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Validation of an Instructional Design Quality Framework for Evaluating E-Learning Course Success in Ugandan Higher Learning Institutions: A Structural Equation Model Approach

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ABSTRACT

As E-learning initiatives continue to be an integral part of Ugandan higher learning institutions' strategic plans, evidence-based guidelines are necessary to deliver pedagogically sound experiences to learners. Despite the continuous strides in the implementation of E-learning interventions in Ugandan higher learning, no established framework is in place to assess the success of E-learning courses from the learners' perspective. The specific aim of this study was two folded, namely, to validate an instructional design quality framework for E-learning success, and to examine the causal influence of instructional design quality constructs on E-learning success. By employing the cross-sectional survey approach, this study collected data from a stratified random sample of 805 students who were taking E-learning courses in ten selected CISCO Networking Academies in Uganda. The quantitative data were analysed using Principal Component Analysis, Confirmatory Factor Analysis and full-fledged Structural Equation Modeling (SEM). The results have supported the measurement and structural model fit to the data and indicated that instructional design quality constructs influenced learner satisfaction and continuance learning intention in the model. The findings of the study have highlighted significant practical and theoretical implications of the proposed framework for research and practice in Open and Distance e-Learning interventions in Uganda higher learning.

KEYWORDS

E-learning courses; instructional design framework; learner satisfaction; continuance learning intention; structural equation modeling; Ugandan higher learning

1. INTRODUCTION

UNESCO has singled out skills development and lifelong learning as post-2015 educational priorities that could be promoted using E-learning in the form of digital technologies and online content. This could be made possible by: (i) expanding access to formal and informal learning, (ii) increasing and diversifying learning pathways to cater for varied pedagogical needs, and (iii) enabling blended learning in dynamic environments [1]. Thus, to realise such potential benefits presented by digital technologies and online content, quality assurance should be part of the agenda to help stakeholders validate and improve Online/E-learning initiatives. With the changing nature of the clientele in the higher education landscape, higher learning institutions in Uganda are fast becoming dual mode universities in a bid to establish a foot hold in the education sector [2]. As such, higher learning institution managers in Uganda now view Open and Distance E-learning as a viable strategy to increase learner access to education, increase

enrolment, and to balance the cost of education provision with modern ICTs. Moreover, the prevalence of easily accessible digital technologies has particularly made it possible for people to access knowledge in a convenient and flexible manner for learning [3]. To that end, several E-learning initiatives have been witnessed in Ugandan higher learning institutions through the adoption and deployment of learning platforms, E-content development, collaborations with global E-learning providers, among other E-learning initiatives [4] [5] [6] [7].

The increased adoption of E-learning as an instructional mode of delivery has equally aroused the need and interest for E-learning research, particularly in the area of E-learning quality assurance and success by considering end-user perceptions [8]. The need could largely be attributed to the influx of profit-oriented and sometimes unqualified actors as providers of E-learning services, which threatens to compromise the quality of higher education quality provision [2]. As pointed out by [9] and [10], efforts at institutional level are being undertaken to address issues regarding E-learning quality. For example, the Higher Education Committee on Quality has classified learning objectives, teaching methods/strategies, assessment methods, interactive teaching materials, learning resources, thematic learning content, activity schedule, and student profile as essential for quality online learning programmes.

Additionally, the Online Consortium model reflects the components of learning effectiveness, instructor satisfaction, learner satisfaction, scale, and access as being critical to online learning [11]. Meanwhile, the Latin American and Caribbean Institute for the Quality of Online Higher Education (CALED) has indicated the elements of instructional design, technology, training, learner information, and services [12]. In addition, [13] has highlighted introduction, objectives, learner assessment, learning content, learner interaction and engagement, course technology, accessibility and learner support as indicators of quality E-learning. In a related case, the iNACOL National Standards for Quality Online Courses has reflected quality in the components of content, instructional design, assessment, technology; and course evaluation and support [14].

However, none of the mentioned guidelines on E-learning/Online learning quality have specifically and comprehensively focused on the instructional design quality attributes based on empirical data from the Ugandan E-learning context. Yet it is important given the fact that E-learning can only be meaningful if it enhances learner satisfaction and persistence in the digital learning environment. The absence of clearly established guidelines in Ugandan higher learning institutions regarding the modalities for evaluating the instructional design quality of E-learning courses triggered this study. The purpose of the study therefore was to propose and validate an instructional design quality framework for evaluating E-learning course success in Ugandan higher learning institutions. Based on the gap in the reviewed literature on E-learning quality in the Ugandan higher learning context, this research attempted to validate the instructional design quality framework for E-learning success. This study thus sought to:

i. Establish the relationship between the observed variables and latent constructs of instructional design quality and E-learning course success

ii. Validate the proposed instructional design quality framework for E-learning success
iii. Examine the causal influence of the instructional design quality constructs on E-learning success

1.1 Theoretical Framework

To successfully validate the instructional design quality framework for E-learning success, this study synthesized the relevant existing models and frameworks as a basis for deriving the working conceptual framework. To that effect, Khan's E-learning framework and Masoumi's e-Quality framework were applied to derive the instructional design quality dimensions of content presentation format, course structure and sequencing, teaching strategies, embedded support devices, and interface design quality. On the other hand, Bhattacherjee's Information Systems Continuance Model was useful in understanding the E-learning course success dimensions of learner satisfaction and continuing learning intention.

