Assessment of Instructional Design Quality and Students' Perceived Learning Outcomes with Cisco E-Learning Courses in Uganda

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Abstract

Despite the continued deployment of Cisco e-learning courses in Ugandan higher education institutions, little is known about the students' learning outcomes from the perspective of instructional design quality. The current study sought to empirically validate the extent to which the instructional design quality characteristics of Cisco e-learning courses as perceived by students influenced their learning outcomes. Specifically, the paper narrowed down to students' perceived satisfaction, academic achievement and continued learning intentions with Cisco e-learning courses as predicted by course content quality, interface design quality and instructional strategies. Guided by the cross-sectional survey approach, this study made use of an e-learning instructional design quality scale that was distributed to 805 trainees who were participating in the Cisco e-learning programme from ten institutions of higher education. The data was analysed using full-fledged structural equation modelling (SEM); and the results were able to support the hypothesised model. The results further indicated that all the instructional design quality sub-constructs significantly predicted perceived satisfaction

and, in turn, perceived satisfaction had an influence on continuance learning intention and achievement. The current study has, thus, added to the expanding body of literature on instructional design attributes that are critical to ODeL success and provided higher learning institutions with critical signposts regarding the efficacy of instructional design in enhancing e-learning success, especially in this era when ODeL is fast becoming an alternative approach to expanding access to educational opportunities.

Keywords: Cisco E-learning Programme; Instructional design quality; Structural equation modelling; Uganda.

Introduction

As the competition for the provision of e-learning continues to expand in developing nations like Uganda, higher learning institutions must equally pay attention to the quality of the e-learning courses based on established guidelines so as to ensure successful learning (Hadullo, Oboko, & Onwenga, 2018; Marciniak, 2018). The Cisco e-learning courses developed and managed by Cisco Systems Incorporated (USA) have progressively continued to provide the required expertise and skills to Uganda's ICT professionals since 2002. This has been mainly in terms of enabling ICT professionals to obtain the knowledge, skills and competencies in designing, installing and managing computer networks and cloud-based IT applications that continue to impact on global competitiveness involving business and work patterns in the country (Makerere University, 2016). Since its initial launch in 2002 at Makerere University, the Cisco e-learning programmes in Uganda have expanded across over 20 learning institutions, covering courses like Information Technology Essentials, Cisco Certified Networking Associate, Cisco Certified Networking Professional and Cyber Security, which are offered in both instructor-led and self-paced formats (Cisco Networking Academy, 2018; Sansa-Otim, 2005).

Cisco e-learning programme instructional model

The Cisco e-learning programme integrates both cloud-based instruction and hands-on lab experiences, delivered via Cisco NetSpace, a learning management system that is highly interactive and engaging (Cisco Networking Academy, 2018; Cisco Systems, 2014; Niekerk & Thomson, 2010). Learners using Cisco NetSpace are able to access and navigate through the instructional content and assignments, as well as collaborate and communicate with peers and instructors (Liu, 2014). The Cisco e-learning courses are built with several instructional design components in mind that include the design of self-paced lectures, an in-built glossary and chapter index, and embedded practical lab tasks based on a multiplicity of hands-on practical tasks and simulated activities; and blended learning with learner-instructor collaboration and engagement is enhanced through the use of a social media platform.

