



Human Touch in EdTech Learning: Does Teacher Presence Boost Satisfaction?

Manpreet Kaur¹, Priya Manchanda¹, Jinesh Jain¹, Kiran Sood^{2*}

¹ Sri Aurobindo College of Commerce and Management, 142021 Ludhiana, India

² Chitkara Business School, Chitkara University, 140401 Punjab, India

* Correspondence: Kiran Sood (Kiransood1982@gmail.com)

Received: 06-12-2025

Revised: 09-19-2025

Accepted: 09-27-2025

Citation: Kaur, M., Manchanda, P., Jain, J., & Sood, K. (2025). Human touch in EdTech learning: Does teacher presence boost satisfaction? *Educ. Sci. Manag.*, 3(3), 194–208. <https://doi.org/10.56578/esm030305>.



© 2025 by the author(s). Published by Acadlore Publishing Services Limited, Hong Kong. This article is available for free download and can be reused and cited, provided that the original published version is credited, under the CC BY 4.0 license.

Abstract: The aim of the present study is to evaluate the impact of the elements of Information Systems (IS) Success Model i.e., information quality, service quality, and system quality on the learners' satisfaction with moderating role of teacher in EdTech platforms. Primary data were collected through questionnaire method from 473 students of 5th to 12th standard who were availing services of EdTech platforms. Results of the study substantiated significant positive association between IS success model constructs and learners' satisfaction. Likewise, moderating role of teachers has been instituted between DeLone and McLean IS Success Model constructs and learners' satisfaction. Furthermore, results established that the impact of service quality and information quality on learners' satisfaction is enhanced in the presence of teacher whereas impact of system quality is decreased in teacher's presence. Present study makes unique addition to the sparse literature on user's satisfaction in e-learning environment on EdTech platforms by reintroducing the posits of the DeLone and McLean IS Success Model, 2003 and building it on the premise that teacher plays a crucial role in affecting learner's satisfaction with system, service, and information quality.

Keywords: DeLone and McLean IS success model; EdTech platforms; Moderating effect; Teacher's role

1. Introduction

EdTech has emerged as a robust form of learning thanks to technology usage in education (Williamson, 2021). Substantial increase in online courses and platforms has been witnessed due to the indisputable importance of EdTech in education post COVID (Al-Fraihat et al., 2020; De Paula, 2021; Dwivedi & Virmani, 2023; Winarsih, 2025). "EdTech" being an extremely diverse field of research and development (Williamson, 2021) has become progressively commodious group (Al-Shargabi et al., 2021) as it assigns establishments, material, technical forms, homilies etc. to gigantic assortment of performers. The EdTech group has advocated claims that digital education augments access, learning, and partnership (Laufer et al., 2021). Studies have argued that technology can be bundled as a product to enhance learning outcomes, make learning more cost-efficient and enhance education retention and retrieve, among other prospective outcomes (Hackman & Reindl, 2022).

EdTech interpositions centred around self-led learning and enhancements to instruction are the highly effective methods of EdTech at boosting learning outcomes. (Rodriguez-Segura, 2022). Technology enhances teacher's teaching pedagogy thereby boosting their instructional value—by facilitating teaching-learning process and judicious response—strengthens the learners' internal motivation by generating a positive attitude towards the subject. Studies in the literature have reported that learner's satisfaction is significantly influenced by service quality of education system (Darawong & Sandmaung, 2019; Farahmandian et al., 2013; Hasan et al., 2008; Huang, 2009; Spreng & Mackoy, 1996; Tj & Tanurahrarjo, 2020). Moreover, teaching support propelled by the teacher appeared to be crucial element pushing user's learning quality (Kiriakidis, 2007; Ladyshewsky, 2013). Furthermore, Motivation, interface, and the teacher's role contribute to positive online learner's assessments, which in turn spawn learner's higher satisfaction (Thanasi-Boçe, 2021).

The DeLone and McLean Information System (IS) Success Model is one of the most widely quoted IS model which has better application in educational field as compared to other models of technology acceptance and usage.