1.1.1 Khan's E-Learning Framework

Khan's E-learning framework is undeniably one of the holistic theoretical models useful in the assessment of meaningful E-learning. As depicted in Figure 1, Khan's E-learning Octagonal framework covers eight dimensions, namely: pedagogical, technological, interface design, evaluation, management, resource support, ethical and institutional dimensions, which are generally grouped into the domains of technological, educational and organisational in outlook [15]. In the interest of the current study, the components of pedagogy and interface design were adapted to help elaborate on the constructs of content quality, instructional strategies and interface design quality. The pedagogical dimension of Khan's E-learning Octagonal framework among other elements pays attention to content analysis, media analysis, design approach, instructional strategies and methods in E-learning. On the other hand, the interface design dimension describes the overall look and feel of the E-learning environment by looking at the design of the content, site and navigation [15].

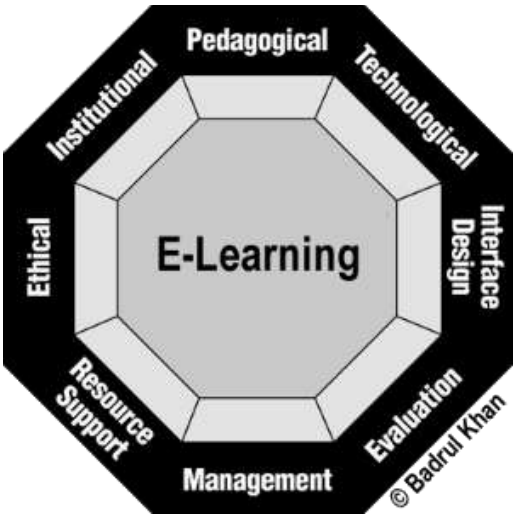

Figure 1. Badrul Khan (2005)'s E-learning Framework (Pg. 14)

1.1.2 Masoumi's e-Quality Framework

In response to the concerns regarding E-learning quality, Masoumi's e-Quality framework was developed to provide a structure for enhancement and assurance of quality in Virtual learning institutions. Masoumi's e-Quality framework is made up of seven dimensions which are: instructional design, pedagogical, technological, student support, evaluation, institutional and faculty support factors [16] [17] . In the current study, four factors of instructional design, pedagogy, technology, and evaluation were adapted. The technological factor addresses concerns regarding development, sustainability and functionality of the technological infrastructure; as well as accessibility, re-usability and interface design. The instructional design and

pedagogical factors on the other hand focus on the constructive alignment of the learning resources, pedagogy and the supporting technology resources; in addition to creative and constructive deployment of learning resources. The sub-dimensions clarifying expectations, selection and organization of learning resources are addressed under the instructional design factor. Lastly, the evaluation factor concerns itself with the extent to which E-learning meets the needs of stakeholders in terms of cost-effectiveness, learner and instructor satisfaction, as well as learning effectiveness.

1.1.3 Bhattacherjee's Information Systems Continuance Model

The Bhattacherjee's Information System Continuance Model focuses on user willingness to continue using an information system or technology in a long-run, unlike the Information System Acceptance Models that limited themselves to the users' initial decision to adopt an information system [18]. According to the model, the viability of an information system in the long term and its success is dependent on continued use rather than just first-time acceptance by the users [19]. The model further theorises that continuance intention towards an information system/technology is to a large extent a function of user satisfaction. Thus, a high degree of user satisfaction is likely to result into a high likelihood of user continued intention towards the technology. The Information System Continuance Model also postulates that perceived usefulness and confirmation have a direct influence on user satisfaction. Then, user satisfaction in turn has a positive affect continuance use intention [19] [20]. In the current study, the dimensions of user satisfaction and continuance intention have been adapted to help in understanding E-learning success construct. Thus, Table 1 gives a summary of the constructs in the theoretical framework, as well as in the proposed instructional design quality framework.

Table 1. Summary of E-learning quality dimensions from the theoretical framework

Framework	**Summary of dimensions**
Khan's E-learning Framework	-Pedagogical, Technological, Interface design, Evaluation, Management, Resource support, Ethical, and Institutional factors
Masoumi's E-quality Framework	-Instructional design, Pedagogical, Technological, Student support, Evaluation, Institutional factor, and Faculty support factors
Bhattacherjee s Information System Continuance Model	-Satisfaction, continuance use intention
Proposed instructional design quality for E-learning success (IDEQES)framework	-Content presentation format, Course structure and sequencing, Teaching methods, Embedded support devices, Interface design quality, Learner satisfaction, and continuance learning intention

From the foregoing review of existing literature on E-learning/Online learning quality guidelines and theoretical framework, this study presents the hypothetical instructional design quality

conceptual model for evaluating E-learning course success in Figure 2, as well as the hypotheses.

