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ANALYSIS OF SYSTEM QUALITY FEATURES IN WORKPLACE E-LEARNING PLATFORMS THAT AFFECT PERFORMANCE EXPECTANCY AND EFFORT EXPECTANCY

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ABSTRACT

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This study investigates the critical features of workplace e-learning systems that affect user satisfaction and the intention to use these systems continuously, particularly within the context of Sri Lankan organizations.

The study adapted the Unified Theory of Acceptance and Use of Technology (UTAUT) and the DeLone and McLean Information Systems Success Model (ISSM) to propose the theoretical framework and identified and evaluated 7 system features of e-learning systems, namely, learning content quality, content design quality, interactivity, user interface design, functionality and system response. These factors were tested to discover whether they had a relationship with performance expectancy and effort expectancy.

A quantitative methodology was conducted, involving data collection from 123 working professionals across various industries in Sri Lanka. The findings reveal that while-learning content quality have a significant impact on performance expectancy, personalization significantly enhance both performance expectancy and effort expectancy, and the user interface design significantly impacts effort expectancy. Results also suggested that features such as interactivity and system response can have a negative impact on performance expectancy and effort expectancy. Performance expectancy was found to have a significant impact on intention to use the e-learning system.

These results present valuable insights for e-learning system developers, user interface designers, instructional designers, HR managers and organizational decision makers to consider the quality features when designing and developing e-learning systems so as to increase user satisfaction and system adoption.

Keywords: E-learning Systems, User Adoption, User Acceptance, Quality Features, UTAUT, ISMM

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1 INTRODUCTION

Learning in the workplace plays a vital role in transferring knowledge to employees. Not only learning will make employees equipped with the knowledge to do their current, job but it also plays a part in developing them to take on bigger roles. Tapscot, describes that knowledge and learning are key ingredients for competitive advantage and that learning should be a major part of organizational strategy. (Tapscott, 1998). As such, workplace-learning becomes an importance aspect for organizations success. Not only this, providing learning opportunities for employees might act as a way of retaining talent in the organization since employees are more likely to sustain in one organization if learning opportunities are provided to them. (D'Amato & Herzfeldt, 2008, Festing & Schäfer, 2022).

With the increasing use of technology and its improvements, the use of online-learning or e-learning at the workplace has also increased over the years. E-learning also can be categorized as a formal way of learning in the workplace. Employee-learning systems are identified as the fasted growing area in the Human Resource budget spending.(Harris & Spencer, 2019). This has become even more relevant during the post-Covid-19 pandemic era where it paved the way for many companies to adopt e-learning, online-learning as a mechanism to continue-learning during the pandemic. These platforms play a pivotal role in shaping the-learning experiences of employees in organizations. Hence, understanding the key factors that contribute to the effectiveness and usability of workplace e-learning platforms is paramount for organizations striving to maximize the potential of their workforce.

This study aims to investigate the system quality features in workplace e-learning platforms that affect performance expectancy and effort expectancy. The study is based on working executives from Sri Lanka who are using an e-learning system at the workplace

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1.1 Key Concepts

There are several key concepts that is important to be introduced at this stage. This section will elaborate the concept of e learning, e learning systems and the concept of user Technology Acceptance

1.1.1 E-learning and E-learning systems

"E-learning refers to any kinds of the use of electronic devices for learning purpose". (Arunachalam, 2019). As per (Shee & Wang, 2008) , E-learning refers to the use of any kind of electronic devices for learning purpose, including the delivery of content via electronic media. These devices can be a computer network, audio (or video tape), satellite broadcast, interactive TV, and so on .(Shee & Wang, 2008).

E-learning systems are been used by organizations in both academic institutions and also at work place environments. Workplace E-learning mainly focuses on providing employees with training and development opportunities. There are several benefits of using e-learning systems at the workplace. The participants can access course content at their convenience, irrespective of time and place, it also gives the chance to continue discussions with asynchronous interactions, gives employees to craft their own responses, and let's employees work together. (Liaw & Huang, 2013). E-learning also has the ability to reduce the training expenses of the company and also improve the service quality of the organization (Chuang, 2008). It is because of these reasons that lately organizations have opted to invest in E-learning systems. The number of e-learning programs implemented in a corporate setting has increased dramatically over the last few years and e-learning has become a major form of training and development within organizations. In the recent years there has been a significant increase in the adoption of e-learning system by companies, thus making it a prominent method for training and developing employees in companies. (Ho & Kuo, 2010).

However, the investment made for these-learning apps will only be justified if the system is adopted by its intended users, the users are satisfied and that they have intention to use the system continuously. An E-learning platform is only truly successful if the employees use the system continuously (Arunachalam, 2019).

1.1.2 Technology Acceptance

One method of investigating whether an information system is adopted by its users is to apply a technology acceptance model. There have been several models to investigate the user acceptance and the success of Information systems. The Technology Acceptance Model, (Davis et al., 1989), The Unified Theory of acceptance and use of Technology (UTAUT), (Venkatesh et al., 2003) are two of the key models used in this area. (Duggal, 2022). Another key model to measure the success of a Information System is the Delone and Mcleans Information Systems Success Model (ISMM) (DeLone & McLean, 1992; 'The DeLone and McLean Model of Information Systems Success', 2003). These models will be further discussed in the literature review chapter.

1.2 Research gaps and justification for the study

Previous Research has already identified that perceived ease of use, and perceived usefulness positively impact user satisfaction and intention to use (Bagci & Celik, 2018; Davis et al., 1989).However, a majority of the extant research was conducted for education institutes((Almaiah et al., 2016, 2019; Y. Cheng, 2012; K. C. Lee & Chung, 2009; Y. Lee, 2006) and there is a lack of literature on workplace e-learning Systems and their adoptions. While the above studies have mostly focused on user acceptance through users' attitudes, seldom have they studied on the characteristics of e-learning systems that influence these attitudes.

In the context of Sri Lanka , there is even more lack of literature on what system features of the E-learning System would increase user satisfaction at the workplace.

Hence this study explores in depth what system features of a e-learning system would affect its user satisfaction and its continuous intention to use the system.

1.3 Research Questions

The research aims to answer the below research three questions.

RQ1 :What are the main system features present in workplace e-learning systems?

E-learning systems in the workplace may contain various features such as security, user authentication, and learner profile management and also features that

are more directly linked to learning such as learning content, assessments, and gamification. This study aims to identify the main features that are specific to e-learning systems.

RQ2: Which system features have the greatest impact on Performance Expectancy, Effort Expectancy and behaviour intention to use the e-learning systems at the workplace?

Once the features are identified and categorized, the study will aim to understand which of those features will have an impact the usage of the e-learning system.

RQ3: How/ to what extent do the system features influence user satisfaction and intention to continue the use of e-learning system?

The study will also aim to quantify the causal impact and provide an understanding of what system features impact user satisfaction the most. By answering the above questions, the study will provide useful contributions to theory and extant literature related to e-learning systems and its adoption. It will also provide useful information to e-learning system developers and vendors in terms of designing e-learning systems including such features that would enhance user satisfaction. Finally, it will also provide useful information to HR Managers and Organizational Management when making investment decisions on e-learning systems.

1.4 Structure of the paper

The structure of the master thesis is as follows. The second chapter will discuss the extant literature related to e-learning systems, features of e-learning systems, their adoption, user acceptance models and possible theories that relate to user acceptance.

The third chapter will present the theoretical Model and propose the research hypothesis. The Hypothesis will be based on what system features that would affect the performance expectancy and effort expectancy in the UTAUT model.

In the fourth chapter , the research methodology will be discussed. The study been a quantitative research , this chapter will include the preparation of the research instrument, data collection techniques, and data analysing techniques.

The Results and Analysis chapter will provide the results from the data collection phase, summarize them and interpret the data and their connections.

It will also discuss the validity of the hypothesis based on the data. It will go through each of the identified system features of the e-learning system and analyze how they will affect the performance expectancy, effort expectancy and behaviour intention to use and present causal relationships, between these constructs.

The last chapter will include a discussion and summary of the results. It will first present a summary of the results and discuss theoretical implications and managerial implications of those results. This section will also provide the limitations of the study and also give insights to possible future research in this area.

2 LITERATURE REVIEW

This chapter discusses on the extant literature of user acceptance models, IS success model, e-learning systems and the quality features of e-learning systems. It narrows down the theoretical concepts that will be adapted for the research and finally proposes the research model.

2.1 Adoption of Information Systems

The Acceptance and adoption of an Information System by its users are a critical factor for the Success of the information systems. Hence, there have been ample literature on the area of user acceptance and IS adoption models. These models try to explain the relationship between users' attitude, satisfaction, and behavioural intention to use and also system usage.

2.1.1 The Technology Acceptance Model (TAM)

One of the first models to discuss how users adopt an Information system was introduced by The Technology Acceptance Model , discusses how users will adopt a new Information System (Davis et al., 1989). The Technology Acceptance Model suggests three main findings. 1. That the use of computer can be substantially predicted from their intentions, 2. Perceived usefulness impacts intention to use, 3. Perceived ease of use impacts intention to use. (Davis et al., 1989)

Scales for Perceived usefulness and perceived ease of use were also Developed by Davis, (1989). Perceived Usefulness can be defined as the extent to which an individual perceives that using a system would increase his or her job performance and Perceived ease of use refers to the extent to which an individual believes that using a system requires less effort (Davis, 1989).

Perceived Usefulness

Several studies have confirmed the relationship perceived usefulness, perceived ease of use and continued intention to use. Learners who perceive that using an e-learning system can enhance their learning performance will have a positive attitude towards using the system. (Lee, 2006).Another study showed that perceived usefulness had a significant impact on positive attitude towards technology and this positive attitude towards technology in turn , positively impacted continued intention to use the system. (Stoel & Hye, 2003). In another study

that examined factors that affect engineers acceptance of e-learning systems, perceived usefulness was revealed to have a significant positive impact on user acceptance (Ong et al., 2004).

Perceived Ease of use

Similar to Perceived usefulness, there is several studies that point out perceived ease of use has a positive relationship to user satisfaction and intention to use. On Ong et al. (2004), study on engineers acceptance of e-learning systems, perceived ease of use was found to be the most influencing factor for behaviour intention to use.