The IS success model has a robust associating cost-benefit value in relation to the implementation of e-learning systems (Al-Shargabi et al., 2021). Lin (2007) validated the updated model and found that system quality, information quality, and service quality had a significant influence on actual online learning system (OLS) use through user satisfaction and behavioral intention to use OLS. Similar results were reported by Yakubu & Dasuki (2018) who investigated the reasons accountable for students' adoption of eLearning in a Nigerian University and found system quality, service quality and information quality as factors of behavioral intention to use Canvas and user satisfaction of Canvas. Few studies focusing on model validation also yielded varied results. Çelik & Ayaz (2022) validated the model on student IS and revealed that system quality, information quality, and service quality had a significant effect on use, but not on 'user satisfaction'—which is in contradiction with the findings reported in prior studies. However, only few studies have attempted to examine the model to analyse learners' satisfaction in EdTech platforms (Alyoussef, 2023; Rulinawaty et al., 2024). Since, this model moves ahead of user behaviour and offers theoretic support to the relationship between system quality, service quality and information quality in e-learning environment—it is reasonable to extend the model by including teacher role as moderator in assessing learners' satisfaction in EdTech platform.

The study attempts to contribute to the extant literature on user's satisfaction in e-learning environment by modifying the DeLone and McLean IS Success Model, 2003 by examining moderating role of teacher in affecting user's satisfaction with system, service and information quality. In the second section, extensive literature was gone through to formulate the hypotheses examining the constructs of DeLone and McLean model and teacher's role on EdTech platform. The third section presents research methodology followed by data analysis, findings and discussion. The paper concludes with the implications and limitations of the study (Bala et al., 2025).

2. Review of Literature

Extant review of literature was done to identify the gap and formulate research hypotheses. This section is divided into three parts, first part deals with studies exploring DeLone and McLean IS Success Model and learners' satisfaction with EdTech platforms, second part studies impact of teacher's role on learners' satisfaction and the last part covers studies moderating role of teacher on relationship between DeLone and McLean IS Success Model and learners' satisfaction with EdTech platforms.

2.1 DeLone and McLean Information System Success Model and Learners' Satisfaction with EdTech Platforms

DeLone and McLean's IS Success model devised by DeLone and McLean, 1992 was synthesis of previous research involving IS success into a more consistent body of knowledge. Its primary drive was to pinpoint the factors accountable for defining ISs success. The model and its interrelationships were validated by many empirical studies. But few studies recommended enhancements to the original model and based on the recommendations, the original model was refined and restructured with the updated DeLone and McLean IS success model in 2003. The updated model depicts the quality of IS as a paradigm of three components that encompass service quality, system quality and information quality.

a. Information quality

Information quality consists of two elements, namely content adequacy i.e., reliability, adequacy, and entirety of information provided and content usefulness i.e., informativeness and suitability of information exhibited (Phuong & Dai Trang, 2018). Amidst the ever-increasing extent of information that is accessible on the internet, the quality of information turns out to be a vital challenge, for internet users, administrators, content providers, webmasters, and IT-staff (Eppler et al., 2003) apart from the EdTech teachers who need to assure the quality of published content. The quality of information signals available to a user during an initial instructor session can help build gullible beliefs and lessen perceived exchange risk (Nicolau & McKnight, 2006). Also, information quality has an ancillary effect on incessant use intention via performance expectancy (Alyoussef, 2023; Lee et al., 2019) found information quality affects perceived ease of use as well as perceived usefulness about the systems. Studies have also revealed that perceived information quality contributes significantly to user satisfaction (Eppler et al., 2003; Jun & Kang, 2013; Kim & Lim, 2001). Thus, on the same consideration, it is hypothesized that *information quality has significant positive impact on learner's satisfaction with EdTech platforms (H1)*.