Statement of the Problem

Despite the increased deployment of Cisco e-learning courses in higher education institutions in Uganda, little is known about the Cisco e-learning students' level of satisfaction with and intention to continue using the e-learning courses, let alone the extent of their academic success from the perspective of instructional design quality. Yet as May-Chiun, Ramayah and Hong (2011) have pointed out, the success and effectiveness of e-learning initiatives are to a great extent influenced by the use of appropriate instructional design guidelines so as to guarantee students' satisfaction with the learning process. Whereas some previous studies have tried to assess the Cisco e-learning courses, these have been done outside Uganda. For example Cakir, Bichelmeyer, Dennis, Bunnage, Duffy, Oncu and Kelli (2006) conducted a study satisfaction and applicability of the Cisco Certified Networking Associate (CCNA) programme, but in the context of the USA, and moreover focused on only one Cisco course. Meanwhile, Niekerk and Thomson (2010) evaluated the Cisco Academy programme in terms of its instructional model, but did not link it to any student learning outcome. In the context of South Africa, Kudyachete (2012) analysed factors that impacted on the performance of Cisco academies, with no focus on instructional design aspects of the e-learning programme. Hence the current study is timely in that it extends the attempts of such scantly previous empirical studies on the subject in the Ugandan context. The purpose of the current study was to empirically validate an e-learning instructional design quality model and to examine the extent to which the instructional design quality characteristics of Cisco e-learning courses as perceived by students influenced their level of satisfaction, continued learning intentions and academic achievement. The study was guided by four key research objectives, and these were to:

- Ascertain the extent to which the hypothesised e-learning instructional design quality model fits the data.
- Establish the structural influence of the instructional design quality constructs on students' perceived satisfaction with Cisco e-learning courses.
- Find out the influence of perceived satisfaction on students' academic achievement in Cisco e-learning courses.
- Examine the influence of academic achievement on students' continued learning intention with Cisco e-learning courses.

Theoretical Underpinnings and Research Model

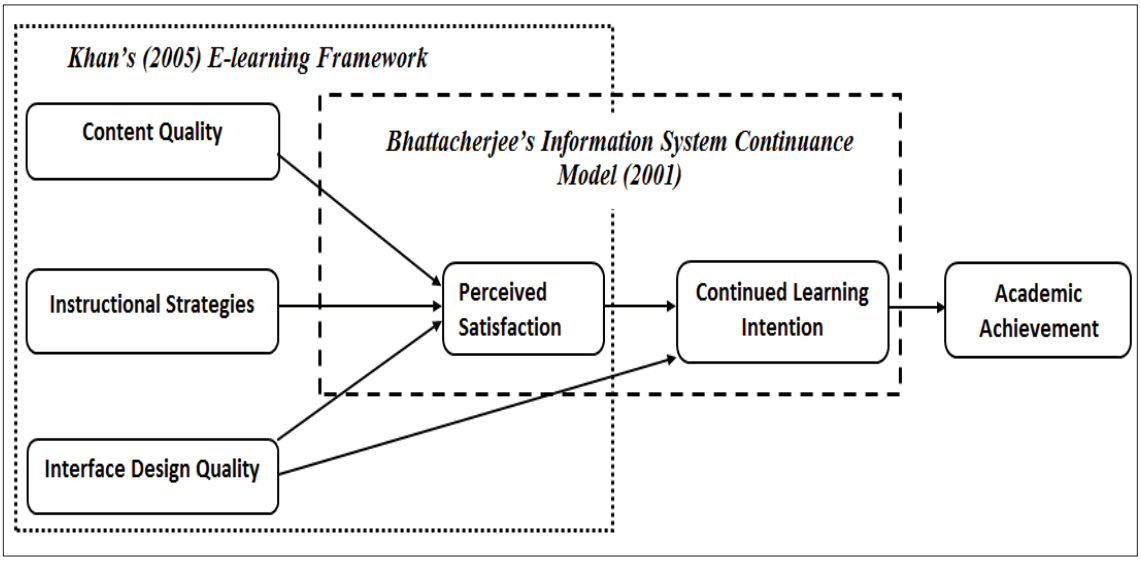
This study was guided by Khan's (2005) e-learning framework and Bhattacherjee's (2001) information system continuance model to examine instructional design quality, perceived satisfaction and continuance learning with Cisco e-learning courses. Khan's (2005) e-learning framework is a theoretical model that gives comprehensive guidelines for achieving meaningful e-learning. Also called the Khan's e-learning octagonal framework, the model is comprised of eight dimensions – pedagogical, technological, interface design, evaluation, management, resource support, ethical and institutional components – which are useful in deriving essential factors that are necessary for creating meaningful e-learning experiences. The current study

adopted the theoretical dimensions of pedagogy and interface design so as to understand the constructs of e-learning content quality, interface design quality and instructional strategies with the Cisco e-learning courses. According to Khan's (2005) e-learning framework, the pedagogical dimension highlights content, audience, goal and media analysis, design approach, organisation; as well as instructional strategies and methods for e-learning. On the other hand, the dimension of interface design addresses content design, page and site design, accessibility, user testing and navigation (Khan, 2005).