2.1.2 The Unified Theory of Acceptance and Use of Technology (UTAUT)

Since the Technology Acceptance Model was introduced, many more competing models also came to place. Information Systems can vary in terms of industry, scope, context, nature of use, and users. Therefore , user acceptance models are also used in different situations, with different stakeholders, contexts, technologies, units of analysis. (Williams et al., 2009). This led to researchers having to choose from several competing models to test for user acceptance. This situation has in turn led to an element of confusion among researchers, as they are often forced to pick and choose characteristics across a wide variety of often competing models and theories. This was one of the main reasons that Venkatesh et al., (2003) introduced the Unified Theory of Acceptance and Use of Technology. (UTAUT). As the name suggests this study was aimed at producing a unified model by studying all the existing user acceptance models at that time. It was suggested that four main constructs directly affect the user acceptance and usage behaviour which were performance expectancy, effort expectancy, effort expectancy, social influence and facilitating conditions. (Venkatesh et al., 2003). They suggested that these four constructs directly impact behavioural intention to use and behavioural intention to use in turn impact usage behaviour. (Venkatesh et al., 2003). The study aims to deploy two of these factors in the study, Performance expectancy and effort expectancy.

Performance expectancy

Performance expectancy refers to the extent to which a person believes that using the system will help him or her to improve job performance (Venkatesh et al., 2003).

Effort expectancy

Effort expectancy refers to easiness of using the system and social influence is defined as the extent to which a person perceives that those who are important him believe that he should use the system (Venkatesh et al., 2003).

The UTAUT model, since its inception has been used widely used. What is more important is it has been discussed with a wide array of technologies, including internet, web systems, hospital information systems, tax payment systems and mobile technologies , with a variety of user groups, including students and professionals, and it has been tested with a range of control factors such as age, gender, experience, income and education. (Williams et al., 2015). This is evidence that the UTAUT has depth and breadth to be used and that it has been validated over time.

2.1.3 Continuous intention to use

The intention to use an Information system is an important factor for its success and is also a indicator of system adoption. Continuous intention to use a system can be defined as a user's persistent behaviour to use a system (Hsu & Lin, 2020). Bhattacherjee,(2001) claimed that continuance intention to use an Information system if the systems perceived usefulness is satisfied and confirmed. This indicates that if the users believe that the IS is useful, they will form intentions to use the system. It is also argued that the intention to behave can predict the actual behaviour. (Sheppard et al., 1988). Hence continuous intention to use is a key indicator of user adoption.

User Satisfaction

User Satisfaction has been defined in several ways. User Satisfaction can be termed as well a user is pleased with a product, service or technology that they have used or experienced. (San Martın et al., 2019; Willroth et al., 2019). Bhattacherjee mentioned that Satisfaction is the user's feeling about the use of LMS. (Bhattacherjee, 2001). It has also been discovered through several studies that user satisfaction has a positive impact on continuous intention to use a system.

2.1.4 Performance Expectancy and Intention to use

There have been several studies that have proved the relationship between performance expectancy and intention to use. One such study conducted in South Korean involving university students found that performance expectancy has a positive relationship towards intention to use. (Sung et al., 2015). A similar study conducted in two universities in Uganda and Australia concluded that

intention to use was positively impacted by performance expectation.(Kaliisa et al., 2017).

In another study conducted using employees in Indonesian workplaces, who use e-learning as part of their corporate-learning programs, concluded that performance expectancy was the strongest predictor of intention to use.(Lantu et al., 2023).

Hence performance expectancy can be considered as having a strong influence on intention to use IT systems.

2.1.5 Effort Expectancy and Intention to use

Effort expectancy has also been proved to have a positive impact on intention to use IS. Sun el al. (2015), claimed that effort expectancy had a positive relationship to intention to use on university students using mobile-learning. Kaliisa et al. (2017) also through their study found that effort expectancy impacts intention to use. Lantu et al (2023) also found that effort expectancy has a positive impact towards intention to use.

Hence it can be concluded that effort expectancy has strong impact on intention to use IT.

2.1.6 IS Success Model (ISMM)

Delone and Mclean proposed a Information Systems Success model ISMM(DeLone & McLean, 1992). They mention that measuring the success of an Information system is critical to understand the value to the IT investment. ('The DeLone and McLean Model of Information Systems Success', 2003). In the first model they proposed that information quality and system quality influence user satisfaction and Information system Use. (DeLone & McLean, 1992). However, in a revised model, Service Quality is also updated as a determinant that influences ser satisfaction and system use. ('The DeLone and McLean Model of Information Systems Success', 2003).

System quality refers to information procession of the system itself(DeLone & McLean, 1992). However, system quality can be perceived in different perspectives depending on the purpose of the system. Belardo, Karwan and Wallace (1982), in their study of Emergency Management DSS , mentions that Reliability, ease of use, Response time, ease of learning comprise of system quality. On another study concerning an Academic Information System , the system quality was defined as resource utilization and investment utilization (Knebel and Raviv, 1982). Usefulness of Decision Support System Features was referred to as the system quality in a study involving a Marketing Decision Support System. (Goslar, 1986). For a study based on computer based model-

ling systems, the system quality was defined by three constructs, System Reliability, System Accessibility and response time. In a more recent study concerning online shopping websites, system quality was defined as the perceptions of the customers regarding it functionality in terms of ease of navigation, availability, layout, appearance and page load speed. (Fang et al., 2011). It is evident that the definition of the system quality depends on the nature of the system and also the industry.

Information quality refers to the quality of the information that the system produces. (DeLone & McLean, 1992). In this context, the information quality of a system can be thought of in several ways. In a study to measure system user satisfaction, the most important items found were information accuracy, output timeliness, reliability, completeness, relevance, precision and currency. (Bailey and Pearson,1983). Srinivasan (1985) , on a study based on Computer based modelling refers to information quality as Report Accuracy, report Relevance, Understandability and report timeliness of the system (Jennex & Olfman, 2003), measures Information Quality of a Knowledge management system on three items, Knowledge process, information richness and linkages between knowledge components. On another study related to online shopping websites, information quality was defined as the customer's perceptions of the characteristics and the presentation of information in the website and information quality was measured as relevance, understandability, accuracy, completeness and timeliness. (Fang et al., 2011).
While the above definitions of Information quality are related to various types of information systems it is important to understand information quality in the context of e-learning. Course Content is a measurement in Information quality in the context of e-learning systems. (Y. Lee, 2006).

Service Quality was the third success factor in the ISMM model. Service Quality, which was initially a marketing indicator, was adopted to measure the service quality in a IS context where the items were tangibility, reliability, responsiveness, Assurance and empathy. (Kettinger & Lee, 1994).

2.2 E-learning

As briefly described in the introduction, E-learning has gained much focus during the last couple of decades. "E-learning systems provide personified, flexible-learning can reduce the cost of learning; and enable-learning on demand"(Al-Adwan et al., 2021). E-learning, or electronic learning, over the years has had several definitions. Engelbrecht (2003), mentions that e-learning refers to the delivery of learning content through any form of electronic media, including internet, extranet, intranet, broadcast, audio, video interactive TV, and CD-ROM.

2.2.1 Adoption of E-learning Systems

One of the key factors for the success of e-learning system is the user acceptance of the System. (Almaiah et al., 2019). It has been noted that assessing the success of e-learning system has been an area of concern for its stakeholders. (Al-Adwan et al., 2021). There have been many studies trying to assess the success E-learning systems using different theoretical models. It is also worthwhile to note that there have been attempts to assess the e-learning systems success by investigating the quality factors of the system. Quality features are critical indicators of success of the e-learning system and it is vital to investigate the relationship between such quality factors and learners' perceptions and beliefs. (Cheng, 2012).

In one such study , TAM and ISMM was used to investigate the factors that have a impact on the success of E-learning systems, and it was found that Instructor Quality, Technical System Quality, Support Service Quality, Education systems quality, and the quality of course content have a direct impact on the Satisfaction, perceived usefulness and the usage (Al-Adwan et al., 2021).This was one of the studies that have integrated a technology acceptance model and Information System Success Model.

A similar Study conducted by (Al-Fraihat et al., 2020), using ISMM and TAM , concluded the perceived Satisfaction of en e-learning system was influenced by technical system quality, information quality, service quality, support system quality, learner quality, instructor quality, and perceived usefulness. And that Perceived usefulness was influenced by technical system quality, information quality, support system quality, learner quality, and instructor quality. (Al-Fraihat et al., 2020).

(Cheng, 2012), also used an extended version of the TAM and ISMM to investigate if quality factors affect the learners' intention to use the e-learning system and in this study, It was found that information quality, system quality, and service quality, perceived ease of use as antecedents to intention to use the e-learning system.

Another Study based on the E-learning system at the University of Saudi Arabia, which used the UTAUT , discovered that performance expectancy and effort expectancy directly influence the continued intention to use the e-learning system (Bellaaj, Zekri, and Albugami, 2015).

(Almaiah et al., 2016), used the TAM and ISMM to examine to the effect on quality features on the acceptance of mobile-learning in universities in Jordan and concludes that learning content quality, content design quality, interactivity, functionality, user-interface design, accessibility, personalization, and responsiveness are critical quality factors that affect mobile-learning acceptance.

Almaiah (2005), propose a Framework to determine the success factors for e-learning systems and mentions 4 domains including Website Quality factors

and Technological Factors. Under Website quality Factors , 5 items , namely Website Content Quality, Website Design Quality, Web site technical quality, Website access Speed and usability. Under Technological Factors, E-learning system functionality, E-learning system Reliability, and Facilitating conditions are proposed.

(Wang & Wang, 2009) conducted a study on the quality factors that influence the adoption of web based e-learning systems in Taiwan, and concluded that information quality, system quality and service quality have a direct impact on perceived ease of use. Also, in another study, investigated the factors that will influence student continual intention to use a web based learning management system. The study conducted for 408 undergraduate students and concluded that instructor quality and system quality affected perceived usefulness and user satisfaction and that information quality largely affected perceived usefulness. (Lwoga, 2014).

Another study involving 172 participants from united nations, International labour organization, United nations Educational, scientific and cultural organization, United nations development program, and United nations higher commissioner for human rights, found that continuance intention to use e-learning systems is directly impacted by user satisfaction and that user satisfaction is impacted by perceived ease of use, perceived usefulness , information quality, service quality, and system quality. (Roca et al., 2006)

2.3 System Features of E-learning systems

There have been several studies conducted on investigating the system features of e-learning systems. This section discussed several of these factors and their probable relationship with performance expectancy and effort expectancy.