b. Service quality

Service quality of e-learning includes course materials quality, teacher on e-learning platform, quality of administrative support (Pham et al., 2019). Studies pertaining to service quality have been confined to traditional physical teaching environment only. While majority of studies have found significant positive impact of service quality on student satisfaction (Darawong & Sandmaung, 2019; Farahmandian et al., 2013; Hasan et al., 2008; Huang, 2009; Spreng & Mackoy, 1996; Tj & Tanuraharjo, 2020), studies focusing on service quality have also considered the role of values in the association between service quality and learner's satisfaction (Caruana et al., 2000; Oh, 1999). Few studies have also focused on the impact of service quality of education on students' loyalty

and satisfaction (Annamdevula & Bellamkonda, 2016; Doan, 2021; Mulyono et al., 2020; Ng & Priyono, 2018; Pham et al., 2019) in their study confirmed significant impact of service quality on student loyalty with the mediating role of learner's satisfaction. In addition to this, studies pertaining to impact of service quality on consumer satisfaction also revealed significant positive relationship between the same (Alexandris et al., 2004; Melastri & Giantari, 2019). Hence, in the present study, we hypothesized that *Service quality has significant positive impact on learner's satisfaction with EdTech platforms (H2)*.

c. System quality

System quality is the degree to which business define a collection of suitable characteristics that should be integrated into the product to boost its lifetime performance (Dreheeb et al., 2016). System quality is a significant success characteristic that affects user satisfaction and intention to use (DeLone & McLean, 2003). Studies have associated system quality with satisfaction (Alyoussef, 2023; Rulinawaty et al., 2024). While majority of the studies reported that system quality significantly influences user satisfaction (Jing & Yoo, 2013; Salameh et al., 2018; Tajuddin et al., 2013), the results of Song et al. (2017) were in contradiction to their findings. They examined Building Information Modeling (BIM) user satisfaction in architecture, engineering, and construction industries over a survey of BIM operators from China and found that system quality didn't have a considerable influence on the satisfaction. Chang et al. (2012) found positive impact of system quality on service quality, job satisfaction, and system performance in a study conducted in BMC Medical informatics. Also, Gürkut & Nat (2017) revealed that system quality has indirect significant impact on system satisfaction in higher education institutions. Due to non-existence of conclusive evidence, in the present study, it has been hypothesized that *System quality has significant positive impact on learner's satisfaction with EdTech platforms (H3)*.

2.2 Teacher's Role and Learners' Satisfaction with EdTech Platforms

Extant literature has been explored to investigate the studies which have analysed the relationship between teacher's role and learners' satisfaction. Lee et al. (2018) confirmed the relationship between learning-environment qualities, teacher involvement and learner satisfaction, while Micari & Pazos (2016) revealed that teacher connectedness affect student satisfaction, and that self-efficacy functioned as a mediator between both learner orientation and teacher connectedness on the one hand, and satisfaction on the other. Dwivedi & Virmani (2023) also signified the role of teachers in an online set up and concluded that teacher, by motivating and engaging learner can create a learning environment and hence increase learner's satisfaction. Dennen et al. (2007) in their study revealed that the teachers deem that learner performance is more likely knotted to teacher actions that are fixated on course content, but learner satisfaction is more prospective tangled to learners' feeling that their interactive communication needs are encountered. Aldholay et al. (2018) concluded that leadership role played by a teacher significantly impacts usage of online learning system by students. This construct needs further exploration due to dearth of available literature. Hence, it is hypothesized that *teacher role has significant positive impact on learner's satisfaction with EdTech platforms (H4)*.

2.3 Moderating Role of Teacher on Relationship Between DeLone and Mclean Information System Success Model and Satisfaction with EdTech Platforms

Teachers play a crucial role in the success or failure of EdTech systems. Their proficiency and application of technology instruments in online teaching affect the quality of information disseminated, their system use and satisfaction during course delivery (Gay, 2016). Aldholay et al. (2018) concluded that leadership role played by a teacher significantly mediates the relationship between overall quality of online learning system and students' satisfaction. Although there is dearth of literature on studies examining the impact of teacher on information quality but, Lee et al. (2018) in their study revealed that the teacher involvement had a moderating effect on flexible contents qualities, the results of which was in consonance with the findings of study conducted by Lala et al. (2002), which revealed a strong effect related to predilection for a superior information quality seal.