Meanwhile, Bhattacherjee's (2001) information system continuance model, an offshoot of Oliver's (1980) expectancy confirmation model, was adopted to understand perceived satisfaction and continuance learning. Bhattacherjee's (2001) information system continuance model postulates that perceived usefulness and confirmation have a direct effect on user satisfaction with information technology. In addition, it is hypothesised that continuance use intention towards information technology is affected by the level of user satisfaction (Bhattacherjee, 2001b; Chen, Chen, Lin, & Chen, 2011). In the current study, the theoretical dimensions of satisfaction and continuance use intention were adopted from Bhattacherjee's (2001) information system continuance model in relation to the instructional design quality constructs of e-learning content quality, interface design quality and instructional strategies.

Thus, from the foregoing theoretical review, a conceptual model of instructional design quality depicted in Figure 1 was derived to understand the causal relationship between the exogenous constructs (e-learning content quality, interface design quality and instructional strategies), on one hand, and the endogenous constructs (perceived satisfaction and continuance learning), on the other. Based on the postulated model, this study hypothesises that:

Figure 1: The hypothesised instructional design quality model



H_1: The e-learning instructional design quality model fits the data.

Literature Review on Instructional Design and Student Learning Outcomes

Course content quality and perceived student satisfaction

Course content quality refers to the essential attributes of the concepts, principles and information to be used by students in an e-learning environment in terms of presentation format, usefulness, accuracy, timeliness, structure and sequence (Dick, Carey, & Carey, 2009). Meanwhile, Alzahrani et al. (2019) and Puriwat and Tripopsakul (2021) have defined content quality indicators in terms of relevance, ease of perception, readability, format, extent of detail and up-datedness. Given that course content is the foundation of an e-learning course, it must achieve proper standards and high-quality to enhance active student engagement and content mastery during the learning experience. The role of content quality in influencing user satisfaction with e-learning has been enumerated by several recent empirical studies. For example, Nikou and Maslov (2023)especially during the exceptional times, such as the COVID-19 pandemic. Design/methodology/approach: This paper aims to determine and analyse the antecedent factors influencing students' satisfaction with e-learning outcomes during the pandemic. Structural equation modelling (SEM reported a strong influence of course design quality attributes in terms of clarity of course materials and learning objectives on e-learning satisfaction during the COVID-19 pandemic. Additionally, Nagy (2018)Athabasca University. The aim of the study was to examine the determining factors of students' video usage and their learning satisfaction relating to the supplementary application of educational videos, accessible in a Moodle environment in a Business Mathematics Course. The research model is based on the extension of Technology Acceptance Model (TAM found a relationship between video use and student satisfaction. The implication, therefore, is that students anticipate the content of an e-learning course to have adequate breadth, clarity, relevance and interactivity (Ozudogru & Hismanoglu, 2016)it is important to investigate whether the quality of e-learning is up to the standard. This study aimed at finding out the views of freshmen students on foreign language courses delivered via e-learning and revealing whether there were any statistically significant differences between students' views in terms of age, gender, time spent on using e-learning system and the faculty they studied at. This research was designed using the survey model. The sample of the research consisted of 478 freshmen students who were studying at four faculties and one vocational college in a state university in Turkey. The research data were collected through a scale, proposing a sixdimensional assessment of e-learning systems, which was developed by Ozkan and Koseler (2009. Thus, based on the foregoing analysis of the literature review and empirical studies, this study hypothesises that:

H_2: Content quality has a significant influence on perceived satisfaction with Cisco e-learning courses