2.3.1 Learning content Quality

Learning content in an e-learning system can be referred to as any written digital material sources such as lectures, courses, assignments, images, and quizzes (Almaiah et al., 2016). The quality of Information in an e-learning system is vital when assessing the success of such a system since poor quality of Information may hinder the attainment of learning goals(Al-Fraihat et al., 2020). Learning content quality or course content quality can be defined as the quality of the-learning content provided by the e-learning system (Seta et al., 2018) and as per (Al-Fraihat et al., 2020), learning content quality includes accuracy, usefulness, reliability, comprehensibility, availability, relevancy, completeness, and being up-to-date. The content of the e-learning material should be precise, accurate, timely, suitable and up-to-date (M. A. Almaiah et al., 2019).(Y. Lee & Kozar,

2006), mention that learning quality consists of content richness and up-to-date content.

It was also noticed that extant literature has used learning content quality and course content quality interchangeably and that they both relate to information quality in the ISMM model.

(Almaiah et al., 2016), in their study confirm that Learning content quality directly impacts perceived usefulness and perceived ease of use. Also, according to (Cheng, 2012), learning content quality significantly increases perceived usefulness and perceived ease of use in e-learning systems. Hence, this study hypothesizes that:

H1: Learning Content quality (LCQ) will positively affect the performance Expectation of the e-learning system.
H2: Learning Content quality (LCQ) will positively affect the Effort Expectation of the e-learning system.

2.3.2 Learning Content Design

The quality of the content design refers to how the e-learning systems content is designed using colour and appealing multi-media techniques. (Almaiah, 2005). As per Lee & Kozar (2006), The content design quality can be termed as " to the type and format of learning content". These formats may include texts, graphics, charts, multimedia content such as audio, video and animations , and the ability to collaborate-learning through sharing files (Almaiah et al., 2016). In another study involving students in Taiwan universities , it was revealed that e-learning course quality has a significant impact on perceived satisfaction (Sun et al., 2008).

(Almaiah, 2005), argues that the design of the-learning content is a vital factor if the e-learning system is to be successfully accepted. If the-learning content in the system is of high quality, the level of satisfaction of its users increases and subsequently the user acceptance increases. (M. A. Almaiah et al., 2016). Further, (Y. Cheng, 2012) found that content design quality has a positive influence on perceived usefulness and perceived ease of use. Hence, it is hypothesized that,

H3: Content Design Quality (CDQ) will positively affect the performance Expectation of the e-learning system.
H4: Content Design Quality (CDQ) will positively affect the Effort Expectation of the e-learning system.

2.3.3 Interactivity

According to (Pituch & Lee, 2006), Interactivity is referred to as the level of interaction between its users, (Students and teachers). If students who use an e-learning system can easily get in contact and interact with other learners and teachers through the e-learning system, they will perceive that such systems are useful. (Cheng, 2012).

Interactivity will positively affect perceived usefulness and perceived ease of use. (Cheng, 2012). Also , (Almaiah et al., 2016), mentions that interactivity has a direct impact on perceived ease of use, perceived usefulness and has an indirect impact on behavioural intention to use through perceived usefulness and perceived ease of use. Therefore, it is hypothesized that,

H5 : Interactivity (INT) will positively affect the performance Expectation of the e-learning system.
H62: Interactivity (INT) will positively affect the Effort Expectation of the e-learning system.

2.3.4 Functionality

In general terms, the functionality of an information system can be termed as having the necessary features that enables its users to achieve the intended goals and tasks through the system.(Cho et al., 2009a)

(Pituch & Lee, 2006) provide a more specific definition for functionality of e-learning systems as the perception that the system should consist of features that provides flexible access to learning materials and that helps to accomplish the required tasks.

Several researchers have pointed out that impact of functionality towards user satisfaction and continued intention to use. (Cho et al., 2009a) mentions that having system functionality will increase the learners' perceptions towards system usefulness. (Cheng, 2012), mentions that system functionality will have a positive influence on the users belief of perceived usefulness and perceived ease of use of the e-learning system. The study hypothesizes that,

H7 : Functionality (FNT) will positively affect the performance Expectation of the e-learning system.
H8 : Functionality (FNT) will positively affect the Effort Expectation of the e-learning system.

2.3.5 User Interface design

Cho et al. (2009) defined user-interface design as how the users perceive the information system's features are presented to them through the structured designs of the interface.

There have been several studies that point out how good user interface design will contribute to user satisfaction. The quality of the user interface design will be a critical factor in determining the degree of usefulness and ease of use of the system (Cheng, 2012). (Almaiah et al., 2016) in their study proved that user interface design had a significant impact on perceived usefulness, and perceived ease of use and further goes on to state that having a simple and a flexible user interface design will reduce the effort needed to use the system and will be perceived as user friendly. (Cho et al., 2009a), conducted a study on perceived user interface design for e-learning tools and confirmed that Perceived User interface design plays a crucial part in increasing , perceived usefulness, perceived ease of use and users' continued use of the system. Thus, the study hypothesizes that,

H9 : User Interface Design (UID) will positively affect the performance Expectation of the e-learning system.
H10: User Interface Design (UID) will positively affect the Effort Expectation of the e-learning system.

2.3.6 Personalization

Personalization in general may refer to a degree of customization to a system. As per (Almaiah et al., 2016), personalization of a system is defined as the level of customization to the user interface, information and services provided by the system based on the user. To achieve personalization one can try to determine the learners requirements, learner profile, and learning style (Ali et al., 2014).

Providing a degree of personalization and customization will provide a better user experience for students. when personalization features are used in mobile-learning it helps to cater to the learners' needs and requirements (Pollara & Broussard, 2011). It is hypothesized that,

H11. Personalization (PNL) will positively affect the performance Expectation of the e-learning system.
H12: Personalization (PNL) will positively affect the Effort Expectation of the e-learning system

2.3.7 System response

As per (Pituch & Lee, 2006), System responsiveness can be defined as the user's perception that the system is fast, reasonable and consistent. (Voss, 2000) argues that system response is a service quality factor and that fast response is crucial for users' perception of service quality.

(Cheng, 2012) proved that responsiveness has a positive influence on perceived usefulness of an e learning system. (Almaiah et al., 2016), also suggest that responsiveness is a key factor in user acceptance and has a positive effect on intention to use through perceived usefulness and perceived ease of use. Hence, it is hypothesized that,

H13. System Response (SR) will positively affect the performance Expectation of the e-learning system.
H14: System Response (SR) will positively affect the Effort Expectation of the e-learning system

2.3.8 Intention to use

Previous literature has found that intention to use was influenced by both performance expectancy and effort expectancy as explained in sections 2.1.4 and 2.15. The study also will validate this relationship through the analysis. Hence it is hypothesized that,

H15. Performance Expectancy (PE) will positively affect the Intention to Use (ITU) the e-learning system.
H16: Effort Expectancy (PE) will positively affect the Intention to Use (ITU) the e-learning system.

2.4 Literature review summary and proposed research model

The literature review was conducted in order to investigate current knowledge regarding user acceptance, e-learning systems and the quality features of the e-learning system.

Two models stood out with regard to IS user adoption models. The TAM and the UTAUT where both models have been used extensively in various areas of IS. Two factors of the UTAUT model, performance expectancy and effort expectancy was chosen for the theoretical model. The ISMM model was also used as an extension to the UTAUT model and where 7 quality factors were

identified for the model. Based on the above hypothesis, this study proposes the below research model to be tested presented by figure 1.

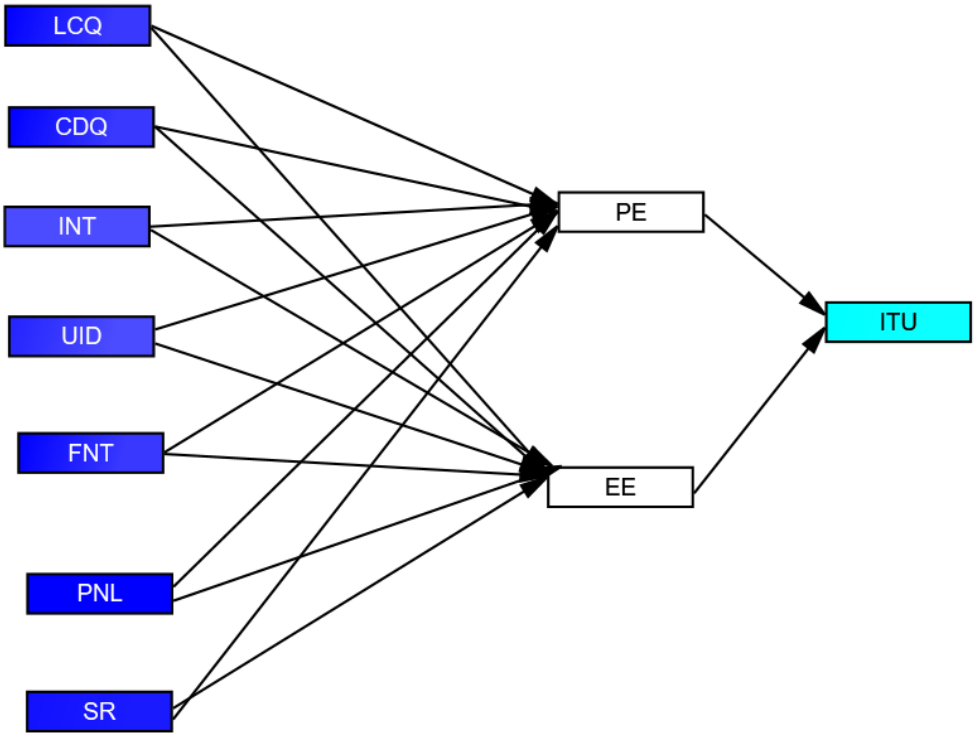


Figure 1 Proposed Research Model

3 RESEARCH METHODOLOGY

This chapter discusses the methodology used in the study. It will describe the quantitative methods used and the justification for using such methods. It will also discuss the method of instrument development, data collection and sampling methods and data analysis techniques.