Researchers have long studied the system quality aspects leading to student satisfaction in the traditional and modern-online learning environment. Teacher's role in user's perception with regard to system quality has been substantiated as the key to learner satisfaction. Studies have demonstrated it as a significant predictor of satisfaction. (Al Mulhem, 2020; Koh & Kan, 2020; Lee et al., 2018). Almarashdeh (2016) emphasised on the role of designing learning management system based on the requirements of the teachers as well as the students, by embracing the latest technologies. Few research efforts were inclined to examine the impact of the quality precursors on learner satisfaction in relation to MOOC and confirmed the relationship between teacher system quality and learner satisfaction (Albelbisi et al., 2021; Hew et al., 2020). Hence, due to lack of conclusive evidence of role of teacher in affecting user's satisfaction with service, system, and information quality of EdTech platforms, following hypotheses have been framed:

H5: *Teacher role moderates the relationship between information quality and learner's satisfaction with EdTech platforms.*

H6: Teacher role moderates the relationship between service quality and learner's satisfaction with EdTech platforms.

H7: Teacher role moderates the relationship between system quality and learner's satisfaction with EdTech platforms.

Parting the paradox unanswered not only in context of the direction of the link (moderating role of teacher in facilitating the relationship between service, system and information quality with learners' satisfaction), but also on the nature of relation prevailing between the two (positive or negative), the present study endeavours to investigate using DeLone and McLean IS Success Model, 2003. Extant review of literature clearly signifies the requirement of a comprehensive study designed at capturing the role of teacher in moderating the relationship between service, system and information quality and learners' satisfaction. Also, most of the research has been distilled in developed countries leaving the realm of emerging markets uncharted. It is enthralling to untangle the nature of relation existing between service, system, and information quality with learners' satisfaction and to allude the relevance of teacher's role in EdTech platforms at this critical moment when these face acute competition from varied EdTech service providers. Hence, this study attempts to extend DeLone and McLean IS Success Model, 2003 by including teacher's role and validate the same by examining it to measure user's satisfaction on EdTech platforms.

3. Research Methodology

3.1 Overview of the Proposed Research Model

Figure 1 depicts the proposed model. The proposed model is centred on IS Success Model given by DeLone and McLean (DeLone & McLean, 2003). This model states that information quality, service quality, and system quality affect the user satisfaction. Teacher's role in user's perception regarding online learning has been substantiated as the key to learner satisfaction (Al Mulhem, 2020; Koh & Kan, 2020; Lee et al., 2018). Therefore, the basic model proposed by DeLone & McLean (2003) has been extended by incorporating teacher role as a moderating variable. Seven hypotheses have been tested in the present research based on the proposed model.

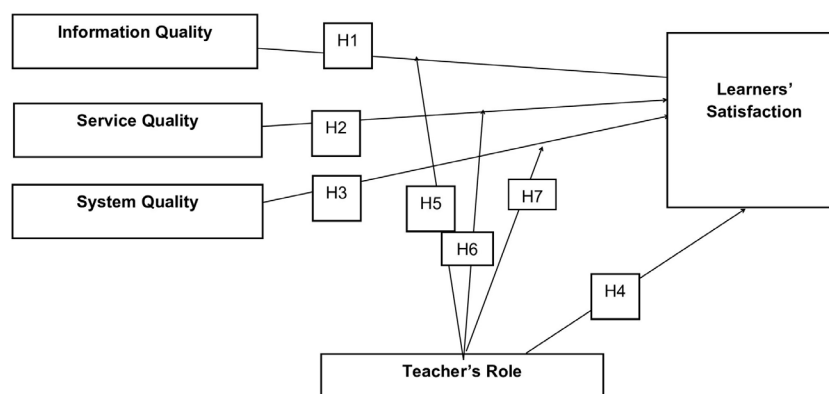


Figure 1. Research framework

3.2 Development of Instrument

An 18-item survey instrument was established for this study where items were measured on a 5-point Likert Scale from Strongly Disagree to Strongly Agree. The variables of the study and their sources were identified. To increase the authenticity of the questionnaire, pre testing was done with 50 respondents chosen at random from the population. The results of pre testing showed that Cronbach's alpha values for all items were more than 0.70 showing authenticity of the questionnaire.

