Developing The E-Learning System Success Model: A Developing Country Perspective

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This study aimed to develop a comprehensive e-learning system success model from a developing country perspective. The integrated lens of DeLone & McLean-Information System Success Model, the Model for Measuring E-learning System Success, and the Social Cognitive Theory was used to develop a research model. Twelve hypotheses were developed and tested with 188 participants. The study employed the Structural Equation Modeling technique to analyze data. Out of 12 hypotheses, two were rejected. At the same time, ten were supported, implying that variables such as contentment and information quality, user self-efficacy, user satisfaction, intention to use/use, net benefits, and loyalty to the system were appropriate for measuring the e-learning system success in developing countries. Based on these results, we recommend that the technical system quality and educational system quality of e-learning systems should be improved.

Keywords: E-learning System Success models, Social Cognitive Theory, developing countries, self-efficacy

INTRODUCTION

Information and Communications Technology is generating incredible new global education prospects. E-learning through computer-based interactive education systems is rapidly becoming a helpful tool for enhancing the quality and effectiveness of teaching and learning (Bumsoo Kim & Min Jae Park, 2018).

Online discussions promise collaborative knowledge construction and participants in online communities can share ideas, learn from peers and build knowledge collectively while reading and reflecting on each other's thoughts (Kent, Laslo, & Rafaeli, 2016). In addition, the virtual settings may enable less-assertive participants to compose their thoughts and contribute to group work/discussions. In addition to the e-learning advantages stated above, many authors (Boyeena & Goteti, 2011; Chatteur, Carvalho, & Dong, 2008; Chuoa, Liub, & Tsai, 2015; Cross, 2004; Davis & Venkatesh, 1996; Dorobat, 2014; Esterhuyse & Scholtz, 2015; Gcora & Cilliers, 2016; Li, Duan, Fu, & Alford, 2012; Šimuth & Hvorechy, 2016) have declared several benefits for learners, instructors, and institutions when using e-learning systems, such as extending the teaching and learning space, enhancing learning, and teaching methods, increasing the convenience of interaction and information accessibility and improving the ease of updating and delivering learning content.

However, e-learning in developing countries has not yielded most of the above-stated advantages. The Southern African Development Community countries (SADC region) consist of developing countries,

notably Angola, Botswana, Comoros, Democratic Republic of Congo, Eswatini, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Tanzania, Zambia, and Zimbabwe., have implemented partial or complete e-learning courses to improve their quality of education. However, in developing countries, users increase slowly, and e-learning programs show higher dropout rates (Bumsoo Kim & Min Jae Park, 2018).

In particular, developing countries may encounter more challenges in e-learning implementation than developed countries because developing countries lack technical and human infrastructure. Other obstacles to implementing e-learning in developing countries include the lack of infrastructure, computers, skills, and the tendency to depend heavily on traditional teaching and learning modalities and methodologies. Another problem is a lack of technology acceptance, a more severe challenge for realizing the benefits of ICT utilization (B. Kim & M.J. Park, 2018). Therefore, it is critically important to measure the e-learning system's success to determine its effectiveness, assess the value of the e-learning system, and justify the investments made in the adoption and implementation of the e-learning system.

Subsequently, the current study aimed to identify and investigate critical e-learning system success factors in a developing country and thus develop a comprehensive e-learning system success model that considers new perspectives relevant and prevalent in developing countries. Section 2 reviews the IS success models and e-learning system success models. Section 3 creates the research model with hypotheses, and Section 4 provides the analytical process and results, presenting both empirical and academic implications. Ultimately, in Section 5, a summary and conclusions are provided.

LITERATURE REVIEW

This section provides brief reviews and critiques of the information systems success model and the e-learning system success models that have been advanced in the e-learning system success research discipline.