Interface design quality and perceived student satisfaction

The interface design quality denotes the essential attributes of the e-learning course environment that give the students opportunities for easy orientation and navigation, characterised by ease of use, flexibility, reliability and timely response (Faghih, Azadehfar, & Katebi, 2013). Senevirathne and Manathunga (2021) have further conceptualised e-learning user interface design in terms of the ability to easily navigate the instructional environment, quickly locate the learning resources and configure various help tools. User interfaces for e-learning environments are crucial because they provide space for learners to engage with interactive text materials, graphics and illustrations, icons, audio and video files; in addition to the tools that facilitate user orientation and navigation to enhance learning (Borrelli & Perrella, 2021). The existing body of literature has revealed that the impact of e-learning course interface design on learning is two-folded: that is, user-friendly e-learning course interfaces allow students to seamlessly interact with the materials and, hence, easily complete the learning tasks. In contrast, poor interface designs with inconsistent navigation paths and instructions distract learning as users are caught in a maze of confusing and uncluttered e-learning environment (Adnan, Ali, & Ahmad, 2015). For example, Duangekanong et al. (2018), in a study on e-learning course attributes, revealed that user interface attributes are significant predictors of user satisfaction, while Liu et al. (2018), in their study on mobile learning, revealed that system responsiveness significantly predicted learner satisfaction. However, despite the attempts at understanding the link between interface design and user satisfaction with e-learning, no such study has so far been undertaken in connection with the Ugandan context regarding the Cisco e-learning courses. Based on the literature, therefore, this paper hypothesises that:

H_3: Interface design quality has a significant influence on perceived satisfaction with Cisco e-learning courses.

H_4: Interface design quality has a significant direct influence on continued learning with Cisco e-learning courses.

H_5: Perceived satisfaction mediates between interface design quality and continued learning with Cisco e-learning courses.

Instructional strategies and satisfaction with e-learning

The overriding purpose of instructional strategies in a course is to maximise student assimilation of new content and learning efficiency (Butler, 2016; Congress, 2015; Ekwue, 2013). Instructional strategies are therefore fundamental in enabling instructors to deliver e-learning content and activities, on one hand, and in reducing learning obstacles, on the other, in order to achieve course goals. E-learning instructional strategies can be classified into two broad categories: the teaching methods and the embedded support devices. The teaching methods help course instructors in delivering learning materials, experiences and activities. Khan (2005) has identified drill and practice, demonstration, student collaboration, the project-based approach and inquiry as some of the teaching methods for e-learning. On the other hand, the

embedded support devices are support tools included in the e-learning content by instructional designers to enhance independent study. The relationship between e-learning course instructional strategies and student satisfaction are grounded in several empirical studies. For example, Zhu et al. (2021), Elshami et al. (2021) and Mavo Navarro and McGrath (2022) have argued that instructional methods that foster learner engagement, real-time interactivity and instant feedback play a key role in enhancing the learning experience. Lovett's (2015) assessment of an online learning programme reported that learners were satisfaction with the instructional strategies related to autonomous learning, personal relevance, collaborative interaction, authenticity of learning, active learning and instructional support. Additionally, Manrique (2015) evaluated the effectiveness of instructional approaches and found that the type of instruction impacted on learners' satisfaction with the course. However, despite the attempts at highlighting the role of instructional strategies in enhancing student satisfaction with e-learning, no specific study has been conducted on Cisco e-learning courses in the Ugandan context. Thus, guided by the foregoing review of literature and empirical studies, this study hypothesises that:

H_6: Instructional strategies have a significant influence on perceived satisfaction with Cisco e-learning courses.