3.1 Quantitative Methods

Quantitative methods in research are applied to examine numerical data through statistical methods. The quantitative research methods uses the process of specifying a theory, which is proposed or already in existence, and then proposes hypothesis, based on the theory, which are analyzed and evaluated through quantitative data. (Swanson & Holton, 2005). Hence it involves determining Units of analysis, measurement units and sample population that data should be collected from and finally analyzed. This method also has certain advantages, a) since the result is numerical, it lacks subjectivity, and the result is often objective, b) the approach provides a simplified way of analyzing large amounts of data c) it allows to compare results within the study and also with other studies easily (Basias & Pollalis, 2008). Since this study aimed to examine the hypothesis based on the theoretical model, it was decided to employ a quantitative method for the study.

3.2 Instrument Development

By developing the conceptual Framework and hypothesis, it was discovered that there are 10 constructs to be measured. Hence, the constructs Learning Content Quality (LCQ), Content Design Quality (CDQ) , Interactivity (INT), Functionality (FNT), User Interface Design (UID), Personalization (PNL), Sys-

tem Response (SR), Performance Expectancy (PE), Effort Expectancy (EE), Intention to Use (ITU) were measured using a 5 point Likert Scale (5 –Strongly Agree, 4- Agree, 3 – Neutral , 2- Disagree, 1- Strongly Disagree).

It is important to design and develop a reliable and effective survey instrument to measure each construct. Hence, scales for each construct were adapted through scales that were used in previous research : Learning content Quality (Almaiah et al., 2016; Cheng, 2012; Lee et al., 2009; Lee, 2006), Content Design Quality (Choi et al., 2007; Lee et al., 2009), Interactivity (Almaiah et al., 2016; Cheng, 2012; Choi et al., 2007; Pituch & Lee, 2006), Functionality (Cho et al., 2009a; Pituch & Lee, 2006), User Interface Design (Cheng, 2012; Cho et al., 2009a; Choi et al., 2007), Personalization (Almaiah et al., 2016), System Response (Y. Cheng, 2012; Pituch & Lee, 2006), Performance Expectancy (Lantu et al., 2023; Venkatesh et al., 2003) Effort Expectancy (Lantu et al., 2023; Venkatesh et al., 2003), Intention to Use (Lantu et al., 2023). Each scale had 3 to 4 items to measure the construct. The Initial items were modified to better suit the work place context since some of the sources were originally used as a scale in Academic Institutions context. Table 1 represents a summary of the initial constructs, their items and the sources referred.

A pilot survey was conducted using 27 respondents who use e-learning systems at the workplace in Sri Lanka. Through the results obtained from this, the reliability and the validity of the survey instrument were tested. Based on the feedback the items in the survey were modified and the final survey instrument was finalized. The items in the construct CDQ did have neither sufficient reliability nor validity to proceed with. Hence, the authors introduced own items for the scale. The item UID 3 was deleted since it proved to be a redundant item in the construct.

Table 1 Survey Construct with Sources

Construct	**Item**	**Code**	**Reference**
learning Content Quality	The e-learning system provides me with sufficient learning content	LCQ1	Arbaugh (2000), Cheng 2012, Lee et al. (2009),Almaiah (2016),Lee (2006)
	The e-learning system often provides the updated information.	LCQ2	
	E-learning provides me with teaching materials that fit with the-learning objectives	LCQ3	
	The e-learning system provides me complete content	LCQ4	
Content design quality	The level of difficulty of the-learning content is appropriate.	CDQ1	Choi et al. (2007), lee et al 2009
	The e-learning system provides me with individualized learning management.	CDQ2	
	The E-learning System provides a variety of learning methods	CDQ3	

Interactivity	The e-learning system enables interactive communication among learners.	INT1	Choi et al. (2007), Cheng(2012), Pituch and Lee (2006),Almaiah (2016)
	The e-learning system easy for you to share what you learn with my colleagues	INT2	
	The e-learning system is easy for you to access the shared content from my collegues	INT3	
	The communicational tools in the e-learning system are effective.	INT4	
Functionality	The e-learning system offers multimedia types (Audio, video and text) of course content.	FNT1	Cho et al. (2009),Pituch and Lee (2006)
	The e-learning system allows me control over the speed of my learning.	FNT2	
	The e-learning system presents course content in a readable and well-organized format.	FNT3	
	The e-learning system offers flexibility in learning as to time and place.	FNT4	
User-interface design	The layout of the e-learning system is user friendly.	UID1	Parikh and Verma (2002), Cho et al (2009), Choi et al (2007),Cheng (2012)
	The layout of the e-learning system is in good structure.	UID2	
	The e-learning system is easy to use.	UID3	
	Overall, the user-interface design of the e-learning system is satisfactory.	UID4	
Personalization	The e-learning system enables me to choose how I want to learn	PLN1	Al-Mushasha and Nassuora (2012),Almaiah (2016)
	The e-learning system enables me to control my learning progress	PLN2	
	The e-learning system records my performance	PLN3	
	The e-learning system remembers the preferences for me	PLN4	
System Response	The e-learning system is very quick in responding to my requests	SR1	Bailey and Pearson (1983), Pituch and Lee (2006), Cheng (2012)
	The response time of the e-learning system is consistent.	SR2	
	The response time of the e-learning system is reasonable.	SR3	
Performance Expectancy	Using the e-learning system increases my learning effectiveness	PE1	Lantu et al (2023), Ngampornchai and Adams,2016, Venkatesh 2003
	Using the e-learning system helps my productivity	PE2	
	Using the e-learning system is benefi-	PE3	

	cial for my career		
	E-learning provided by the company improves my performance	PE4	
Effort Expectancy	The e-learning system is easy to operate	EE1	Lantu et al (2023), Ngampornchai and Adams,2016, Venkatesh 2003
	I can easily use the e-learning system provided by the company without much help from others	EE2	
	It is easy for me to be fluent in using the e-learning system	EE3	
	I have the expertise to operate system	EE4	
Behaviour Intention to use	I intend to use e-learning system in the upcoming months	ITU1	Lantu et al 2023, Attuquayefio and Addo, 2014; Sattari et al., 2017
	I plan to use e-learning system and benefit from its use	ITU2	
	I will recommend the use of e-learning system to my colleagues	ITU3	

The Final Survey Instrument was modified based on the above observations and Table 2 presents the final survey instrument.

3.3 Data collection procedures

Once the scale items were finalized an online survey was developed using startquestion.com. In addition to the constructs listed in table 2, the survey also included questions to collect demographic information including Age, gender and years of working experience. The Online survey was distributed among working professional in Sri Lanka. Email contacts, and professional networks were used to distribute the survey invitation. Snowballing method was used to accumulate survey respondents. The survey invitation mentioned the purpose of the survey and in addition it mentioned that the participation for the survey was voluntary, and that there were no rewards for completing the survey. Since the survey was distributed without the knowledge whether the respondents used an e-learning system at the workplace , a filtering question was used to validate if they used an e-learning system at their workplace.

Sri Lankans who are working abroad were excluded from the survey and also the responses of the pilot study were not considered in the final data analysis. The survey was distributed among 230 potential participants and the survey resulted in a total of 188 responses out of which 24 were incomplete and were discarded. Out of the remaining responses, 41 respondents mentioned that they did not use an e-learning system at their current workplace. Hence the final result yielded 123 usable responses.

Table 2 Finalized Survey Instrument

Contruct	Scale Items	Code
learning Content Quality	The e-learning system provides me with sufficient learning content	LCQ1
	The e-learning system often provides updated Learning Content	LCQ2
	E-learning provides me with teaching materials that fit with the-learning objectives	LCQ3
	The e-learning system provides me with complete-learning content	LCQ4
Content design quality	The course content includes a variety of learning methods (quizzes, activities,Case studies and Discusssions)	CDQ1
	The-learning content in the e-learning system has an appealing visual design	CDQ2
	The Course content in the e-learning system has appropriate opportunities to assess and evaluate my learning.	CDQ3
Interactivity	The e-learning system enables interactive communication among learners.	INT1
	The e-learning system makes it easy for me to share what I learn with my colleagues	INT2
	The e-learning system makes it easy for me to access the content shared from my colleagues	INT3
	The communicational tools in the e-learning system are effective	INT4
Functionality	The e-learning system offers multimedia types (Audio, video and text) of course content.	FNT1
	The e-learning system allows me control over the speed of my learning.	FNT2
	The e-learning system presents course content in a readable and well-organized format.	FNT3
	The e-learning system offers flexibility in learning as to time and place.	FNT4
User-interface design	The layout of the e-learning system is user-friendly.	UID1
	The layout of the e-learning system is in good structure.	UID2
	Overall, the user interface design of the e-learning system is satisfactory.	UID3
Personalization	The e-learning system enables me to choose how I want to learn	PLN1
	The e-learning system enables me to control my learning progress	PLN2
	The e-learning system enables me to choose the-learning Content that I want	PLN3

	The e-learning system records my learning Progress	PLN3
System Response	The e-learning system is very quick in responding to my requests	SR1
	The response time of the e-learning system is consistent.	SR2
	The response time of the e-learning system is reasonable.	SR3
Performance Expectancy	Using the e-learning system increases my learning effectiveness	PE1
	Using the e-learning system helps my productivity	PE2
	Using the e-learning system is beneficial for my career	PE3
	The E-learning System provided by the company improves my performance	PE4
Effort Expectancy	The e-learning system is easy to operate	EE1
	I can easily use the e-learning system provided by the company without much help from others	EE2
	It is easy for me to be fluent in using the e-learning system	EE3
	I have the expertise to operate the e-learning system	EE4
Behaviour Intention to use	I intend to use the e-learning system in the upcoming months	ITU1
	I plan to use the e-learning system and benefit from its use	ITU2
	I will recommend the use of the e-learning system to my colleagues	ITU3

3.3.1 Descriptive Statistcis

Table 3 depicts the demographic distribution of the responses. 44.7% of the respondents were female while 55.3% were male. The majority of the respondents had between 5-10 years of work experience while 26.8% had 10-15 years of work experience, 16.3% had work experience of 15 years or above. 61.8% of the respondents were aged between 31-40,while 22% was between 21-30 years of age and the remaining were above 41 years of age.