The DeLone & McLean IS Success Model

The most prolific model used for measuring an information system's success is the D&M S-M, which was first presented in 1992 by (W. H. DeLone & McLean, 1992). The D&M S-M has served as a blueprint for measuring IS success; hence, over 300 scientific research papers were reportedly used in 2003 (W. DeLone & McLean, 2003). The original 1992 D&M S-M includes six components, i.e., system quality, information quality, Use of the system, user satisfaction, individual impacts, and organizational impacts. The model and the relationship between its components. In the D&M S-M IS, "systems quality" measures technical success, "information quality" measures semantic success, and "use, user satisfaction, individual impacts," and "organizational impacts" measure effectiveness success. Since its inception in 1992, the D&M S-M has been widely supported, validated, and criticized by some researchers.

Researchers (Hassanzadeh, Kanaani, & Elahi, 2012) argued that the D&M S-M could not measure the IS success or the e-learning system success since it does not consider aspects of culture the loyalty of the system user. Seddon (1997a) argued that the D&M S-M's inclusion of variance and process interpretations in one model leads to potentially confusing meanings that diminish the value of the D&M S-M. W. DeLone and McLean (2003) argued that most of the scientific articles presented between 1992 and 2003 tended to justify their empirical measurement of IS success by citing the D&M S-M but failed to heed the appropriate cautions of the D&M S-M of 1992. The D&M S-M further reported that some researchers had used the model to support their "chosen" success variable rather than to inform the development of a more comprehensive success construct, thereby overlooking the main conclusions of the (W. DeLone & McLean, 2003) article, which stipulated that IS success is a multidimensional and interdependent construct and that it is, therefore, necessary to study the interrelationships amongst or to control for, those dimensions. According to (W. DeLone & McLean, 2003), researchers should systematically combine individual measures from the IS success categories to create a comprehensive measurement instrument.

The revised (W. DeLone & McLean, 2003) model includes six components, i.e., system quality, information quality, service quality, intention to use/use the system, user satisfaction, and net benefits.

Inputs and critique of the original model from (Seddon, 1997a), who, amongst other issues, intended to use and use the system to represent attitude and behavior and, therefore should be measured individually. W. DeLone and McLean (2003) have also pointed out problems crucial regarding voluntary Use of the system versus mandatory Use of the system that may have a bearing on the system. In the 2003 model, the service quality construct was added to the model, and the individual and organizational impacts were collapsed into one construct called net benefits. The updated D&M S-M includes arrows to demonstrate proposed associations among success dimensions in a process sense but does not show positive or negative signs for those associations in a causal sense. According to (W. DeLone & McLean, 2003), the nature of these causal associations should be hypothesized within the context of a particular study.

The MELSS Model

The MELSS was introduced in 2012 by (Hassanzadeh et al., 2012). This model also utilized the D&M S-M as its foundation to measure the e-learning system's success. The MELSS model consists of 10 components used to measure the e-learning system success, i.e., technical system quality, educational system quality, content and information quality, service quality, user satisfaction, benefits, intention to use, system use, loyalty to the system, and goals achievement. Concisely, the MELLS model attempted to eliminate the shortcomings of the (W. DeLone & McLean, 2003) model and the (Lee-post, 2009) model by incorporating three more components into the MELLS model, i.e., educational quality, system loyalty, and goal achievement.

Scholars (Hassanzadeh et al., 2012) attempted to make the MELSS model more comprehensive by surveying two categories of the research population, i.e., e-learning experts (those who have knowledge and experience in the subject) and e-learning system users (including students, alumni, and instructors). Analyzing the model (Hassanzadeh et al., 2012), (i) technical system quality directly affects user satisfaction. It implies that the more technical quality, the higher the user satisfaction. Therefore, higher user satisfaction will increase the chances of the e-learning system's success. Educational system quality influences user satisfaction. However, the influence of educational quality on user satisfaction is less than that of technical system quality. Educational and service quality are interrelated, implying that service quality through educational system quality can influence user satisfaction and intention to use. Content and information quality have the most direct effect on user satisfaction. It implies that if the content and information quality are higher, the users will be more satisfied with the e-learning system. (v) User satisfaction leads to achieving personal and educational goals. (vi) User satisfaction directly impacts benefits, encouraging users to reuse the system. (vii) When the user of the e-learning system is more satisfied, the loyalty to the system will increase. (viii) Finally, the intention to use the e-learning system directly affects system usage. According to the MELSS model, even when the user intends to use the system, it has not been actualized; the user will be loyal to the system and still suggest or recommend it to others.