Perceived satisfaction and continued learning, and achievement in e-learning courses

According to Lin (2012) and Chang (2013), continuance use intention is the sustained use of an information technology by the adopter after the initial adoption decision, as well as the willingness to recommend it to others. Thus, in the context of e-learning courses, continuance use intention is critical in determining the extent to which the intervention was well designed and implemented. Currently, empirical evidence exists to support the relationship between user satisfaction and continuance use intention with e-learning. For example, Alraimi, Zo and Ciganek (2015), in their assessment of MOOCs' continued use intention, found student satisfaction to be one of the significant predictors. In quite similar studies, Pereira, Ramos, Gouvêa and Da Costa (2015), in a study of influencers of student satisfaction and continuance use with e-learning in the context of Brazilian public organisations, have reported user satisfaction as being a critical predictor continued use intention. Meanwhile, Aziz (2015) has reported satisfaction as having a positive impact on learners' continuance use intention with smart gadgets as tools for e-learning. The above empirical findings clearly align with Antonio et al.'s (2015) study on the use of virtual learning environments that found user satisfaction to be a strong influencer of continued use intention; and Tri-Agif et al.'s (2016) investigation that found a significant influence of student satisfaction as a predictor of student continued use intention with e-books. However, none of the above studies directly ventured into understanding student satisfaction, academic achievement, and continuance learning intention with Cisco e-learning courses in the Ugandan context. On the basis of the foregoing review of literature and empirical findings, this study hypothesises that:

H_7: Perceived satisfaction has a significant influence on the intention to continue learning with Cisco e-learning courses.

H_8: Continued learning intention exerts a significant influence on student achievement in Cisco e-learning courses.

Methodology

Sample profile

The data for this cross-sectional survey was collected from 805 Cisco e-students enrolled at 10 different higher education institutions in Uganda. The Cisco academies surveyed were at the College of Computing and Information Sciences, Makerere University, the Islamic University in Uganda (IUIU), Kampala International University (KIU), the Department of Women and Gender Studies, Makerere University, Multitech Business School, Uganda Institute of Information and Communications Technology, Muni University, Uganda Technology and Management University, Mbarara University of Science and Technology (MUST), and Cavendish University Uganda. In terms of ownership, five of the higher education institutions were public while the other five were privately run.

Regarding the respondents, the majority of the e-students who took part in the study were males, constituting 60% (485/805), followed by 40% being female e-students (320/805). In terms of Cisco courses offered, 77% of the respondents were taking CCNA, and 23% were taking other Cisco courses, including CCNP, ITE and Cyber Security. Respondents' ICT experience was equally examined. It was found that the majority of the students, constituting over 56%, reported the level of ICT experience as being intermediate. Yet students with ICT experience at beginner and advanced levels trailed at 22%, respectively. Thus, following the guidelines on sample size adequacy for SEM offered by Jackson (2003) and Comrey and Lee (1992), the sample size of 805 was deemed satisfactory for this study.

Measures

A self-reported 40-item questionnaire measuring instructional design quality, perceived satisfaction and continuance learning with Cisco e-learning courses was used to collect the data. The measurement items were initially drawn from a comprehensive literature review on e-learning instructional design, student satisfaction and continuance use intention. The items were later content-validated by the experts, and subjected to a pilot study before being applied to this study.

Instructional design quality

Three hypothesised dimensions of content quality, interface design quality and instructional strategies were used to assess instructional design quality. Cisco e-students rated the content quality of the e-learning courses using nine items, while eight items were used to assess interface design quality. Both sub-constructs were based on a five-response category Likert scale, i.e. "Strongly agree", "Agree", "Neutral", "Disagree" and "Strongly disagree".

Meanwhile, 12 items were employed to assess instructional strategies in the Cisco courses based on the Likert category of "Never", "Rarely", "Sometimes", "Often" and "Always". The reliability values for content quality, interface design quality and instructional strategies were Cronbach's alpha= .859, .849 and .901 respectively.

Perceived satisfaction

Six items were used to examine perceived student satisfaction with Cisco e-learning courses rated on the five Likert point category of "Strongly agree", "Agree", "Neutral", "Disagree" and "Strongly disagree". Yet the reliability index for the dimension was at Cronbach's alpha=.846.