Table 3 Profile of Respondents

Measure	**Item**	**Frequency**	**Percent**
Age	21-30	27	22.0

	31-40	76	61.8
	41-50	18	14.6
	51-60	2	1.6
Experience	1-2 years	7	5.7
	10-15 years	33	26.8
	2-5 years	11	8.9
	5-10 years	52	42.3
	Above 15 years	20	16.3
Gender	Female	55	44.7
	Male	68	55.3

4 DATA ANALYSIS AND RESULTS

This chapter discusses the process of analyzing the results of the survey. This process included reliability analysis, Factor Analysis and Hypothesis Testing using Structural Equation Modelling (SEM). SPSS was used for reliability analysis and factor analysis while SPSS AMOS was to test the structural equation model.

4.1 Measurement Model Validation

The reliability of a scale is referred to as the consistency and predictability of a scale and that the results of the scale represent the true state of the variable it is supposed to measure (DeVellis & Thorpe, 2021).

The reliability of each of the 10 constructs was tested using Cronbach's Alpha As per DeVellis & Thorpe (2021), Alpha is referred as the proportion of a scale's variance that can be attributed to a common variable and this common variable could be the true latent variable portrayed from the items. Hence, the higher the cronbach's Alpha, the reliability of the constructs measure also increases. As shown in table 4, the reliability of for each of the 10 constructs were greater than .7 which is the parameter for acceptance. (Kannan & Tan, 2005; Wang & Wang, 2009).

Table 4 Reliability Measures using Cronbach's Alpha

Construct	Cronbach's alpha coefficient of the construct	Item	Cronbach's alpha coefficient of the construct if item deleted
LCQ	0.82	LCQ1	0.787
		LCQ2	0.766
		LCQ3	0.764
		LCQ4	0.776

CDQ	0.725	CDQ1	0.568
		CDQ2	0.647
		CDQ3	0.688
INT	0.852	INT1	0.832
		INT2	0.764
		INT3	0.805
		INT4	0.838
UID	0.886	UID1	0.882
		UID2	0.807
		UID3	0.823
PNL	0.778	PNL1	0.749
		PNL2	0.652
		PNL3	0.736
		PNL4	0.755
FNT	0.744	FNT1	0.717
		FNT2	0.710
		FNT3	0.668
		FNT4	0.637
SR	0.857	SR1	0.809
		SR2	0.757
		SR3	0.830
PE	0.846	PE1	0.794
		PE2	0.776
		PE3	0.827
		PE4	0.817
EE	0.874	EE1	0.838
		EE2	0.833
		EE3	0.835
		EE4	0.849
ITU	0.9	ITU1	0.825
		ITU2	0.815
		ITU3	0.932

The above table also suggests that if the deletion of individual items would decrease the Cronbach's Alpha of the construct except for ITU3, if deleted would increase ITU up to .932. However, in order to keep a minimum of 3 items per construct ITU3 was not deleted.

4.2 Exploratory Factor Analysis

Exploratory Factor Analysis was conducted to measure the structure and correlation between the items in the scale. Principle Component Analysis using

Varimax rotation was used and factors were extracted based on Eigenvalue. The results of rotated factor matrix are provided in the table 5 and table 6.

Table 5 KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.851
Bartlett's Test of Sphericity	Approx. Chi-Square	2927.125
	Df	630
	Sig.	0.000

The KMO value is above 0.50 so it indicates that criteria of sampling adequacy is met. The Bartlett test of sphericity is statistically significant (P<.005), hence it indicated that the correlation matrix is statistically different from an identity matrix as desired.

The results of the exploratory factor analysis shows that the items loaded on only 8 factors since the analysis method did not specify a fixed number of factors to extract. Items CDQ1 , CDQ2, UID1, UID2 AND UID3 loaded on the same item. Also PNL2, PNL3, SR1,SR2,SR3 loaded on the same factor. All the other items loaded on their own constructs. This model explains 70% of the variance out of the total variance. In order to further investigate the construct validity and discriminant validity of the model confirmatory factor Analysis was also conducted.

Table 6 Factor Analysis Using Varimax Rotation

Rotated Component Matrix[a]								
	Component							
	1	2	3	4	5	6	7	8
LCQ1						0.682		
LCQ2						0.675		
LCQ3						0.706		
LCQ4						0.554		
CDQ1			0.522					
CDQ2			0.709					
CDQ3								
INT1				0.735				
INT2				0.872				
INT3				0.773				
INT4				0.674				
FNT1								0.504
FNT2								0.732
FNT3								0.540

FNT4					0.771
UID1		0.631			
UID2		0.651			
UID3		0.694			
PNL1					
PNL2	0.509				
PNL3	0.629				
PNL4					
SR1	0.748				
SR2	0.711				
SR3	0.757				
PE1			0.742		
PE2			0.738		
PE3			0.583		
PE4			0.608		
EE1		0.682			
EE2		0.815			
EE3		0.752			
EE4		0.588			
ITU1				0.841	
ITU2				0.867	
ITU3				0.686	

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 10 iterations.

4.3 Confirmatory Factor Analysis

The AMOS version 26 was used for performing the Confirmatory Factor Analysis (Arbuckle, 2019). The model was again assessed for the reliability, convergent validity, and discriminant validity. The convergent validity refers to whether the items measure the concept that they claim to measure. Hence the higher the convergent validity, the accuracy of the scale measurement is increased.

The initial model with all items did not result in an appropriate model fit since it did not produce acceptable model fit indices. Table 7 shows the model fit indices of the initial model.

In addition, the convergent validity and the discriminant validity of the factors did not produce satisfactory results. Table 7 shows the results for composite reliability (CR) , and Average Value Extracted (AVE) and it is evident that even thought CR was acceptable for all factors, the AVE , which is an indicator for convergent validity was not satisfactory for FNT, PNL and CDQ where the AVE value was < 0.5.

Table 7 Convergent Validity of the Initial Model

Factor	CR	AVE	MSV	ASV
LCQ	0.817	0.529	**0.63**	0.363
CDQ	0.729	**0.473**	**0.63**	0.333
UID	0.889	0.729	0.476	0.313
INT	0.856	0.602	0.295	0.133
PNL	0.788	**0.483**	0.466	0.305
FNT	0.743	**0.423**	**0.465**	0.285
SR	0.859	0.67	0.466	0.246
PE	0.849	0.585	0.446	0.314
ITU	0.91	0.773	0.303	0.164
EE	0.876	0.638	0.446	0.282

Table 8 below shows the discriminant validity results of the initial model. It indicates that LCQ, FNT and CDQ did not hold discriminant validity.

Table 8 Divergent Validity measures in initial model

	EE	INT	SR	ITU	PE	LCQ	FNT	PNL	CDQ	UID
EE	0.799									
INT	0.130	0.776								
SR	0.439	0.396	0.818							
ITU	0.437	0.286	0.294	0.879						
PE	0.668	0.392	0.508	0.550	0.765					
LCQ	0.601	0.416	0.613	0.417	0.645	**0.727**				
FNT	0.611	0.206	0.418	0.430	0.511	0.655	**0.650**			
PNL	0.561	0.543	0.683	0.308	0.623	0.532	0.532	0.695		
CDQ	0.521	0.425	0.455	0.427	0.581	0.794	0.682	0.494	**0.687**	
UID	0.605	0.305	0.546	0.422	0.514	0.650	0.591	0.611	0.690	0.854

CDQ and FNT was removed from the model. CDQ was removed due to the fact that its items loaded on UID in the initial factor analysis. Statistically, this suggests that the items in CDQ and items in UID measure the same factor. In more general terms, CDQ and UID might be perceived as the same construct. This can be explained by the fact that when designing content for e-learning systems, the user interface design is considered as a major influence and therefore the content design factor can be considered as a part of User Interface Design in the context of E-learning systems.

FNT did not produce a acceptable AVE result which is > .5 and FNT produced a AVE of .456. This suggested that the items in FNT failed to measure the

factor accurately and therefore having less convergent validity. Hence , FNT was removed from the model.

Figure 2 presents the graphical view of the final CFA model. The final CFA model produced satisfactory results for reliability, convergent validity and discriminant validity.

5 indices were considered to measure the model fit and the final CFA model and had satisfactory statistics including x2/df=1.837, RMR of 0.045. CFI was approaching .9 with a value of .881 and RMSEA was close to .08 with a value of .083.The acceptable criteria for these indices are RMSEA<.08, RMR<.05, CFI>.90. (Hu & Bentler, 1999). Hence it was concluded that the measurement model represented a good fit. Table 9 summarizes the goodness of fit indices for the hypothesized measurement model.

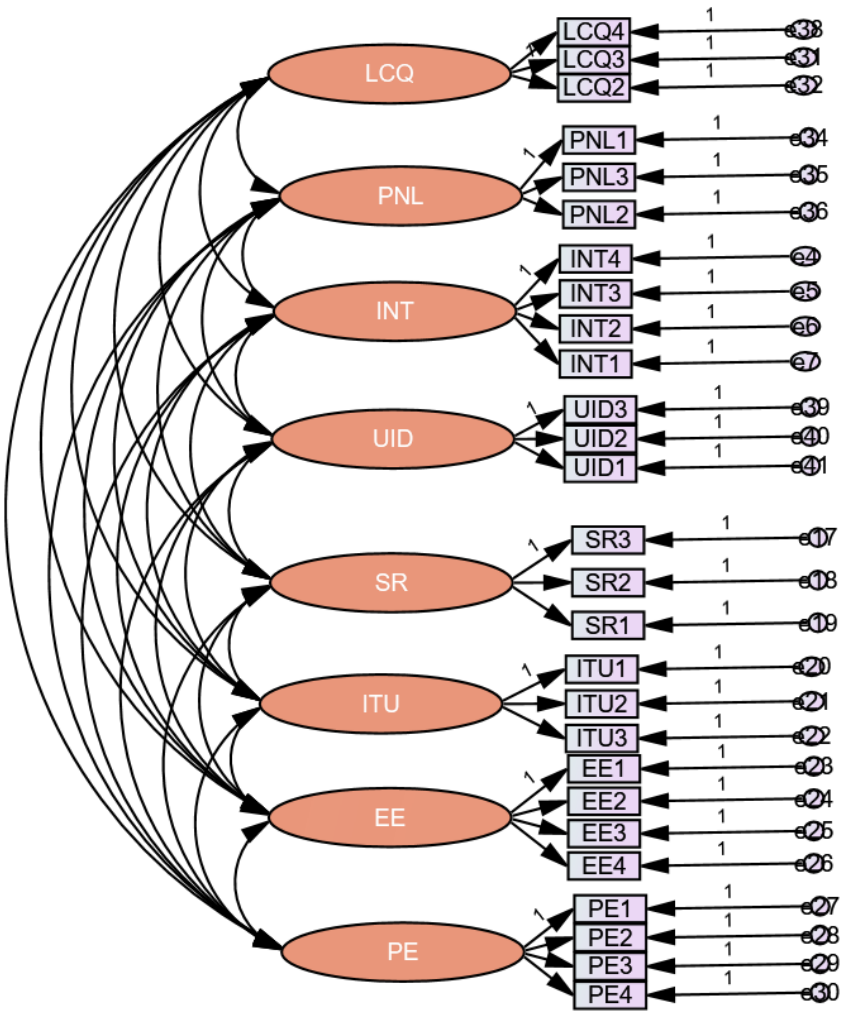


Figure 2 Finalized CFA Model

Table 9 Goodness-of-fit indices for the Final measurement model

Model Fit Indices	Criteria	Result
Chi Square		543.835
Chi Square/DF	< 3	1.837
RMR	< .05	0.045
CFI	> .9	0.881
RMSEA	< .08	0.083

Subsequently, the psychometrics properties of the measurement model including Convergent Validity and Discriminant validity of the model were tested (Bagozzi & Yi, 1988; Fornell & Larcker, 1981).