Although the MELSS model attempted to comprehensively measure the e-learning system's success by incorporating additional components to the D&M S-M, like any other scientific research, the MELSS model has its strengths and weaknesses. A significant contribution made by the MELSS model is that several stakeholders' perspectives were considered in constructing the model, not only the students. The study involved users (students, instructors, and alumni) and experts (experienced and knowledgeable e-learning practitioners). Finally, the model confirmed that components such as technical system quality, educational system quality, content, and information quality, service quality, user satisfaction, intention to use, user loyalty to the system, benefits of using the system, and goals achievement are suitable for measuring the e-learning system success. Nevertheless, the model needs further empirical testing and validation in different contexts. To increase its strength, it may also be essential to test the model from the opinions of different groupings used in this study individually and collectively.

The SCT

An increasing number of authors (Del Blanco, Serrano, Freire, Martínez-Ortiz, & Fernández-Manjón, 2013; Dorobat, 2014; Engelbrecht, 2003; Kenan, Elzawi, Pislaru, & Restoum, 2015; Bumsoo Kim & Min

Jae Park, 2018) are beginning to examine e-learning system success from a Social Cognitive Theory (SCT) perspective. SCT emerged from Social Learning Theory (SLT), which identified that people learn from their own experiences and by observing the experiences of others (Bandura & Locke, 2003). Three significant constructs in SCT interact to influence behavior: Personal Factors (age, cognitions, previous experience with the behavior), Environmental Factors (access to resources, safety, support from family/friends, etc.), and aspects of the behavior itself (vigor of the behavior, outcomes achieved as a result of practicing the conduct, competence with the behavior, etc.). Successful efforts to change behavior depend on identifying the positive supports and detractors in each of the three constructs.

As (Li et al., 2012) suggested, SCT is critical for examining the direction and motivation for learning. Central to the SCT is self-efficacy. Self-efficacy refers to an individual's belief or confidence about their capabilities to execute a specific task within a given context (Bandura & Locke, 2003). For instance, prior studies have used self-efficacy to investigate individual users' behavior toward e-learning and their consequent performances. Critical to e-learning success is that students and instructors with high self-efficacy will activate sufficient effort that, if well-executed, produces successful outcomes. On the other hand, students and instructors with low self-efficacy are likely to cease their efforts prematurely and fail on the task.

RESEARCH MODEL

The current study examined the e-learning system success through the integrated lens of the prominent D&M S-M; MELSS, and the SCT. The D&M S-M outlines System Quality (technical level); Information Quality (semantic level); and Use, User Satisfaction, Individual Impact, and Organizational Impact (influence level). Similarly, the MELSS model, as an adaptation from the D&M S-M IS success model, focuses more on the e-learning aspects measurements, which are System Quality and Service Quality(technical level), educational quality, content, and information quality (semantic level), user satisfaction, intention to use/use, loyalty to the system, benefits of using the system and goal achievement (influence level).