3.3 Data Collection

Primary data were collected from India by means of a self-structured questionnaire administered through google forms during the period January 2024 till June 2025. Questionnaire was distributed to the students studying in 5th to 12th standard through the teachers teaching in EdTech platforms who shared the same in their WhatsApp groups. Snowball sampling technique was employed for collecting data because it was not possible to contact the students who had used or were using EdTech platforms. Earlier research has confirmed that when respondents are from a specific population (Nardi, 2018) and target population is not easily accessible (Wagner et al., 2014), and is

interconnected though a network, snowball sampling method is the most appropriate sampling technique. Hence, in the present study, this technique has been used as the nature of population is specific (i.e., students studying between 5th to 12th standard using EdTech platforms) and they belong to an interconnected network of teachers teaching at such platforms. Out of the total responses received, 473 responses were found to be useful for the final analysis. Remaining questionnaires were incomplete, and they were not used for the analysis.

3.4 Sample Description

Table 1 presents sample description for the present study.

Table 1. Participants description ($n = 473$)

Variables	Category	Frequency	Percentage
Gender	Female	287	60.67
	Male	186	39.33
	Fifth	15	3.17
	Sixth	30	6.34
Class/standard	Seventh	32	6.76
	Eighth	35	7.39
	Ninth	133	28.11
	Tenth	138	29.17
	Eleventh	24	5.07
	Twelfth	66	13.95
	Educom	125	26.43
EdTech platforms	Cuemath	114	24.10
	Vedantu	65	13.74
	Byjus	169	38.67

3.5 Analysis Methods

The research study used PASW (Predictive Analytics SoftWare, version 18) and PLS-SEM (Partial Least Squares Structural Equation Modeling, trial version) for data analysis and hypotheses testing. PASW was used for descriptive analysis and for analysis of common method bias. PLS-SEM was used to analyse the reliability and validity of the scale as well as for hypotheses testing as it can analyse complex models comprised of many indicators (Hair et al., 2019), as shown in Table 2. This technique is considered suitable in situations where researchers want to develop a new theory or identify key driver constructs (Hair et al., 2016).

Table 2. Variables and their sources

Constructs	Source	Code	Items
System quality	Adapted from Alotaibi (2021)	SY1	My EdTech platform is user friendly
		SY2	My EdTech platform allows interaction between user and platform
		SY3	My EdTech platform has high speed information access
Information quality	Adapted from Aldholay et al. (2018)	IF1	Information (like audios, videos etc) available at EdTech platform is accurate
		IF2	Information available at EdTech platform is up to date
		IF3	Information available at EdTech platform is organised
Service quality	Adapted from Aldholay et al. (2018)	SEQ1	EdTech platform provides proper online assistance
		SEQ2	EdTech platform's functionality is up to the mark
		SEQ3	EdTech platform provides good interactivity
Teacher's role	Adapted from Aldholay et al. (2018)	SEQ4	EdTech platform provides rapid response to my service requests
		SEQ5	EdTech platform provides quick solution to my complaints
		IR1	Teacher enthusiasm about EdTech platform stimulates my desire to learn
		IR2	Teacher provides prompt response to my queries
Satisfaction	Adapted from Alotaibi (2021)	IR3	Teacher pays individualised consideration to students
		IR4	Teacher inspires me to put additional efforts in the subject
		SAT1	I am satisfied with performance of my EdTech platform
		SAT2	My EdTech platform helps me in attaining my educational goals
		SAT3	Overall, I am delighted with the experience of utilizing EdTech platform

3.6 Data Analysis and Interpretation

Common Method Bias (CMB)

As a single instrument was used to collect data for all independent and dependent constructs, CMB problem

may be there in data which needs to be addressed (Kock, 2015). Podsakoff et al. (2012) has recommended some remedies to deal with problem of CMB which were adapted in the study. First of all, items were properly framed and rechecked to get accurate answers from the respondents. Secondly, Harman single factor test was used to analyse CMB. All the items measuring independent and dependent constructs were loaded onto a single factor through exploratory factor analysis that explained 43.871% of total variance which is less than 50% suggesting that CMB is not an issue in the data (Streukens et al., 2017).