Table 10 shows the Standardized Factor Loadings, Cronbach's Alpha, Composite reliability, and AVE values for the finalized model. The factor loadings for all the items were greater than .06 except for PNL3 (.596). This is an acceptable value with all loadings are greater than 0.6 (Bogozzi & Yi, 1988).

The second indicator for convergent validity was composite reliability, which ranged from 0.753 to 0.910 while the acceptable value for this is 0.6. (Bogozzi & Yi, 1988; Fornell & Larcker, 1981). This indicated a reliable measurement model. Finally, The AVE for all factors were greater than 0.5 while the acceptable value was the same. (Bogozzi & Yi, 1988; Fornell & Larcker, 1981; Hair et al., 2006). Hence the model also exhibited an appropriate level of convergent validity.

Table 10 Convergent validity for the measurement model

Factor	Item	Standardized Loadings	CR	AVE	MSE
LCQ	LCQ2	0.653	0.789	0.557	0.450
	LCQ3	0.74			
	LCQ4	0.835			
UID	UID1	0.78	0.889	0.729	0.450
	UID2	0.899			
	UID3	0.878			
PNL	PNL1	0.777	0.753	0.507	0.452
	PNL2	0.749			
	PNL3	0.596			
INT	INT1	0.684	0.855	0.601	0.335
	INT2	0.917			
	INT3	0.825			
	INT4	0.644			
SR	SR1	0.813	0.858	0.670	0.415
	SR2	0.877			

	SR3	0.761			
PE	PE1	0.809	0.849	0.586	0.452
	PE2	0.819			
	PE3	0.695			
	PE4	0.731			
EE	EE1	0.8	0.876	0.638	0.444
	EE2	0.797			
	EE3	0.807			
	EE4	0.792			
ITU	ITU1	0.923	0.910	0.772	0.301
	ITU2	0.942			
	ITU3	0.76			

Post establishing the convergent validity, the discriminant validity of the finalized model was examined and to establish discriminant validity the Fornell & Larcker (1981) criteria was used. In order for discriminant validity to be accepted the squared correlations between the factors should be smaller than the corresponding Average Variance Extracted estimates. (Fornell & Larcker 1981). As shown in table 11, the diagonal values, which were the Average Extracted were larger than the corresponding squared correlations between the factors which ranged from 0.128 to 0.672. Hence it was also concluded that the finalized model had acceptable discriminant validity.

Table 11 Discriminant validity for the Final measurement model

	PNL	**INT**	**SR**	**ITU**	**EE**	**PE**	**LCQ**	**UID**
PNL	**0.712**							
INT	0.579	**0.775**						
SR	0.644	0.393	**0.818**					
ITU	0.416	0.286	0.293	**0.879**				
EE	0.562	0.128	0.439	0.437	**0.799**			
PE	0.672	0.390	0.508	0.549	0.666	**0.765**		
LCQ	0.510	0.416	0.637	0.387	0.607	0.639	**0.746**	
UID	0.596	0.304	0.543	0.423	0.604	0.513	0.671	**0.854**

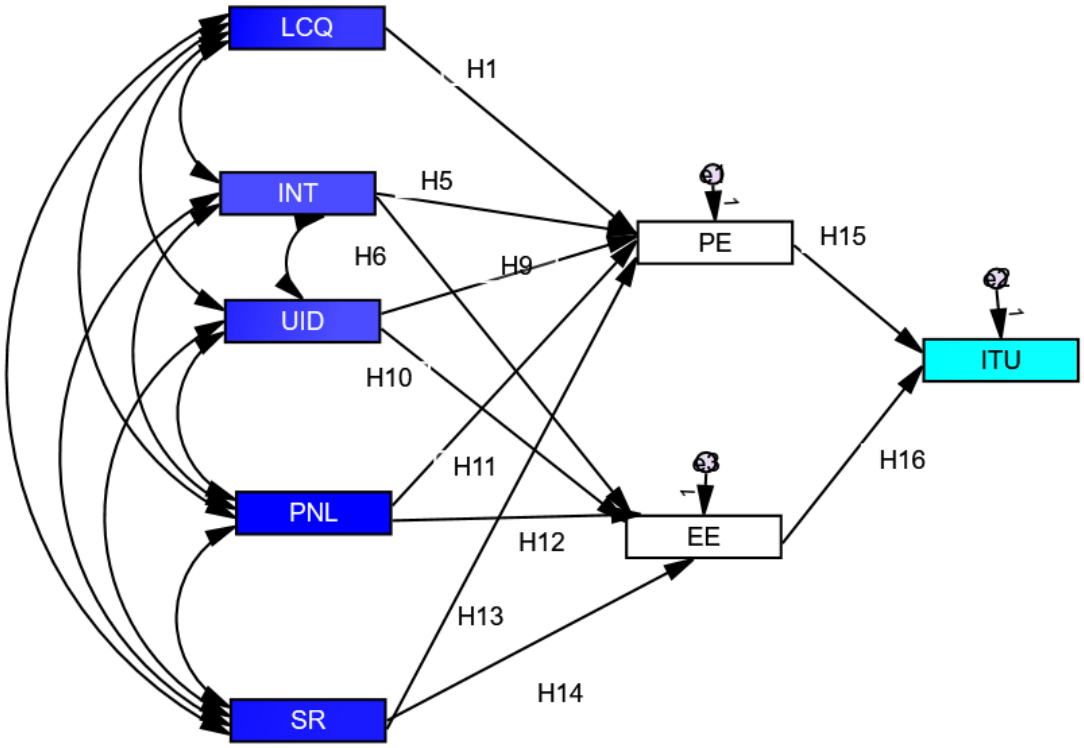
Note: Diagonals represent the average variance extracted, and the other matrix entries represent the squared factor correlations.

4.4 Structural Model for hypothesis Testing

In order to test the structural model of the hypothesized relationships SPSS AMOS 6.0, a software package that is used to perform structural equation mod-

elling (SEM) was used. SEM is a statistical technique that is applied to test complex relationships between multiple variables and it is used to investigate causal relationships. (Al-Mamary et al., 2023). SEM is also able to provide a view of the whole research model than multiple regression modelling. (Liaw & Huang, 2013).
Figure 3 displays the proposed structural model and the hypothesis subsequent to the modification of the initial model.

Figure 3 Structural Model and Hypothesis



Below are the finalized hypotheses.

H1: Learning Content quality (LCQ) will positively affect the performance Expectation of the e-learning system.
H5 : Interactivity (INT) will positively affect the performance Expectation of the e-learning system.
H6: Interactivity (INT) will positively affect the Effort Expectation of the e-learning system.
H9 :User Interface Design (UID) will positively affect the performance Expectation of the e-learning system.

H10: User Interface Design (UID) will positively affect the Effort Expectation of the e-learning system
H11. Personalization (PRN) will positively affect the performance Expectation of the e-learning system.
H12: Personalization (PRN) will positively affect the Effort Expectation of the e-learning system
H13. System Response (SR) will positively affect the performance Expectation of the e-learning system.
H14: System Response (SR) will positively affect the Effort Expectation of the e-learning system
H15 : Performance Expectation will positively affect the Intention to use (ITU) the e-learning system
H 16: Effort Expectation will positively affect the Intention to use (ITU) the e-learning system

Prior examining the validity of the above hypotheses using the structural model, it goodness of fit was validate by using the same indices that was used to test the measurement model. Table 12 summarizes the goodness of fit indices for the structural model. The table shows that the model produced a x2/d.f. of 9.086 which is greater than the accepted limit of < 3. and RMSEA was 0.257 which was higher than the accepted limit of <0.08. however, the model produced acceptable results for RMR of 0.016, GFI of .903, CFI .924 and NFI of .917 while the accepted level for these indices are <0.05, > .9 , >.9 and .9 respectively .

Table 12 Model Fit indices for Structural Equation Model

Fit Indices	**Criteria**	**SEM Results**
Chi Square		63.605
Chi Square/DF	< 3	9.086
RMR	< .05	0.016
GFI	> .9	0.903
CFI	> .9	0.924
NFI	> .9	0.917
RMSEA	< .08	0.257

Since it was concluded that the model had adequate acceptance levels for the goodness of fit indices, the model was tested for the hypotheses subsequently. Figure 4 is a graphical representation of the results after testing the model for the hypothesis.