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The Model constructs are briefly explained below:

a) Technical system quality (TSQ): technical system quality refers to the system's performance, e.g., reliability, user interface, speed, response time, usability etc. (W. DeLone & McLean, 2003)
b) Content and information quality (C&IQ): the content and information quality represent the desirable characteristics of an IS output and semantic success (W. DeLone & McLean, 2003; Hassanzadeh et al., 2012)
c) Educational system quality (ESQ): educational system quality represents the quality of the system's features and capabilities that facilitate and improve teaching and learning (Hassanzadeh et al., 2012). Mohammadi (2015) defined academic quality as the extent to which an IS system can provide a conducive learning environment for learners in collaborative learning.
d) Service quality (SQ): service quality refers to the quality of support that users receive from the IS and help desk (W. DeLone & McLean, 2003; Hassanzadeh et al., 2012; Mohammadi, 2015).
e) User self-efficacy (USE): user self-efficacy is a new construct explored in this study. Self-efficacy is one of the Social Cognitive Theory (SCT) primary constructs. Self-efficacy refers to an individual's belief (or confidence) in their abilities to mobilize the motivation, cognitive

resources, and courses of action needed to successfully execute a specific task within a given context (Bandura & Locke, 2003).

f) User satisfaction (US): user satisfaction measures the user's interaction and experience with the system (W. DeLone & McLean, 2003). According to (Hassanzadeh et al., 2012), user satisfaction refers to a general idea about the system.

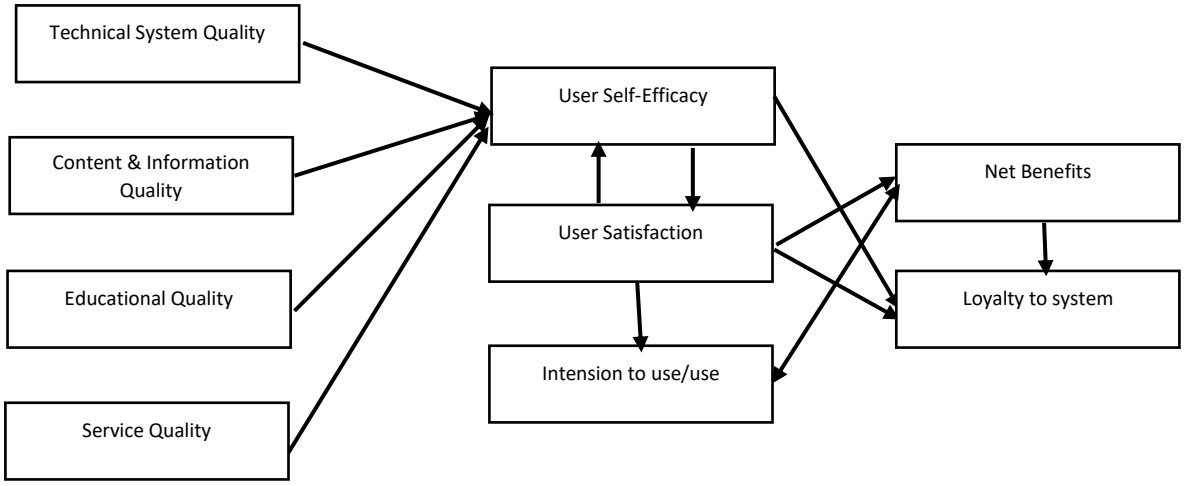
g) Intention to use/use (IU/U): intention to use refers to the user's "attitude" towards using the system (W. DeLone & McLean, 2003; Hassanzadeh et al., 2012)

h) Net benefits (NB): net benefits refer to the impact of an e-learning system on one person, group, organization, industry, or community (W. DeLone & McLean, 2003; Hassanzadeh et al., 2012)

i) Loyalty to the system (SL): In the (Hassanzadeh et al., 2012) study, loyalty to the system is referred to as users' involvement and participation rate in e-learning activities.