Continued learning intention and academic achievement

Students rated their intention to continue learning with CISCO e-students using five items with a reliability index of Cronbach's alpha=.854. The items were based on a five-response category Likert scale, i.e. "Strongly agree", "Agree", "Neutral", "Disagree" and "Strongly disagree". Meanwhile, achievement was measured using one item that asked students to give their "*current cumulative score for the continuous web-based assignments out of 100 %*".

Data analysis procedures

Second order full-fledged SEM with AMOS version 22.0 was used to establish the adequacy of the hypothesised instructional design quality model and thereafter assess the causal relationships among the exogenous constructs (content quality, interface design quality and instructional strategies) and endogenous constructs (perceived satisfaction and continuance learning) in the study.

Presentation of Results

Adequacy of the hypothesised instructional design quality model

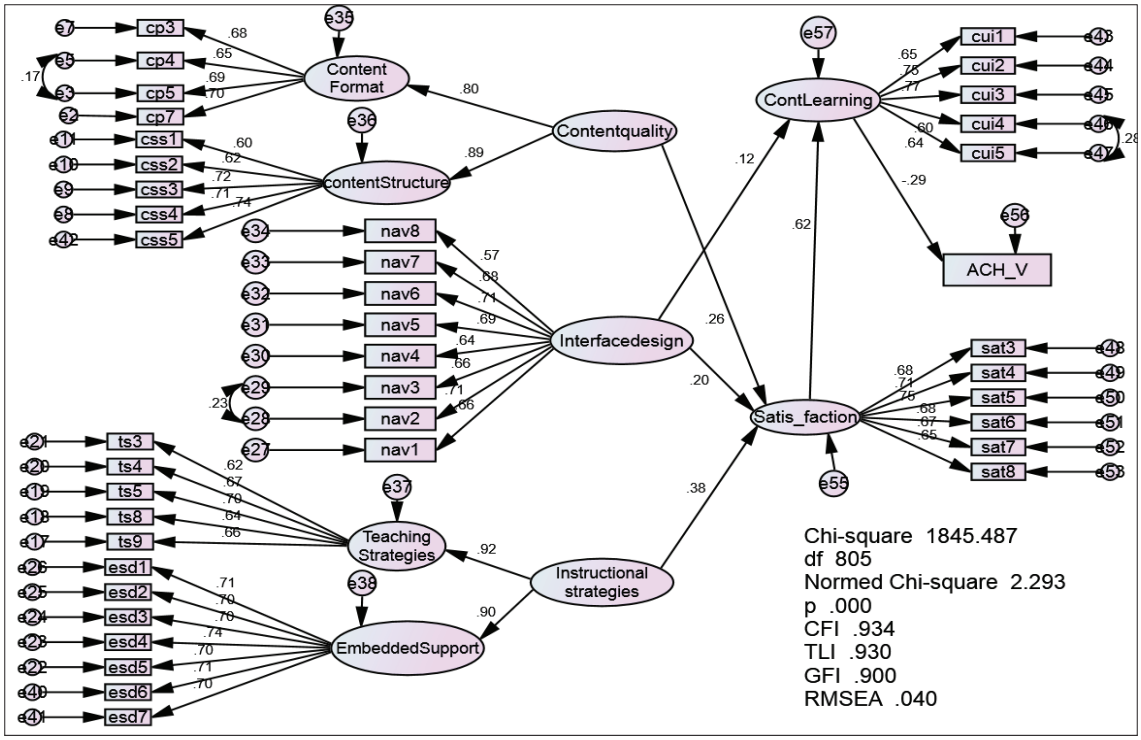
Table 1: Summary of fit indices for the structural equation model

Model fit category	Fit index	Level of acceptance
Absolute fit	Chi-square ($\chi 2$)	Below the one in the table for critical chi-square values
	Root Mean Square of Error Approximation (RMSEA)	<.05 to <.08
	Goodness of Fit Index (GFI)	≥.90
Parsimonious fit	Chi-square/Degrees of Freedom ($\chi 2$/df)	<3 to <5
Incremental fit	Comparative Fit Index (CFI), Tucker-Lewis Fit Index (TLI)	≥.90

Guided by the recommendations of Matsunaga (2011), the adequacy and validity of the hypothesised model were assessed on the basis of absolute, incremental and parsimonious indices whose thresholds are summarised in Table 1. As seen in Figure 2, the results of full-fledged SEM of instructional design quality, student satisfaction and continuance learning are presented, and are intended to address the respective hypothesises of the study.