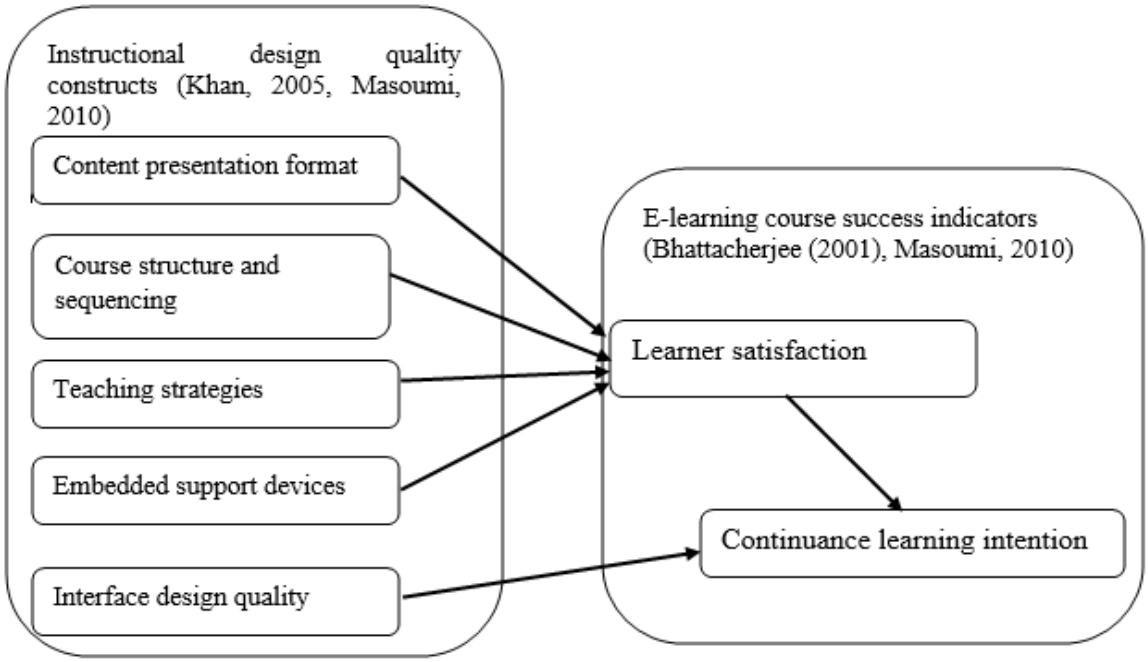

Figure 2. Proposed instructional design quality framework for E-learning success

H_1: There is a relationship between the observed variables and latent constructs of instructional design quality and E-learning course success

H_2: The hypothesised instructional design quality framework for E-learning success fits the data

H_3: Content presentation format has a significant and positive influence on learner satisfaction with E-learning courses

H_4: Course structure and sequencing have significant and positive influence on learner satisfaction with E-learning courses

H_5: Interface design quality has a significant and positive influence on learner satisfaction with E-learning courses.

H_6: Interface design quality has a significant and positive influence on continuance learning intention with E-learning courses.

H_7: Teaching strategies have significant and positive influence on learner satisfaction with E-learning course

H_8: Embedded support devices have a significant and positive influence on learner satisfaction with E-learning courses.

H_9: Learner satisfaction has a significant and positive influence on continuance learning intention with E-learning courses

2. METHODOLOGY

2.1 Sample Characteristics

The quantitative data for the current study were collected from a stratified random sample of 805 students who had enrolled into various E-learning courses in ten selected CISCO Networking Academies in Uganda. Descriptive statistics have revealed that 77% of the learners who participated in the study were taking the CCNA E-learning course, those taking ITE constituted 10%,

CCNP was about 8% and Cyber Security made up about 4%. Moreover, 56% of the students reported their level of ICT experience to be intermediate. Those who rated themselves as beginner and advanced in terms of ICT experience were merely 22% respectively. Descriptive results further reveal that males were the majority, constituting 60%, followed by 40% being female E-learners. In view of the guidelines on sample size adequacy for SEM offered by [21] [22], the study's sample size of 805 was considered satisfactory for performing SEM.

2.2 Research Instrument and Measurement

A self-administered questionnaire with 48 items was used to collect quantitative data used in validating the instructional design quality framework for E-learning success. The questionnaire items were derived from an extensive review of related literature on E-learning instructional design, learning satisfaction and continued learning intention. For the purposes of quality assurance, the measurement items for the study were first subjected to content-validation by six Experts in specializations of Instructional Technology and Research Methodology. Lastly, the instrument items were piloted on a sample of 232 E-learners before being applied to this study.