Table 3. Construct reliability and validity

Indicator	Information Quality	Service Quality	System Quality	Teacher's Role	Satisfaction
IF1	0.925				
IF2	0.951				
IF3	0.937				
SEQ1		0.816			
SEQ2		0.807			
SEQ3		0.759			
SEQ4		0.837			
SEQ5		0.854			
SY1			0.821		
SY2			0.815		
SY3			0.868		
IR1				0.879	
IR2				0.909	
IR3				0.903	
IR4				0.911	
SAT1					0.873
SAT2					0.852
SAT3					0.837
Cronbach's alpha	0.931	0.873	0.787	0.922	0.816
Rho A	0.931	0.875	0.819	0.925	0.824
Composite reliability	0.956	0.908	0.873	0.945	0.89
Average variance extracted (AVE)	0.879	0.665	0.697	0.811	0.73

Construct Reliability and Validity

When the data for multiple variables measuring a construct is collected through a single instrument, multi collinearity can be an issue in statistical analysis. Tabachnick et al. (2007) referred multi collinearity as a situation where there are high correlations among variables in the data set. Hence to check multi collinearity, Variance Inflation Factor (VIF) values were calculated for all the items and were found to be in the acceptable range of 0 to 5 (Diamantopoulos & Siguaw, 2006).

Table 3 displays the outer loadings, Cronbach alpha, average variance extracted (AVE) and composite reliability for the outlined constructs. All the values for outer loadings are above the threshold value of 0.70. Consistency and reliability were assured as value of Cronbach alpha and composite reliability for all the constructs are greater than 0.70. Convergent validity was measured using the value of AVE which was calculated by averaging the square of outer loadings for each construct, the value of which should be more than 0.5 (Fornell & Larcker, 1981). Findings confirmed the convergent validity of the scale.

Assessing discriminant validity

First of all, Heterotrait-Monotrait (HTMT) ratios were calculated which are displayed in Table 4. All HTMT values were less than the acceptable value of 0.9 (Ringle et al., 2015). Further Fornell Larcker criteria was used to check discriminant validity and the results are displayed in Table 5. Bivariate correlations were compared with square root of AVE for every construct. All the correlations were less than the square root of AVE showing presence of discriminant validity (Ringle et al., 2015).

Table 4. Heterotrait-Monotrait (HTMT) ratio

	Information Quality	Teacher's Role	Satisfaction	Service Quality
Information quality				
Teacher's role	0.704			
Satisfaction	0.602	0.74		
Service quality	0.402	0.53	0.737	
System quality	0.236	0.343	0.446	0.41

Table 5. Fornell and Larcker criterion

	Information Quality	Teacher's Role	Satisfaction	Service Quality	System Quality
Information quality	0.938				
Teacher's role	0.655	0.901			
Satisfaction	0.526	0.643	0.854		
Service quality	0.363	0.478	0.631	0.815	
System quality	0.199	0.308	0.372	0.35	0.835

Note: The values in bold represent square root of average variance extracted (AVE).

Model and hypotheses testing

Bootstrapping procedure was run in PLS Smart software with 5000 subsamples for examining the hypothesized structured relationships. Table 6 and Figure 2 display the results of the analysis.