Figure 4 Structural Model with Results

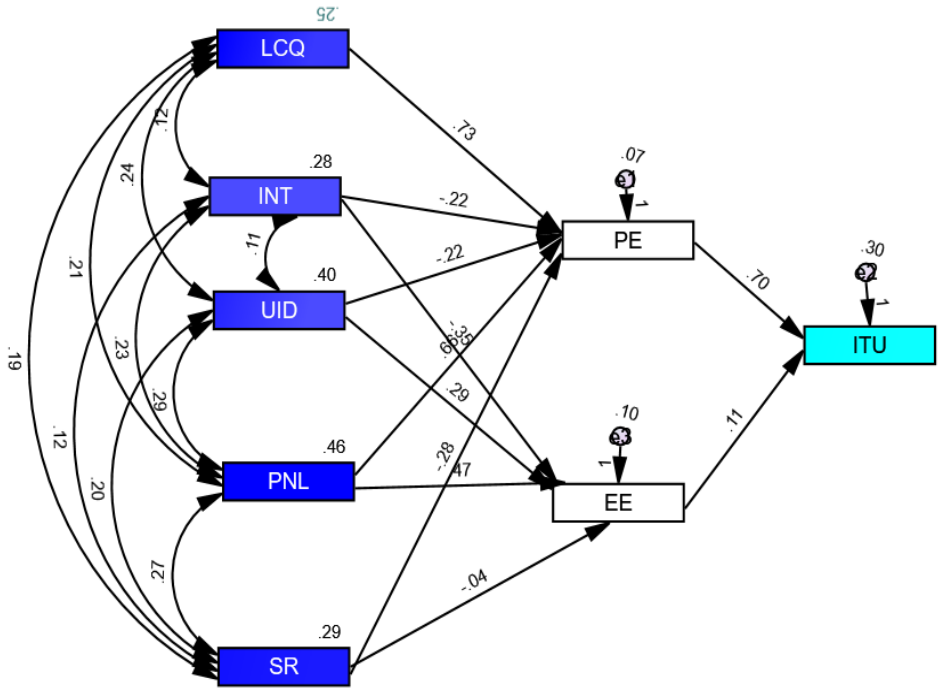


Table 13 below provides a summary of the hypothesis testing and the results. Based on the analysis, it is evident that Learning Content Quality (LCQ) significantly and positively impacts Performance Expectation (PE). (H1, β=0.727, P<0.05) and hence H1 is supported. Even though Interactivity (INT) showed a significant impact on both PE and EE (H5, β=-0.224, P<0.05 and H6, β=-0.486, P<0.05 respectively) the impact was negative.

Table 13 Results of Hypothesis testing

H No	Path			Estimate	S.E.	C.R.	P
H1	**LCQ**	**--->**	**PE**	**0.727**	**0.089**	**8.207**	***
H5	INT	--->	PE	-0.224	0.065	-3.463	***
H6	INT	--->	EE	-0.354	0.072	-4.937	***
H9	UID	--->	PE	-0.224	0.066	-3.379	***
H10	**UID**	**--->**	**EE**	**0.292**	**0.063**	**4.635**	***
H11	**PNL**	**--->**	**PE**	**0.659**	**0.07**	**9.456**	***
H12	**PNL**	**--->**	**EE**	**0.471**	**0.079**	**5.932**	***
H13	SR	--->	PE	-0.276	0.077	-3.576	***
H14	SR	--->	EE	-0.036	0.079	-0.459	0.646
H15	**PE**	**--->**	**ITU**	**0.702**	**0.11**	**6.358**	***
H16	EE	--->	ITU	0.108	0.118	0.913	0.361

Similar results were evident for the relationship between UID and PE, where User Interface Design (UID) had a significant negative impact on PE. (H9, β=-0.224, P<0.05). H10 was supported where UID has a significant positive impact on Effort Expectancy (EE). (H10, β=0.292, P<0.05).
Personalization (PNL) had a significant impact on PE (H11, β=0.659, P<0.05) and on EE (H12, β=0.471, P<0.05) and hence H11 and H12 hypotheses were supported by the results.

System Response (SR) had a significant negative impact on both PE (H13, β=-0.276, P<0.05). The relationship between SR and EE was not significant (H14, β=-0.036, P>0.05 respectively).

H15 hypothesis was supported with PE having a significant positive impact on Intention to Use (ITU) (H15, β=0.702, P<0.05) while Effort Expectancy did not seem to have a significant impact on ITU. (H16, β=0.108, P>0.05). Since H16 Hypothesis was rejected.

5 DISCUSSION

This study was conducted to investigate the affect of system quality features on intension to use E-learning systems at the workplace. Learning content quality, Content Design Quality, Interactivity, Personalization, User Interface Design, Functionality and System Response were initially identified as e-learning system quality features.

5.1 Learning content Quality

Learning content quality was strongly related to performance expectancy with a positive relationship. This indicates that learners that use an e-learning system perceive, that if the quality of the-learning content in the system is high, it will help them improve their job performance. This finding is consistent with previous research(Al-Fraihat et al., 2020; Almaiah et al., 2016; Y. Cheng, 2012; Lee et al., 2009; Liu et al., 2010; Sun et al., 2008) highlighting the importance of having high quality of learning content for in shaping user perceptions and expectations of learning outcomes.

Learning Content Quality included several aspects such as relevance, clarity, completeness, and the ability to meet learning objectives. Quality content is well-organized and presented in a clear, logical manner, making it easier for learners to understand and retain information.(Keller, 2010).

In addition, organizing the content and information into logical and understandable components in the e-learning system allows students to accomplish their learning tasks quickly.

When the content is perceived to be organized in logical and understandable manner, it will assist learner to achieve the-learning objectives (Al-Fraihat et al., 2020), which will in turn make them believe that it will improve their job performance.

In Addition, learning content that is relevant to the learners' needs and interests significantly enhances their motivation and engagement (Mayer, 2011). In a workplace setting, relevance of learning content can be referred to as the extent to which it can be directly applicable to perform their job tasks and duties. Hence, if the content is relevant they will believe it will help them perform their jobs better.
When learners find the content directly applicable to their personal or professional goals, they are more likely to believe that the e-learning system will help them perform better in real-world situations

5.2 User Interface design

User Interface Design had a significant positive effect on effort expectancy. This indicates that learners who perceive that the user interface is well designed, also believe that the effort required to use the system is reduced and is easy to use. This result is also confirmed by previous research (Almaiah et al., 2016; Cheng, 2012; Choi et al., 2007; Liu et al., 2010).

Since Effort Expectancy refers to the degree of ease associated with using a system, this result of a positive impact relationship between UI design and Effort Expectancy implies that effective UI design makes the e-learning system easier to use, thereby lowering the perceived effort required by users. Several factors may contribute to this relationship.

User interface design refers to structural design of the interface that present the features and instructional support of an information system. (Cho et al., 2009). One main component of the user interface design is the screen layout of the e-learning system. If the layout is well organized, has a good structure and provide clear instructions to users, users may perceive it as useful. (Cheng, 2021).

A well designed user interface also provides a simple and clear graphical user interface. If the buttons and icons are poorly designed, it may cause misunderstanding and confuse the learners (Cho et al., 2009). However, When users encounter a straightforward interface with clearly labelled buttons, menus, and icons, they can navigate the system more easily and efficiently, reducing perceived effort. However, carefully designed user interface with clearly labelled buttons, menus and icons will help the learner easily identify them and move through the system, thus reducing the effort required use the system (Cho et al., 2009b; Hong et al., 2002). Parallel to simple design, a well designed user interface also adds consistency and predictability. Maintaining consistency across the system by having uniform buttons styles, colour schemes and fonts will help users to be familiar with the system, thus making it easier to use.

In addition, interface signs such as buttons, links, icons and text are considered when evaluating the quality of user interfaces. When the interface signs area intuitive enable users to locate information and complete tasks with mini-

mal effort and thus increasing the usability of the system. (Nazrul & Tétard, 2014).

Hence the relationship between user interface design and effort expectancy can be justified.

5.3 Personalization

Personalization showed a positive and significant impact on both performance expectancy and effort expectancy. This indicates that if the users believe that the e-learning is can be personalized to their needs, they believe that it will help them achieve their learning goals and job tasks, and also that the system is easy to use.

As per initial definition, personalization is the extent, to which the e-learning system can be customized in terms of information, services and user interface design, based on the learners needs. (Almaiah et al., 2016). Hence, the relationship between personalization and performance expectancy can be explained though what learning content (Information) is presented to the learner and how (user interface) it is presented.

The-learning content provided can be personalized in several ways. One such way is providing personalized learning paths, (Zajac, 2009) where the learner can customize and select the training paths, training courses they desire to do. This level of personalization is highly important in a workplace setting, since if this is possible, professionals are able to choose-learning content and paths that will be most useful for them to perform their job tasks. Hence, when this level of personalization is present in the e-learning system, learners will believe that it will be useful to their job.

In addition, personalization techniques can be used to suggest training courses based on development goals of the employee. When learning paths and courses are customized so that employees can gain knowledge required for their future desired job tasks, they will perceive that that the system is assisting to achieve their career goals hence increasing the performance expectancy.

There is also a psychological aspect why personalization may affect performance expectancy through learning styles. The concept of individual having preferred learning styles have been thoroughly researched. Kolb (1975) defined learning styles as a unique-learning method adapted by the learner during the-learning process. Also, learning style can be referred to as the way a person take in information and process them based on their strengths and characteristics. (Felder, 1996). There is evidence from previous research that when the instructional processes are adapted to different learning styles, that learning can be enhanced (Buch & Sena, 2001). Hence, learning styles are incorporated to the e-learning system, it should enable the learners to learn more effectively, and also they could build their own paths based on their individual psychological types and learning preferences (Gunasekaran et al., 2002). Once the learner believe that learning is effective, they will perceive the system to be useful in perform-

ing their job tasks. Because of the above reasons, the relationship between personalization and performance expectancy can be justified.

Similarly, the relationship between personalization and effort expectancy can be justified through several factors. In addition to the above levels of personalization, the e-learning system can be personalized in terms of services and user interface. When personalizing web based e-learning systems, profiling learner's preference, interests and browsing behaviours is required. (Chen et al., 2005).

By customizing the interface by their browsing behaviour, it will be easy for the learner to navigate through the system reducing the effort required to use the system. For instance, if the system is customized so that the home page displays the quick links and course content that the learner prefers it will save the learners time and effort.

Additionally, the learner profiling can suggest learners of the-learning content that is similar to their preferences. By opting out content that is irrelevant to the learner and only displaying the most important content, , learners are able to focus on their preferred learning content and not be distracted by additional and information, hence reducing the perceived effort to use the system.

5.4 Performance Expectancy and Intention to Use

The results indicated a strong positive relationship between performance expectancy and intention to use the e-learning system. Hence, suggesting that when learners perceive that the e-learning system will improve their learning performance and help them achieve job tasks, they intend to use the e-learning system more. This is supported by several previous studies conducted to examine e-learning acceptance at workplace (Duggal, 2022; Lantu et al., 2023; Y.-H. Lee et al., 2013; Yoo et al., 2012).