The hypothesised SEM demonstrated acceptable fit with the data ($\chi 2$ / df=2.293, CFI=.934, TLI=.930, GFI=.900, RMSEA=.040). The SEM results have therefore revealed model fit of the relationship between instructional design quality, student satisfaction and continuance learning with Cisco e-learning courses.

Figure 2: Revised e-learning instructional design quality model



Moreover, the analysis has further revealed that the predictor variables (content quality, interface design quality and instructional strategies) were able to explain 63% of the variability in student satisfaction with the e-learning courses, and that student satisfaction explained 50% of the variability in student continuance use intention with Cisco e-learning courses.

Casual influence of instructional on perceived satisfaction and continuance learning

As reflected in Figure 2, the standardised estimates (β) of the hypothesised causal relationships were both statistically significant and practically important.

The standardised path coefficient of content quality□perceived satisfaction was β=.258, p=.011; interface design quality□perceived satisfaction was β=.204, p=.016; interface design quality□continued learning was β=.123, p=.031; instructional strategies□perceived satisfaction

was β=.378, p=.001; perceived satisfaction continued learning was β=.616, p=.001; and continued learning achievement was β=.287, p=.001. Data analysis further revealed that there was a partial mediation effect of interface design quality on perceived satisfaction and continued learning (Sat_Interface x ContLearning=0.125> ContLearning_Interface =0.123)

Discussion and Conclusion

Guided by Khan's (2005) e-learning framework and Bhattacherjee's (2001) information systems continuance model, this study had two overall aims. First, was to examine the validity of the hypothesised e-learning instructional design model. The empirical results pointed to the effect that the model is valid as it demonstrated adequate fit to the data since the fit indices in terms of the normed chi-square, CFI, RMSEA, GFI and TLI were within the limits recommended by Kline (2016), Hair, Black, Babin and Anderson (2016) and Awang (2015). The study results are consistent with several empirical studies and the theoretical framework used; for example, Cheng (2011)this study uses the framework of the extended TAM to examine the antecedents and consequences for employees' acceptance of the e-learning system within financial services organizations. The total of 328 useable responses collected from eight interna- tional or domestic financial services companies in Taiwan were tested against the model using structural equation modelling (SEM whose study found satisfactory structural model fit to the data. The current study results were also in alignment with Chih-Yang, Tsai-Chu, Ping-Teng and Chih-Wei's (2011) findings on continued use of e-learning by civil servants that showed that the hypothesised model demonstrated adequate fit to the data. Moreover, the results agree with the theoretical framework of the study. That is, the instructional design quality constructs derived from Khan's (2005) e-learning framework and satisfaction and continuance use intention from Bhattacherjee's (2001) information systems continuance model.

The second aim of the study was to establish the causal relationships between e-learning content quality, interface design quality and instructional strategies, on one hand, and perceived satisfaction and continuance learning, on the other. As earlier hypothesised, content quality, interface design quality and instructional strategies were found to have a positive and statistically significant causal influence on student satisfaction. Specifically, e-learning content quality demonstrated a significant positive causal influence on student satisfaction, implying that course content quality accounted for significant variance in student satisfaction with the Cisco courses. The result on content quality is supported by earlier empirical studies. For example, Khan (2022) reported that the quality of the online course exerted a statistically significant influence on learners' satisfaction. Meanwhile, Yawson and Yamoah (2020), in their investigation to understand e-learning at higher education level, found course design and interaction factors to significantly influence student satisfaction with e-learning in the Ghanaian context. The findings in the current study further support the observations by Lee and Jeon (2020)the study focuses on finding whether there is a difference in the perception of the cyber university's mobile LMS depending on self-directed learning (SDL that when information systems like e-learning environments avail end users with high-

quality content, their satisfaction is enhanced. The result also aligns with that of Budiardjo, Pamenan, Hidayanto, Meyliana, and Cofriyanti (2017), who reported that information quality exerted a causal influence on user satisfaction.