Research Model

FIGURE 1
RESEARCH MODEL



Hypotheses Development

H1: *Technical system quality has an influence on user self-efficacy.*

H2: *Content and information quality have an influence on user self-efficacy*

H3: *Educational quality has an influence on user self-efficacy*

H4: *Service quality has influence user-self efficacy.*

H5: *User self-efficacy affects user satisfaction.*

H6: *User satisfaction has influence users' intention to use/use the e-learning system.*

H7: *Perceived net benefits lead to higher intention to use/use. There will be a relationship between intention to use/use and net benefits.*

H8: *Positive experience with the system (user satisfaction) increases net benefits. Therefore, there will be a relationship between user satisfaction and net benefits.*

H9: *User self-efficacy affect users' loyalty to the system and recommend it to other users. Therefore, there will be a relationship between user self-efficacy and system loyalty (continued Use).*

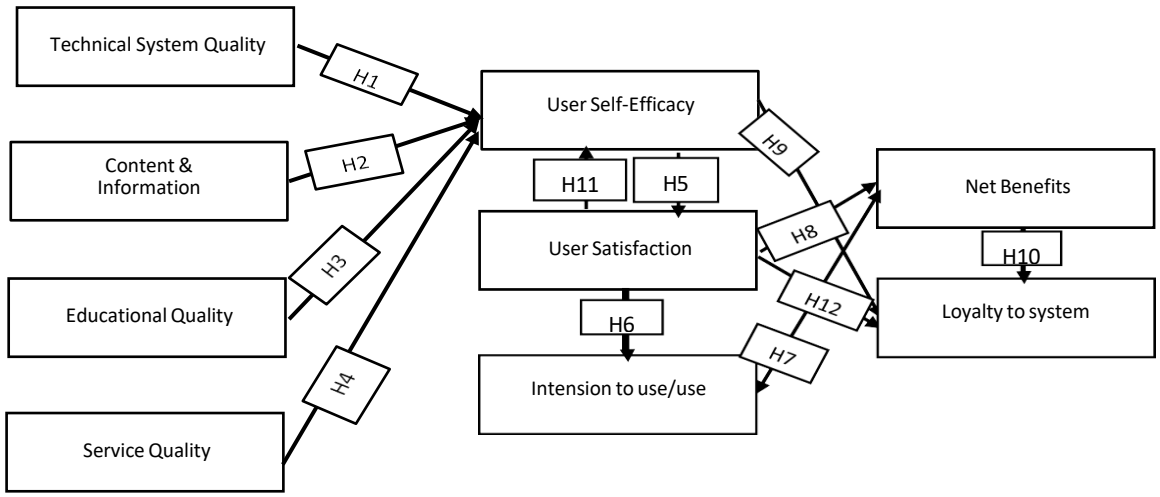
H10: *Net benefits have an influence on system loyalty.*

H11: *User satisfaction has an influence on user self-efficacy*

H12: *User satisfaction has an influence on system loyalty*

Research Model and Hypotheses

FIGURE 2
RESEARCH MODEL AND HYPOTHESES



ANALYSIS, RESULTS, AND IMPLICATIONS

This study sought to develop a comprehensive e-learning system success model through the integrated lens of the D&M S-M IS, MELSS, and SCT. The study aims to plug in the gaps that previous models failed to address, particularly the obstacles faced by developing countries. By analyzing empirical data from a university of technology in South Africa, this study incorporated some critical e-learning system success factors from previous research. It introduced new perspectives that are important for the e-learning system success measurement.

A total number of 188 participants took part in this study. To alleviate a sample bias, a stratified random sampling technique was employed. The participants' categories ranged from e-learning experts (helped to confirm model variables) to system users, including students, alumni, lecturers/tutors, academic managers, curriculum supports personnel, and instructional designers, who are all vital role players in the e-learning system success at the university. Previous studies (Kent et al., 2016; Bumsoo Kim & Min Jae Park, 2018; Waheed, Kaur, Ain, & Hussain, 2016) only focused on lecturers and students' dimensions, omitting other role players despite their importance. This study is the first to consider almost all vital role players in a single study in an attempt to develop a comprehensive e-learning system success model.