Instructional design quality constructs: Five hypothesised dimensions of content presentation format (7 items), course structure and sequencing (5 items), teaching methods (9 items), embedded support devices (7 items), and interface design quality (8 items) were used to measure the instructional design quality. The reliability values for all the instructional design quality constructs were all within the recommended limits of 0.7 and above [23]. Thus, the Cronbach's alpha values were .752 (content presentation format), .813 (course structure and sequencing), .796 (teaching methods), .875 (embedded support devices) and .866 (interface design quality).

E-learning success indicators: Two sub-dimensions of learner satisfaction and continuance learning intention were used to assess E-learning success. Seven measurement items were used to measure learner satisfaction with E-learning courses. The construct yielded the reliability index of Cronbach's alpha =.846. Learners also rated their intentions to continue learning with E-learning courses based on five items whose reliability index was Cronbach's alpha=.819. The Instructional design quality constructs and E-learning success indicators were rated based on a five-point Likert response category of "Strongly agree", "Agree", "Neutral", "Disagree" and "Strongly disagree" to enable the respondents easily better understand the options that suit their perceptions on the subject under study. Moreover, the mid-point options of "Neutral" was added for purposes of flexibility on the side of the respondents.

2.3 Data Analysis Procedures

This study employed a two-step analysis of Structural Equation Modeling. The first step involved the confirmation process of the proposed E-learning quality framework, and the second being the assessment of causal relationships among the constructs. Thus, three multivariate techniques were employed for data analysis. First, Principal component analysis (PCA) based on Promax rotation method was used to understand the factor structure of the instructional design quality constructs and E-learning success indicators. Secondly, pooled Confirmatory Factor Analysis (CFA) was applied with AMOS software version 22.0 to establish interrelationships, validity and reliability of

the sub-dimensions involved. Lastly, full-fledged Structural Equation Modeling (SEM) was used to establish the adequacy of the hypothesised instructional design quality for E-learning success framework. Furthermore, SEM was used to assess the causal relationships among the exogenous constructs (content presentation format, course structure and sequencing, teaching methods, embedded support devices, and interface design quality) and endogenous constructs (Learner satisfaction and continuance learning intention) in the study. The adequacy of the measurement and structural models was assessed on the basis of meeting the acceptable threshold for the relative chi-square, Root Mean Square Error of Approximation (RMSEA), Comparative fit indices (CFI), Tucker-Lewis Index (TLI) and Goodness of Fit Index (GFI) [24] [25] [26]. The details regarding the acceptable fit indices for the models are presented in Table 2.

Table 2. Summary of the fit indices

Model fit category	Fit index	Level of acceptance
Absolute fit	χ^2	The smaller the better or below the one in the table for critical chi-square values
	RMSEA	<.05 to <.08
Parsimonious fit	χ^2/df	3 to 5
Incremental fit	CFI, TLI, GFI	≥.90

3. RESULTS

3.1 Underlying Structure of Instructional Design Quality and E-Learning Success Constructs

Prior to employing PCA, the suitability of the data for factor analysis was examined. The result revealed that the correlation matrix indicated satisfactory coefficients above 0.3. In addition, the Kaiser-Meyer Olkin measure of sampling adequacy (KMO) value of .957 exceeded the threshold of .60. The Bartlett's Test of Sphericity achieved statistical significance χ^2 (1176) =19166.158, p=.000 which fully supported the factorability of the correlation matrix [23]. Factor extraction with EFA revealed 7 components with eigenvalues greater than one. Thereafter, the quality of the extracted components was examined in terms of the factor loadings such that only items with loadings ≥ 0.5 and with no cross loadings were retained [27] [28]. As seen in Table 3, the items cp1, cp2, ts1, ts2, ts6 and sat1 yielded factor loadings less than 0.5 and were therefore disregarded from further analysis. The remaining items had their factor loadings ranging between 0.543 and 0.811, and these were suitable for use in pooled CFA. As guided by the grouping of the items and review of literature, the extracted components were named accordingly. These were named as: embedded support devices, course structure and sequencing, interface design quality, content presentation format, teaching methods, learner satisfaction and continuance learning intention. To further assess the stability of the measurement items in the framework, the factor loadings from both Exploratory Factor Analysis and Confirmatory Exploratory Factor Analysis were compared. As presented in Table 3, the difference in the variations of the factor loadings was found to be very negligible, as they were all within the acceptable range. The implication therefore is that the factor loadings largely remained stable.

3.2 Relationship Between the Observed Variables, Instructional Design Quality and E-Learning Course Success Latent Construct

The results in Figure 3 indicate achievement of adequate fit between the Pooled CFA measurement model and the data: χ^2/df=2.383, CFI=.931, TLI=.925, GFI=.901, RMSEA=.041. Additionally, the standardised factor loadings and composite reliability were used to establish the convergent validity.