The SEM analysis also found that interface design quality had a statistically significant correlational influence on student satisfaction with Cisco e-learning courses. The direct influence of interface design quality on continuance learning was also noted. The result has shown consistency with Khan's (2005) in the e-learning framework which theorises that e-learning interface design is critical to meaningful e-learning. Ghai and Tandon's (2022) assessment of aesthetic visual design of e-learning found the attributes of layout, consistency and topography to be predictors of e-learning system usability. Additionally, Rodríguez-Ardura and Meseguer-Artola (2016) found that interactivity exerted a significant influence on user-perceived attitude towards e-learning. Furthermore, the causal influence of instructional strategies on student satisfaction was not only significant and positive, but also practically important. The result has shown clear agreement with Khan's (2005) in the e-learning framework which postulates that relevant pedagogical strategies are crucial to achieving meaningful e-learning. Moreover, in empirical studies by Lovett (2015) and Manrique (2015), students reported satisfaction with various instructional strategies used in the e-learning environments.

Lastly, perceived satisfaction, too, exerted a positive and statistically significant influence on continuance learning with Cisco e-learning courses. In turn, continued learning intention had a significant predictive influence on student achievement in Cisco e-learning courses. The result aligned with Bhattacherjee's (2001) information systems continuance model which hypothesises that the higher the degree of user satisfaction with an information technology / system, the higher the likelihood of continuance use intention. Besides, the result is supported by previous studies like those of Younas et al. (2022)the adaption of online learning channels, digital competency of students' involvement, and academic achievement during COVID-19. Purpose: The purpose of this study is to examine the online influencing components for learning among University students in Pakistan during the COVID-19 Pandemic. Methods: The study population comprised Pakistani University students in Punjab province who tooke online lessons throughout the epidemic. In accordance with the study's purpose, a questionnaire survey was employed to gather primary data. SPSS-23 is used for analyzing the demographic data, and cleaning and preparing data for testing hypotheses. SmartPLS 3.0 was used to investigate the suggested study framework using structural equation modeling (SEM, Budiardjo, Gilang, Hidayanto and Cofriyanti (2017) and Junjie (2017)such as Coursera and Khan, are more popular than native ones in mainland China. The empirical results show that the effects of three ECM factors (satisfaction with prior learning experience, confirmation with prior learning experience, and perceived usefulness, who found student satisfaction to have a significant predictive influence on user continuance intentions with e-learning and performance.

The results of this study have enriched our understanding with regard to the multidimensionality of the instructional design quality construct and its role in realising meaningful e-learning, student satisfaction and continued use intentions with e-learning interventions. In that respect, the study has made significant contributions to the theory and practice of e-learning instructional design. In terms of theory, this study has shed light on the instructional design quality and e-learning success in the context of Ugandan institutions of higher learning that has so far received limited attention. In terms of educational practice, the study findings have offered guidelines to e-learning object specialists, interface designers and programmers, subject matter experts, instructors and e-learning course coordinators for purposes of effective e-learning course design and development. The paper, thus, recommends that in order to achieve meaningful and successful e-learning, e-learning courses should be designed based on proven principles of human learning, with user-friendly user interfaces and, above all, supported with appropriate instructional strategies. Two key guidelines are also given for future research directions. First, there is need to investigate the role of e-learning interactivity in enhancing meaningful and satisfactory learning. Second, future studies on personalisation of e-learning and how it affects perceived learning, satisfaction and continued use intentions could be undertaken.

Declaration of Conflict of Interest

The author declares no potential conflict of interest with respect to the research, authorship and/or publication of this manuscript.

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Availability of data and material for data transparency

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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