%	3.50	1.223	-0.377	-0.838
SQ7	There is an easy access to internet at ET compounds	1280	9	0.7%	3.57	1.180	-0.499	-0.566
SQ8	The e-learning system gives me flexibility as to time and place of use	1280	9	0.7%	3.94	1.062	-0.894	0.141
SQ9	The e-learning system provides high-speed information access	1280	9	0.7%	3.93	0.899	-0.675	0.331
SQ10	Browsing speed for e-learning was satisfactory	1280	9	0.7%	3.69	1.010	-0.569	-0.081
SQ11	The e-learning system is reliable	1280	9	0.7%	3.96	0.906	-0.795	0.563
SQ12	The rate at which the e-learning system displays information is enough	1280	9	0.7%	3.89	0.877	-0.652	0.328
SQ13	The network connection to internet has been satisfactory while accessing	1280	9	0.7%	3.63	1.035	-0.561	-0.140
SQ14	The response time of the e-learning system is very good	1280	9	0.7%	3.88	0.957	-0.672	0.085

Appendix C2: Statistical Descriptives of Content Quality

Code	Measurement Items	Valid Responses	Missing Data		Mean	Std. Dev	Skewness	Kurtosis
			N	%				
CQ1	The e-learning system provides me useful content	1280	9	0.7%	4.25	0.775	-0.964	1.013
CQ2	I find e-learning to be useful in my job	1280	9	0.7%	4.31	0.824	-1.190	1.308
CQ3	The e-learning system provides content that is easy to understand	1280	9	0.7%	4.22	0.816	-0.977	0.884
CQ4	The e-learning system provides content that is relevant to my job	1280	9	0.7%	4.20	0.869	-1.089	1.163
CQ5	The e-learning system provides content that exactly fits my needs	1280	9	0.7%	3.81	0.895	-0.485	0.027
CQ6	The e-learning course content is up-to-date enough for my purpose	1280	9	0.7%	3.84	0.911	-0.580	0.121
CQ7	The e-learning course content is accurate	1280	9	0.7%	3.94	0.865	-0.596	0.201
CQ8	The course content is covered to an appropriate degree of breadth	1280	9	0.7%	3.88	0.830	-0.525	0.348
CQ9	The e-learning system provides sufficient content	1280	9	0.7%	3.96	0.865	-0.656	0.313

Appendix C3: Statistical Descriptives of Support Quality

Code	Measurement Items	Valid Responses	Missing Data		Mean	Std. Dev	Skewness	Kurtosis
			N	%				
SUQ1	I get satisfactory support to use the e-learning system	1280	9	0.7%	3.88	0.917	-0.642	0.096
SUQ2	The academy responds to my requests in a timely manner	1280	9	0.7%	3.79	0.953	-0.586	0.026
SUQ3	The staff in charge of e-learning has the technical ability to answer my requests	1280	9	0.7%	3.89	0.897	-0.640	0.295
SUQ4	I get prompt responses for my e-learning support requests	1280	9	0.7%	3.83	0.928	-0.655	0.336
SUQ5	The e-learning support staff are available to support my e-learning queries whenever I needed them	1280	9	0.7%	3.72	1.029	-0.626	0.002

Appendix C4: Statistical Descriptives of Learner Motivation

Code	Measurement Items	Valid Responses	Missing Data		Mean	Std. Dev	Skewness	Kurtosis
			N	%				
LM1	I find the e-learning system enjoyable	1280	9	0.7%	3.76	0.994	-0.577	-0.059
LM2	The actual process of using the e-learning system is pleasant	1280	9	0.7%	3.84	0.936	-0.636	0.086
LM3	I have fun using the system	1280	9	0.7%	3.52	1.050	-0.407	-0.293
LM4	I think what I learn through e- learning is useful for my promotion	1280	9	0.7%	3.94	1.028	-0.882	0.351
LM5	I think what I learn through e-learning is useful to increase my knowledge	1280	9	0.7%	4.23	0.878	-1.231	1.511
LM6	I think what I learn through e- learning is helpful for me to remain current on my job	1280	9	0.7%	4.10	0.938	-0.966	0.650