This relationship may be contributed by several factors. As per the initial definition of performance expectancy, it is the extent to which a person believes that using certain IS will help them in achieving their job tasks. In a workplace setting, this is directly related to employees perceiving that they will gain knowledge and information related to conduct their job tasks by using the e-learning system. This knowledge will in turn help them to conduct their jobs better and also prepare them for future job tasks. Hence, if the learners perceive that the system will help them in their jobs, they will have a positive attitude towards the system and thereby creating intention to use the system.

5.5 General Discussion

The results showed that both interactivity had a negative impact on both performance expectancy and effort expectancy which is contrary to previous findings (Almaiah et al., 2016; Cheng, 2012; Pituch & Lee, 2006; Rodríguez-Ardura, 2015). System response also showed a negative impact on performance expectancy which again was contrary to existing findings of cheng (2012), Almaiah (2016) and Pituch and Lee (2006)

Several reasons could contribute to the negative effect. These features may be adding unwanted complexity to the e-learning system which affects the learners' perceptions towards them. Also, in the context of e-learning systems at the workplace, professionals may prefer simplicity and functionality over these features.

5.6 Practical Implications

The findings of the study present several implications to the key stakeholders of e-learning systems, Developers, UI Designers, Instructional Designers, E-learning and L&D Practitioners and HR Managers. Below are the some implications and practical suggestions.

One of the main findings of the research was the impact of Learning Content Quality on Performance Expectation. Performance Expectation had a positive impact on intention to use. Hence-learning content quality play a major role in the user adoption of the e-learning system. This is not surprising, since the main objective of an e-learning system is to provide-learning content. Therefore, Instructional designers and L&D practitioners should focus on creating high quality learning content. This can be achieved by creating content that is accurate, comprehensive, relevant and able to meet the-learning objectives. However, when doing this, the e-learning systems capability creating engaging content would also be a determining factor.

Educators and instructional designers should focus on creating content that is not only accurate and comprehensive but also engaging and relevant to learners' needs. By doing so, they can enhance learners' performance expectancy and overall satisfaction with the e-learning experience.

The study also revealed that the user interface design has a positive effect on effort expectancy. Hence user interface designers should focus designing user interfaces that are simple, consistent and also meaningful. In practical terms, designers should focus on the overall layout, menus, and also the smaller elements such as buttons, links, icons and images which are referred to as interface signs. (Nazrul & Tétard, 2014). Nazrul & Tétard (2014) also mention that a system can be differentiated through intuitive interface signs therefore, designers should create interface signs that users can quickly relate to and find meaning.

Some of the key User Interface design principles are Alignment, Quantity, Clarity, Simplicity and affordance and it is found by applying these design principles one can make an user interface intuitive to its users. (Al-Samarraie et al., 2016).

Another important aspect is having sufficient support features in the user interface. These features may include tool tips, error messages for error prevention, progress bars and loading indicators, keyboard shortcuts, breadcrumbs and search functionality. Having these features will reduce the effort the learner needs to experiment in the system to find what they are looking for or to complete their intended tasks.

By following these steps, the user interface can be designed in way to reduce the perceived effort required to use the e-learning system. Even though this study did not have a relationship between effort expectancy and intention to use , there are previous studies that have presented evidence that effort expectancy will have a positive impact on intention to use. (Almaiah et al., 2019; Al-Mamary et al., 2023; Chiu & Wang, 2008). Therefore, user interface design will have positive impact on the adoption of the-learning system through effort expectancy.

The study also proved that personalization had a positive impact on both performance expectancy and effort expectancy. Hence focus on personalization will be for user interface designers, developers and instructional designers. There are several studies conducted in relation with how to achieve personalization in E-learning systems. Chen et al.(2005) suggested that personalization can be achieved in e-learning systems by applying the item response theory (IRT). Another study proposed a prototype for a personalized learning environment (PLE) incorporating a learning style inventory to identify the-learning style of the learner and to adapt the content based on the-learning style.(Syed-Khuzzan & Goulding, 2009) Another two way approach was also suggested : 1. to have the same learning content but allowing the users to skip certain course content if they are familiar with it. 2. Have different learning content for the same subject prepared in the system and allow learners to choose the difficulty level they prefer. (Zajac, 2009).

While the above is based on personalizing the-learning content, designers and developers should also focus on how the overall look and feel can be customized. This can be through simple customization of colour schemes, ability to change layout, ability to save search preferences, and ability to change what is visible.

However, while personalization proves to be an important factor, practicality and objectivity should also be considered. In a practical viewpoint, it is impossible to enable 100% customization based on user needs. Also, it is important to keep overall learning objectives and company goals in view so as not to lose the overall purpose of the e-learning system for the sake of personalization. Therefore, developers, user interface designers, instructional designers and L&D practitioners need to seek a balance between personalization and the goals of the e-learning system.

Finally, as per the results performance expectancy had a direct impact on intention to use the system. Hence, developers and practitioners should focus on enhancing the useful of the e-learning system for its users. Having training content that is aligned with Job needs and knowledge gaps, management support and guidance to promote the system and highlighting the benefits of the system may lead employees to perceive the system as useful.

5.7 Research Implications

The study includes several theoretical implications that expand the understanding of how e-learning systems are adopted in work place settings. They contribute to existing theories and models in e-learning systems and IS.

This study extends the existing theory of UTAUT and integrates it with the DeLone and McLean IS Success Model. By applying these two models , the study investigated system features which are unique to e-learning systems such as learning content quality, personalization, and interactivity. The results provide an understanding of how these features influence performance expectancy, effort expectancy and in turn intention to use e-learning systems. Further , the findings highlight the important role the system quality features play in influencing continuous intention to use e-learning systems and validates the inclusion of these features in UTAUT and ISMM models.

In contrast with the proposed hypothesis, the study indicated that interactivity and system response had a negative impact on performance expectancy and effort expectancy. While this is in contrast with existing research findings, it calls for future research to investigate these features further.

While several researches have studies how e-learning systems can be personalized and how adaptive-learning environments can be created, this study confirms that personalization has a significant impact on creating a positive attitude towards the e-learning system.

The research focused on a specific context, workplace setting in Sri Lanka, while the majority of the research in e-learning systems adoption had been carried out in academic settings. This gives insight UTAUT and ISMM can be used in different cultural settings.

5.8 Limitations and future work

This study also proposes several considerations for future research based on the results, and the limitations of the study.

First, the final data collection summed up to 123 respondents. While statistics showed that the sample size was adequate, it would be worthwhile to test with a larger sample to check if the results differ. In addition, the research was carried out in Sri Lanka, and respondents were from different industries. Inves-

tigating the same model in specific industries such as IT, manufacturing, apparel, telecommunication, and hospitality, which are leading industries in Sri Lanka, would be research worthy.

Second, the e-learning usage in the Sri Lankan work places is comparatively low. Hence, applying the same model in contexts where e-learning is more heavily used, might bring out other quality features that influences user satisfaction.

Third, the initial model had content design quality (CDQ) as a quality feature. However, since the construct did not hold validity, the study removed the construct from the final analysis. The items for CDQ were developed by the author and these items loaded on the same factor that the items of user interface design loaded on. Therefore, 2 points for future research is suggested, 1. To investigate whether CDQ itself is a separate quality feature or whether it's a combination of factors such as user interface design, and learning content, 2. If it is a separate factor, developing reliable and valid constructs to measure the same and investigate the impact it has on user satisfaction. This also points out to the fact of scale reliability and validity. The initial measurement model did not have validity and had to be modified. The reason for this could be that the scales such as Content Design Quality, Functionality, User Interface Design , and personality have not been critically tested for validity as there are seldom used. Hence , it is noted as a future research area to develop more reliable and valid measurement tools for the quality features of e-learning systems.

Next, the model was only tested for performance expectancy and effort expectancy. It would be important to study the features with the other factors of the UTAUT model, and also test if there are any moderating factors such as age, gender, years of work experience, hierarchical level.

6 CONCLUSION

The purpose of this study was to examine critical system features of e-learning systems that impact user satisfaction and intention to use. The study was conducted in work place settings in Sri Lankan organizations. The study aimed at answering three research questions. 1. What are the main system features present in workplace e-learning systems? 2. Which system features have the greatest impact on Performance Expectancy, Effort Expectancy and behaviour intention to use the e-learning systems at the workplace? And 3. How/ to what extent do the system features influence user satisfaction and intention to continue the use of e-learning system? A comprehensive quantitative analysis was conducted which resulted in several key findings. These findings contribute to both academic literature and have practical implications on e-learning systems design and implementation.

The study first identified key system features that would possibly have an impact on e-learning systems adoption and user satisfaction. These werelearning content quality, content design quality, interactivity, personalization, user interface design, functionality, and system response. Existing literature was extensively reviewed to determine relevant theories, models and to develop a theoretical framework. The UTAUT framework and the ISMM framework were adapted to create the framework.

The hypotheses testing revealed that learning content quality had a significant impact on performance expectancy. This highlights the importance the need for of relevant, complete and useful learning content in the e-learning system. Personalization had a significant impact on both performance expectancy and effort expectancy. This emphasized the fact that e-learning systems need to incorporate some level of customization and adaptive-learning environment based on learner preference. User Interface design also had a significant positive influence on effort expectancy, which underscore the importance of simple, concise yet engaging user interface that would reduce the cognitive load for the learners.

However, contrary to the anticipated result, interactivity and system response indicated a significant negative effects on performance expectancy. This might suggest that interactivity features and system response features might present complexity and undesirable interactions, that reduce users' positive attitude towards the system

Furthermore, the study also revealed that performance expectancy plays a critical role in influencing the intention to use e-learning systems. This finding reiterates the findings of previous studies that if the users find the system useful, the probability that they will continue to use increases.

The study also contributes some practical implications to e-learning system developers, user interface designers, instructional designers, and organizational decision-makers. It suggests that they should focus on creating quality content, enable personalized user experience and create user friendly and engaging user interfaces when implementing e-learning systems. Organizations

can leverage this information to make investment decisions on e-learning system, which will in turn increase user satisfaction, user adoption and also organizational learning goals.

In conclusion, this study contributes to the theoretical understanding of e-learning system adoption in workplace contexts and offers practical guidelines for designing systems that meet user expectations and promote sustained engagement. It also provides future research opportunities in terms of investigating these features in specific industries, different cultural settings and also investigate other factors that may moderate the relationships found in the study.

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