Table 6. Path analysis

Hypothesis	Path	Path Coefficient	t-Statistics	p-Value	Decision
H1	Information quality → Satisfaction	0.131	3.602	0.00	Supported
H2	Service quality → Satisfaction	0.355	7.941	0.00	Supported
H3	System quality → Satisfaction	0.145	3.574	0.00	Supported
H4	Teacher's role → Satisfaction	0.344	8.236	0.00	Supported
H5	Teacher*information quality → Satisfaction	0.105	3.167	0.002	Supported
H6	Teacher*service quality → Satisfaction	0.176	5.822	0.00	Supported
H7	Teacher*system quality → Satisfaction	-0.223	7.924	0.00	Supported

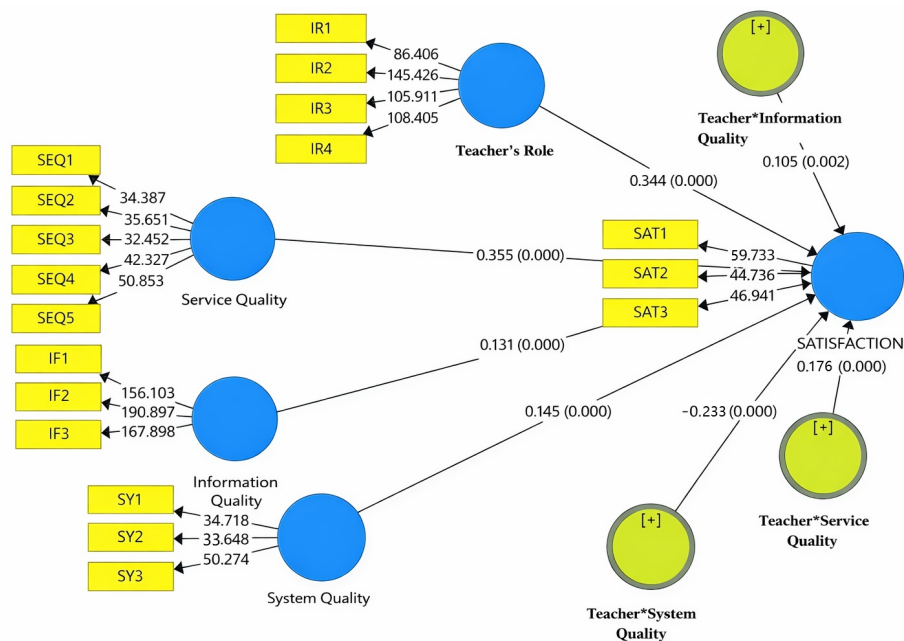
**Figure 2.** Results of path analysis

Table 6 displays effect sizes {beta coefficients, corresponding significance of effect sizes (*t*-statistics), *p*-values} and results of the specified hypotheses. All the constructs of IS success model namely, information quality, service quality and system quality were found to be positively influencing satisfaction where service quality ($b = 0.355$, p -value = 0.000) had medium size effect on satisfaction whereas information quality ($b = 0.131$, p -value = 0.000) and system quality ($b = 0.145$, p -value = 0.000) were found to have small size effect on satisfaction. These findings support H1, H2 and H3. As far as H4 is concerned, teacher role was found to have significant positive impact on satisfaction ($b = 0.344$, p -value = 0.000) statistically supporting H4. The results also supported H5, H6 and H7 as the relationships between all the constructs of IS success model and satisfaction was moderated by the teacher role. Figure 3 shows the slope plot which confirms that teacher role entails a strong relationship between information quality, service quality & system quality, and satisfaction with EdTech platforms as the lines are not parallel.

Detailed examination of path coefficients signified that interaction effects of teacher*information quality ($b = 0.105$, p -value = 0.002) and teacher*service quality ($b = 0.176$, p -value = 0.000) were found to be positive whereas for teacher*system quality ($b = -0.223$, p -value = 0.000) was found to be negative and significant. Hence, our results confirmed that teacher's role is significant in influencing satisfaction of students with EdTech platforms. In addition, teacher's role significantly moderates the impact of IS success model on satisfaction. Model fit indicators are also displayed in Table 6. χ^2 for the model (2029.091), standardized root mean square residual (0.063) and normed fit index (0.712) values depict the fitness of the model. Coefficient of determination ($R^2 = 0.572$) value signified good explanatory power of the model.