Validity and Reliability Test Scale of the Model Variables

Cronbach's alpha was used to assess the scale reliability coefficient. The rule of thumb is that this coefficient should be at least 0.50, with many analysts seeking a value of 0.70 or higher before accepting the set of items as being related to a single latent factor. Based on Cronbach's alpha outcomes below, presented in the following tables, it is explicit that all model variables have excellent internal consistency and are valid and reliable (ranging from a low of 0.7336 for Educational Quality and a highest of 0.8951 for User Satisfaction). The table below summarises the validity and reliability test scale:

TABLE 1
CRONBACH'S ALPHA VALUES OF THE MODEL

Exogenous Variables	Observation	Average Inter Item Covariance	Cronbach's Alpha Values
TSQ	188	0.88	0.81
C&IQ	188	1.03	0.88
ESQ	188	0.72	0.73
SQ	188	0.87	0.79
USE	188	0.79	0.82
US	188	1.13	0.89
IU/U	188	1.04	0.88
NB	188	1.03	0.84
SL	188	0.95	0.82

Structural Equation Modelling Analysis

Researchers (Hair, Money, Page, & Samouel, 2007) tend to set arbitrary evaluation points on different coefficient values. Coefficient Path Analysis (CPA) is a standardized partial regression coefficient that splits the correlation coefficient into direct and indirect effects measures. The table below indicates the coefficient degrees of significance:

TABLE 2
COEFFICIENT RANGES

Coefficient Range	Strength of Association
±0.91 - ±1.0	Very Strong
±0.71 - ±0.90	High
±0.41 - ±0.70	Moderate
±0.21 - ±0.40	Small but definite relationship
±0.00 - ±0.20	Slight, almost negligible

The CPA of the model illustrates the levels and weight of the interrelatedness, interdependence and tested associations between the model constructs. In this study, we introduced user self-efficacy as a mediating construct between the exogenous variables and user satisfaction to determine an individual user's cognitive abilities, confidence level, and behavior towards an e-learning system. The following findings were made:

TSQ was found to have a direct moderate relationship with USE at a CPA of 0.67. This association means that TSQ may still be improved to accommodate an average user's self-efficacy. C&IQ was found to be directly associated with USE at a CPA of 0.78. In terms of C&IQ, users' self-efficacy was found to be high. The e-learning system provided clear, understandable, and up-to-date content that did not badly affect users' self-efficacy. ESQ was found to have a direct moderate relationship with USE at a CPA of 0.51. Users' self-efficacy has been negatively affected by ESQ. Therefore, improvements in ESQ need to be made to realize a positive relationship between ESQ and USE.

The SQ correlation to USE was high at a CPA of 0.71. Generally, users' self-efficacy will be improved if they receive help and guidance. C&IQ and SQ were also found to have a high indirect influence on the US through USE, whereas TSQ and EQ were found to have a moderate/insignificant indirect influence on the US. Reciprocally, USE and US were found to strongly correlate with one another at a CPA of 0.90 and 0.84, respectively. If USE is high, then the US will also be increased, and when US is high, USE will also be increased. IU/U was found to have a very strong correlation with the US at a CPA of 0.91. If users are satisfied with the system, they will subsequently intend to use or use the system in the future. This association also implies that USE has a strong indirect influence on IU/U throughout the US. Moreover, USE was found to have a high direct association with SL at a CPA of 0.85. When USE is high, users tend to be loyal to an e-learning system.

Similarly, the US was highly associated with NB and SL at a CPA of 0.85 and 0.81, respectively. When users' general idea about the system is positive, their perceived value of using the system increases. They would also prefer to use a specific e-learning system over other systems. IU/U was found to have an alternating high association with NB at a CPA of 0.83. Whenever NB is high, IU/U will also be increased; when IU/U is high, NB will also increase. Finally, NB was found to have a very strong association with SL. When users derive value from using the e-learning system, their loyalty toward the e-learning system will inevitably increase.