Table 3. Underlying structure of instructional design quality E-learning success constructs

Component/ Items		**Factor Loadings**	
		EFA	**CFA**
Content presentation format			
cp1	Video learning content	.431	-----
cp2	Audio learning content	.313	-----
cp3	Text learning content	.711	.636
cp4	Lessons notes that are clear	.786	.703
cp5	Learning content illustrate with pictures	.716	.730
cp6	Animated learning content	.434	-----
cp7	Learning content with vocabulary suitable to my learning level	.550	.582
Course structure and sequencing			
css1	Learning activities to support the course objectives	.559	.607
css2	Clearly states the grading method to be used	.549	.611
css3	Provides me with content that is well-organized	.677	.719
css4	Breaks down practice activities appropriately for ease of my understanding	.699	.722
css5	Learning activities that follow each other	.599	.750
Teaching methods			
ts1	Complete learning activities with my classmates	.439	-----
ts2	Share information with my peers	.489	-----
ts3	Discuss my ideas with my peers	.585	.622
ts4	Study real-world problems in classroom activities	.570	.665
ts5	Work on assignments that deal with real-world information	.554	.702
ts6	Seek my own answers while learning	.375	-----
ts8	Solve learning problems i encounter	.543	.658
ts9	Complete learning through project work	.575	.666
Embedded support devices			
esd1	Elements for gaining attention during learning	.779	.724
esd2	Lesson activities that increase my learning success	.772	.718
esd3	Strategies for stimulating recall of my prior information	.783	.698
esd4	Strategies for maintaining attention on content being learnt	.747	.731
esd5	Strategies for enhancing learning retention	.716	.674
esd6	Elements that maintain my motivation during learning.	.736	.712
esd7	Opportunities for practice of difficult concepts I learn	.650	.697
Interface design quality			
nav1	Has navigational tools on all pages	.603	.660
nav2	Enables me to control my learning progress.	.624	.730
nav3	Has well organized pages	.534	.683
nav4	Has predictable screen changes	.746	.632

nav5	Presents me with a logical sequence on how to complete tasks	.636	.707
nav6	Gives me clear page directions.	.665	.722
nav7	Allows a new page to open in a new browser window	.711	.670
nav8	Requires less scrolling no matter the screen size used	.718	.560
Learner satisfaction			
sat1	Course usefulness	.478	-----
sat3	Knowledge gained from the course	.672	.684
sat4	E-learning course functions	.747	.710
sat5	Learning content quality	.749	.751
sat6	Meeting my learning expectations	.797	.684
sat7	My learning interest in the course	.755	.673
sat8	Overall learning experience with this E-learning course	.811	.651
Continuance learning intention			
cui1	I would like to take another E-learning course after this	.730	.637
cui2	I will recommend this E-learning course to my friends	.804	.736
cui3	I intend to continue using the E-learning course for sharing knowledge	.843	.778
cui4	I will use the E-learning system on a regular basis in the future	.741	.645
cui5	I intend to continue using a related E-learning course for life-long learning	.725	.678

Note: Extraction Method: Principal Component Analysis; Rotation Method: Promax with Kaiser Normalization.