Appendix C5: Statistical Descriptives of Computer and Internet Self Efficacy

Code	Measurement Items	Valid Responses	Missing Data		Mean	Std. Dev	Skewness	Kurtosis
			N	%				
SE1	I enjoy using personal computers	1280	9	0.7%	4.01	1.124	-1.118	0.552
SE2	I was comfortable with using the PC and software applications before I took up e-learning courses	1280	9	0.7%	3.88	0.986	-0.755	0.311
SE3	I am not intimidated by using the e-learning based courses	1280	9	0.7%	3.86	0.988	-0.629	0.010
SE4	I feel confident using a computer to learn about and apply new concepts	1280	9	0.7%	4.22	0.834	-1.016	1.015
SE5	Using a computer is an efficient way for me to learn new things	1280	9	0.7%	4.21	0.861	-1.090	1.171
SE6	I can apply new concepts that I learned from the e-learning system	1280	9	0.7%	4.09	0.873	-0.888	0.789
SE7	I am comfortable using the e-learning system	1280	9	0.7%	4.16	0.874	-1.080	1.250
SE8	I can successfully use the e-learning system	1280	9	0.7%	4.25	0.830	-1.100	1.277
SE9	It is easy for me to become skillful at tasks learned from the e-learning system	1280	9	0.7%	4.05	0.892	-0.785	0.405

Appendix C6: Statistical Descriptives of Use of the E-Learning System

Code	Measurement Items	Valid Responses	Missing Data		Mean	Std. Dev	Skewness	Kurtosis
			N	%				
US1	I use the e-learning system frequently to study different courses.	1280	9	0.7%	3.70	1.061	-0.576	-0.165
US2	In most cases, I use the e- learning system, because I choose to, not because I have to.	1280	9	0.7%	3.37	1.107	-0.385	-0.408
US3	I use the e-Learning system a lot.	1280	9	0.7%	3.47	1.073	-0.295	-0.493

Appendix C7: Statistical Descriptives of Learner Satisfaction

Code	Measurement Items	Valid Responses	Missing Data		Mean	Std. Dev	Skewness	Kurtosis
			N	%				
LS1	I am satisfied with the performance of the e-learning system	1280	9	0.7%	3.89	0.870	-0.614	0.371
LS2	The online courses serve my needs well.	1280	9	0.7%	3.80	0.919	-0.554	0.143
LS3	The e-learning system is useful	1280	9	0.7%	4.30	0.794	-1.097	1.271
LS4	I am pleased with the experience of using e-learning	1280	9	0.7%	4.07	0.840	-0.760	0.595
LS5	I think the decision to use e-learning is a wise one.	1280	9	0.7%	4.14	0.867	-0.862	0.484
LS6	I am very satisfied with the information I receive from the e-learning system	1280	9	0.7%	4.01	0.877	-0.660	0.117
LS7	As a whole, the e-learning system is successful.	1280	9	0.7%	4.02	0.858	-0.754	0.581
LS8	As a whole, I am satisfied with the e-learning system	1280	9	0.7%	4.01	0.873	-0.764	0.513

Appendix C8: Statistical Descriptives of Perceived Learning

Code	Measurement Items	Valid Responses	Missing Data		Mean	Std. Dev	Skewness	Kurtosis
			N	%				
PL1	The e-learning system helps me improve my job performance	1280	9	0.7%	4.02	0.895	-0.818	0.561
PL2	The e-learning system helps me think through problems	1280	9	0.7%	3.90	0.902	-0.718	0.539
PL3	The e-learning system helps me remain current	1280	9	0.7%	3.99	0.882	-0.747	0.485
PL4	The e-learning system improves my knowledge	1280	9	0.7%	4.13	0.876	-0.976	0.977
PL5	I feel more self-reliant as the result of what I learned in the e-learning system	1280	9	0.7%	3.97	0.871	-0.679	0.373
PL6	The e-learning system helps me save time to study required courses	1280	9	0.7%	4.09	0.893	-0.995	1.003
PL7	The e-learning system gives me more convenience for my studies	1280	9	0.7%	4.05	0.893	-0.922	0.886