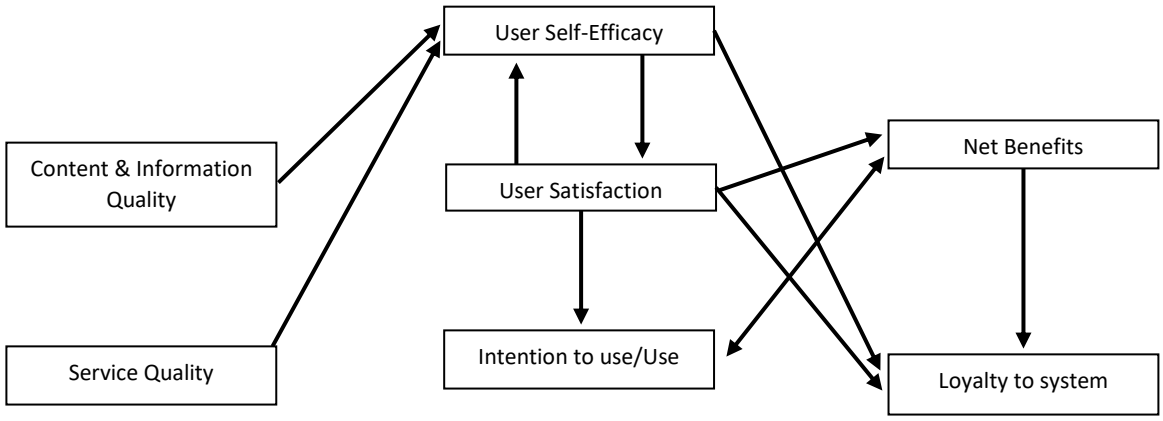
Hypothesis Results

TABLE 3
HYPOTHESES & P-VALUES

Hypotheses#	P-Value <0.05	Supported
H2	0.00	✓
H4	0.00	✓
H5	0.01	✓
H6	0.00	✓
H7	0.01	✓
H8	0.00	✓
H9	0.00	✓
H10	0.00	✓
H11	0.00	✓
H12	0.00	✓

Final Model

FIGURE 3
FINAL MODEL



Model Goodness of Fit

According to (Kline, 2008), a minimum of the following fit indices should be reported to determine the model's goodness of fit. In addition, the following cut-offs are recommended:

TABLE 4
MODEL GOODNESS OF FIT (GOF)

Measure	Name	Cut-off for good fit	Model GOF value
X^2	Model Chi-Square	P-value >0.05	**0.000**
RMSEA	Root Mean Square Error of Approximation	RMSEA < 0.08	**0.072**
CFI	Comparative Fit Index	CFI ≥ .90	**0.925**
SRMR	Standardized Root Mean Square Residual	SRMR <0.08	**0.047**

Based on the recommended measures and cut-offs for the goodness of fit provided in the table above, the final model has attained the appropriate statistical goodness of fit values.

SUMMARY AND CONCLUSION

In this paper, we reviewed several e-learning system success models that were previously advanced to measure the success of the e-learning system. We then employed an integrated lens of the D&M S-M, SCT, and the MELSS model to measure the e-learning system success from a developing country's perspective. This was done because we believe developing countries face unique challenges compared to developed countries. Based on the final model depicted above, we found that variables such as C&IQ, SQ, USE, US, IU/U, NB, and SM are appropriate for measuring the e-learning system success from a developing country perspective. However, the correlation between TSQ and ESQ path analysis to USE was low. Indirectly, TSQ and ESQ correlation to the US was also low. Therefore, universities in developing countries such as those in the SADC region should work on improving TSQ and ESQ of the e-learning system so that USE

and US may be elevated. A final model was developed upon analyzing CPA, and testing the hypotheses. The final model's goodness of fit was confirmed based on X2, RMSEA, CFI, and SRMR measures.

Future research studies may be conducted to test the model in similar contexts/environments. In addition, further work to enhance this research may be done by running t-tests on the model to validate why TSQ and ESQ were dropped from the final model. Finally, scholars may repeat this study in a different context using a different e-learning system or information system or multiple e-learning systems to enhance the validity of this study's results.

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