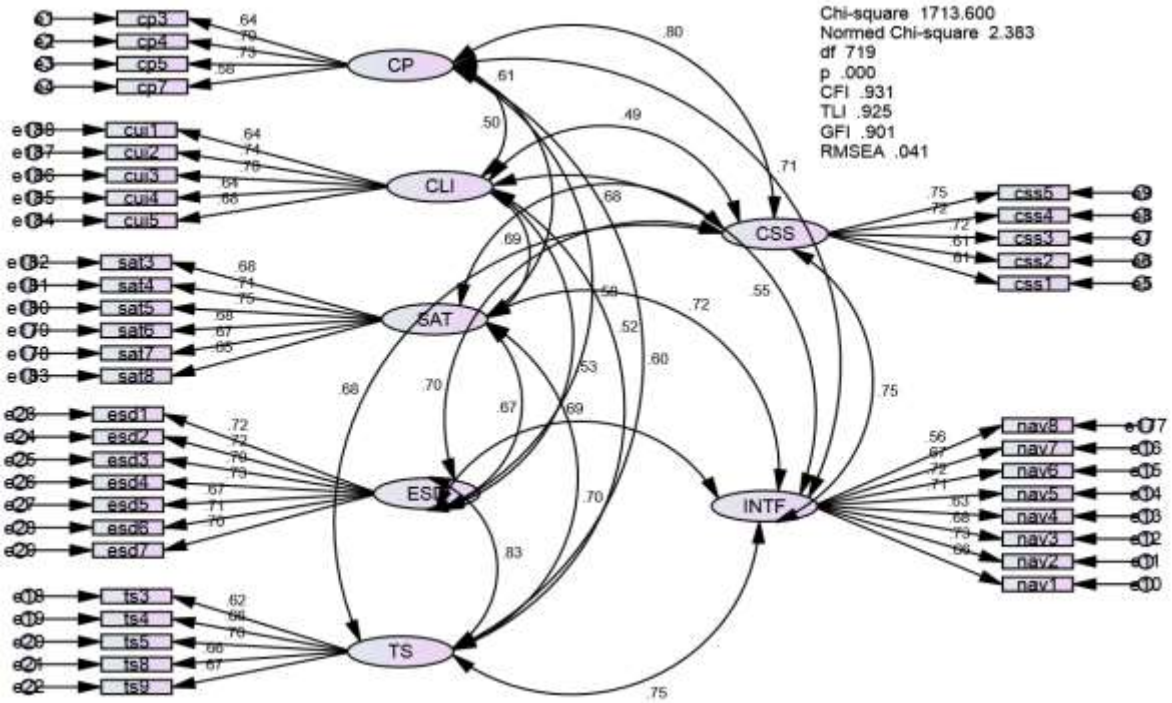

Figure 3. Pooled measurement model

Note: CP (Content presentation format), CSS (Content structure and sequencing), INTF (Interface design quality), TS (Teaching strategies), ESD (Embedded support devices), SAT (Learner satisfaction), CLI (Continuance learning intention)

According to Figure 3, all the factor loadings were above 0.50 which indicated evidence of convergent validity [26]. Moreover, according to Table 4, the Average Variance Explained (AVE) and the composite reliability were all above the threshold of 0.50 and 0.70 respectively [28] [29]. Thus, evidence of convergent validity has been fully established. Evidence of discriminant validity is also indicated in Table 4. That is, the AVEs for the factors are presented along the diagonal, and all of them are above 0.5.

The fit indices produced after structural model execution in Figure 4 have provided evidence of adequate fit between the hypothesised model and the data: χ^2/df=2.380, CFI=.930, TLI=.925, GFI=.900, RMSEA=.041. That is because the fit indices met or even exceeded the required threshold; χ^2/df=2.380 less than the recommended $\leq$ 3, CFI=.930, TLI=.925, GFI=.900 equal to or even greater than the required $\geq$ 0.90, and RMSEA=.041 less than the recommended $\leq$ 0.8 or even $\leq$ 0.5 [29] [26] [24].

Table 4. AVEs, Inter-factor correlations and shared variance and among the constructs

Dimension	1	2	3	4	5	6	7
CP	**0.662**	0.264	0.645	0.511	0.372	0.335	0.361
CSS	0.803	**0.682**	0.479	0.282	0.267	0.244	0.305
SAT	0.61	0.684	**0.712**	0.448	0.489	0.468	0.526
CLI	0.496	0.494	0.692	**0.69**	0.691	0.487	0.483
TS	0.601	0.684	0.699	0.517	**0.551**	0.468	0.563
NAV	0.715	0.75	0.725	0.552	0.75	**0.67**	0.563
ESD	0.579	0.698	0.669	0.531	0.831	0.695	**0.707**
Composite Reliability	0.758	0.814	0.861	0.82	0.796	0.868	0.875

Note: (a) Along the diagonal are the Average Variance Explained (AVE) for each sub-construct; (b) above the diagonal is the shared variance matrix; (c) below the diagonal is the correlation matrix.

The squared inter-factor correlations are above the diagonal, with most of them less than the calculated AVEs [26]. The inter-factor correlations (shared variance) are presented below the diagonal and are all less than 0.85 [30]. All these indicate that the conditions for discriminant validity have been satisfied. In conclusion, the results have demonstrated evidence of the relationship between the observed variables, instructional design quality and E-learning course success latent construct.

3.3 Assessment of the Hypothesised Instructional Design Quality Framework for E-Learning Success

The evidence of adequate model has helped to test hypothesis two of the study, which indeed has been accepted.

3.4 Relationship Between Instructional Design Quality and E-learning success Constructs

Objective four of this study sought to examine the causal relationship between the

instructional design quality and E-learning success constructs. The research objective was accompanied with hypotheses three to seven (H_3-H_7) which were intended to test the direction and significance of the causal relationships among the latent variables. To that end, the structural model's standardised

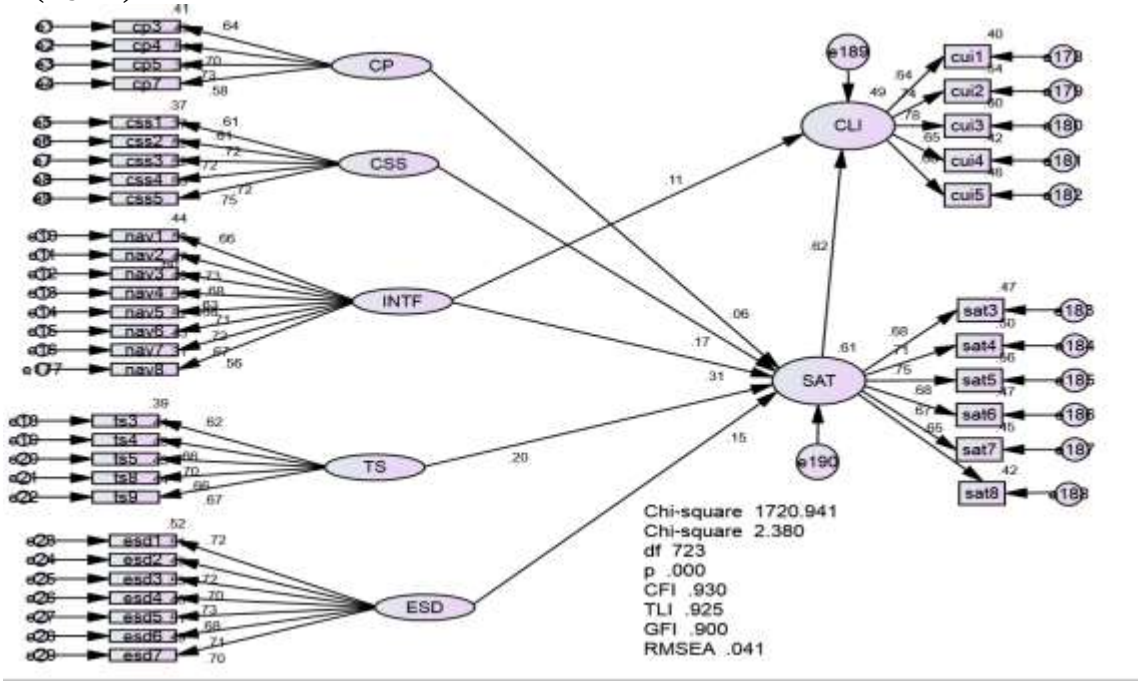

Figure 4. Hypothesised instructional design quality for E-learning success model

Table 5. Regression Weights: (Group number 1 - Default model)

Structural paths			Estimate	C.R.	P	Result
SAT	←	CSS	0.17	2.13	0.033	Significant
SAT	←	INTF	0.305	4.639	***	Significant
SAT	←	TS	0.199	2.421	0.015	Significant
SAT	←	ESD	0.146	2.018	0.044	Significant
SAT	←	CP	0.058	0.809	0.418	Non- Significant
CLI	←	SAT	0.616	9.193	***	Significant
CLI	←	INTF	0.11	1.971	0.049	Significant

Beta estimates (β), critical ratios, and significance values were examined. The full-fledge SEM results presented in Table 5 reveal that except for content presentation format, the casual influence of the other instructional design quality constructs on E-learning success was both positive and significant. That is, course structure and sequencing→learner satisfaction (β=.17, p=0.033), interface design quality→learner satisfaction (β=.305, p<0.001), interface design quality→continuance learning intention (β=.11, p<0.049) teaching methods→ learner satisfaction (β=.199, p=0.015), embedded support devices→ learner satisfaction (β=.146, p=0.044), and learner satisfaction→continuance learning intention (β=.616, p<0.001). Contrary to the rest of the structural paths, content presentation format→ learner satisfaction

yielded β=.058 (p=0.418), which though positive, was a non-significant result. Table 5 also reveals that the Critical Ratios (CR) for all the structural paths were well above the threshold of 1.96. In Table 6, the decisions that were taken on the hypotheses considering the results of the analysis are summarised.

Table 6. Summary of results as per hypothesis

No.	Hypothesis statement	Decision
H_1	There is a relationship between the observed and latent variables of instructional design quality and E-learning success	Supported
H_2	The hypothesised instructional design quality framework for E-learning success model fits the data	Supported
H_3	Content presentation format has a significant and positive influence on Learner satisfaction with E-learning courses	Not Supported
H_4	Content structure and sequencing has a significant and positive influence on learner satisfaction with E-learning courses	Supported
H_5	Interface design quality has a significant and positive influence on learner satisfaction with E-learning courses	Supported
H_6	Interface design quality has a significant and positive influence on continuance use intention with E-learning courses	Supported
H_7	Teaching strategies have a significant and positive influence on learner satisfaction with E-learning courses	Supported
H_8	Embedded support devices have a significant and positive influence on learner satisfaction with E-learning courses	Supported
H_9	Learner satisfaction has a significant and positive influence on the intention to continue learning with E-learning courses	Supported

4. DISCUSSION

To achieve the objectives of the study, a two-step approach was been employed for data analysis. The first objective of the study sought to establish the extent of the relationship between the observed variables and latent constructs of instructional design quality and E-learning courses. The results from the data analysis indicated adequate relationship between the manifest and latent variables that were assessed. Moreover, the variables have demonstrated satisfactory psychometric soundness in terms of reliability, convergent and discriminant validity. The result has extended the earlier guidelines regarding the instructional design quality indicators [16] [15] [17]. Furthermore, the results have provided more evidence to support the assertion that satisfaction and continuance use intention constitute meaningful and interpretable dimensions of information systems success [19]. Thus, hypothesis one of this study was fully supported and consequently accepted. As per the second objective, full-fledge SEM procedures were applied to validate the proposed instructional design quality framework for E-learning success. The results indicated that the SEM model was valid and reliable given that the fit indices met or even exceeded the required threshold [29] [26] [24]. Thus, there is adequate confidence to suggest that the validated framework is satisfactory for assessing the instructional design quality of E-learning interventions.

Objective three of the study sought to examine the causal influence of the instructional design quality constructs on E-learning success indicators and

was accompanied with six hypotheses. According to the SEM results, the causal relationships in the structural model were significant except for content presentation format. Course structure and sequencing was found to have a positive and significant causal influence on learner satisfaction. The result has aligned closely with existing guidelines and empirical evidence. For example, [31] has recommended that E-learning content should be logically organised by placing important information at the beginning of the modules, while adhering to consistent, simple and concise and language. A study by [32] revealed course structure as a significant predictor of learning satisfaction. The current study further assessed the influence of the interface design quality subconstruct on both learner satisfaction and continuance learning as earlier hypothesised, and the result was found to be positive and significant. The result extends our understanding of the role of user interfaces in E-learning use and enriching previous related studies. For example, in a study by [33], learners reported their satisfaction with the mobile learning application interface because it was easy to understand, had an easy to use touch screen and provided timely feedback for learning. In addition, [34] in the assessment of LMS adoption found a significant relationship between system interactivity and learner perceived usefulness. Meanwhile, [35] have reported that successful use of a software applications is largely dependent on the nature and characteristics of the user interface design. It is not surprising therefore, that studies like that of [32] [36] have reported that the user interface attributes of ease of use, interactivity, user-friendliness, organisation and minimalist design have a significant influence on user satisfaction.

As hypothesised earlier, the result of SEM revealed a positive and significant causal relationship between teaching methods and learner satisfaction. The result agrees with that of [37] which reported iterative learning instructional strategies as influencers of student mobile learning. Similarly, it has been reported that instructional methods and strategies of gaming and problem-based learning [38] , authentic learning [39] [40] significantly impact on learning. As per hypothesis eight of the study, a positive and statistically significant relationship between embedded support devices and learner satisfaction with E-learning courses has been revealed. The result has been supported by [41] whose experimental study reported a link between using video games as advanced organizers and skills learning. Meanwhile, the sub construct of content presentation format despite the positive result, was found to be non-significant regarding its influence on learner satisfaction. This contrasts with [32] who has emphasised that the presentation of E-learning content has to demonstrate consistency by presenting materials in multiple formats through quality graphics, text, video, audio, and animations. Moreover empirical literature has further shown that content quality [42] and information quality [43] [44] significantly influence user satisfaction with E-learning.

The last hypothesis of this study sought to test the causal influence of learner satisfaction on continuance learning intention with E-learning courses. Indeed, as hypothesised, the structural relationship yielded a positive and significant result, which fully supported hypothesis nine of the study. The result has demonstrated a quite similar pattern with the postulation made by Bhattacherjee's Information System Continuance Model that the extent of user satisfaction with an information system affects his/her continuance intention. Besides, the result aligns closely with some empirical evidence. For example, [45] reported user satisfaction as being a critical predictor of continuance use intention with E-learning in public organizations. Satisfaction has equally been found to have a positive influence on students' continued use intentions with smart gadgets as tool Ubiquitous learning tools [46], and civil servants' continued use of E-learning [47].

5. CONCLUSION AND RECOMMENDATIONS

The results of this study have enriched our understanding about the multidimensional nature of the instructional design quality construct as a means of evaluating E-learning success in terms of learner satisfaction and continued learning intentions. In tandem with its purpose, this study has made critical contributions to theory and the practice of E-learning quality assurance. On theoretical perspectives, the study has addressed a gap in knowledge regarding the instructional design quality and E-learning success in the context of higher learning in Uganda which was found to have received marginal attention. In terms of E-learning quality assurance, the study has proposed and validated a framework for successful evaluation of E-learning courses. This will present E-learning stakeholders like E-learning course coordinators learning, object specialists, interface designers, subject matter experts and instructors with guidelines which are vital for effective E learning course design, development and evaluation. This study thus recommends that to achieve success in Open Distance and E-learning initiatives in Ugandan higher learning institutions, E-learning course design should be based on established principles of learning and instruction, with interface designs that are user-friendly; and buttressed on appropriate and sound instructional strategies. In the interest of future research directions, two key guidelines are also given. First, there is need to investigate instructional design quality from the perspective of numerous stakeholders other than learners alone. Secondly, future studies that attempt to evaluate instructional design quality and E-learning success should further be supported by qualitative data to triangulate the results of the current study.

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