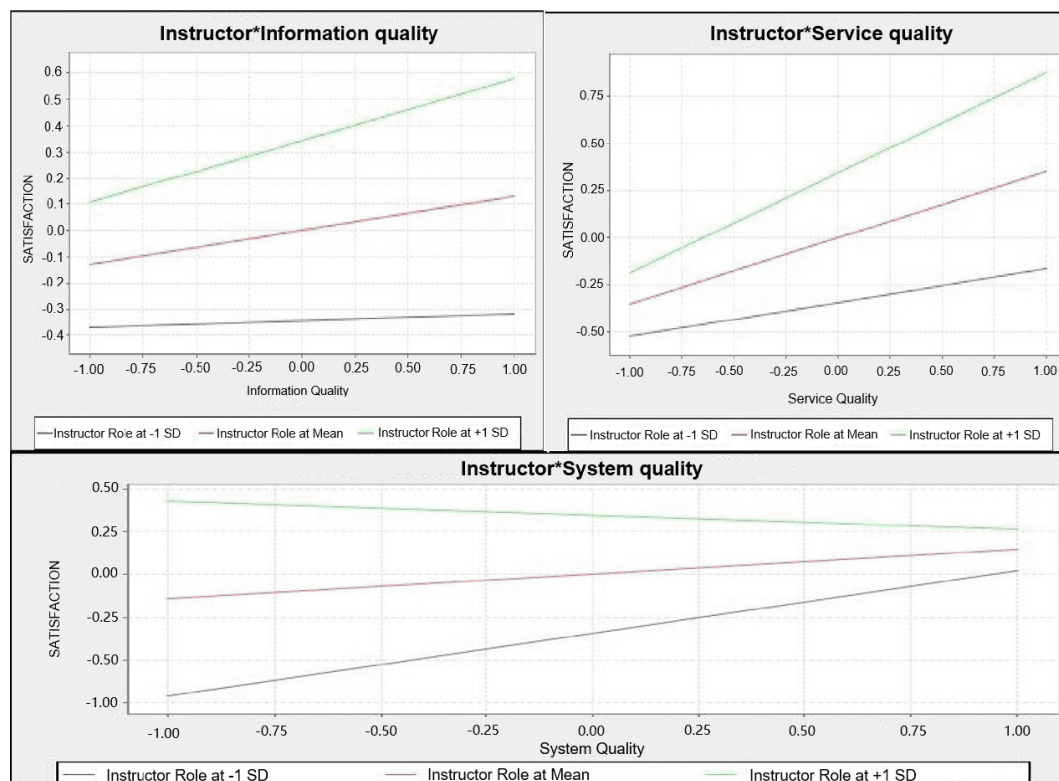


Figure 3. Slope plot

To analyse predictive power of the model, PLS predict analysis was run as per guidelines given by Shmueli et al. (2019), and the results are displayed in Table 7. Such analysis is conducted to examine whether researched PLS-SEM model is practically useful for predicting real-world outcomes or it is just fitting the observed data. Values of Q^2 predict for PLS model were greater than zero for every item of endogenous construct, learner's satisfaction which concludes that model is capable of predicting learner's satisfaction better than a naïve benchmark model that relies only on mean values.

Table 7. Results of PLS predict

Indicators	PLS Q^2 Predict	PLS MAE	LM MAE
SAT1	0.534	0.504	0.471
SAT2	0.378	0.59	0.619
SAT3	0.439	0.559	0.573

Note: PLS = partial least squares; MAE = mean absolute error; LM = linear model.

PLS manifest variables prediction errors were analysed for the endogenous construct learner's satisfaction. Figure 4 presents PLS errors for all items of learner's satisfaction which shows non symmetrical distribution of the errors. If the distribution of the errors is not normal, a comparison is made between PLS mean absolute error (MAE) values and linear model (LM) MAE values for all the items of dependent construct. The same is done and statistics are presented in Table 7. MAE values for PLS model are smaller than the MAE values for LM model two out of three variables. This suggests that the PLS model typically exhibits lower prediction errors than the linear benchmark. According to Shmueli et al. (2019) guidelines, these results show moderate predictive relevance, implying that even though the model does not show strong predictive superiority across all indicators, it still has a meaningful and practically useful predictive capability in terms of explaining and forecasting learner satisfaction.

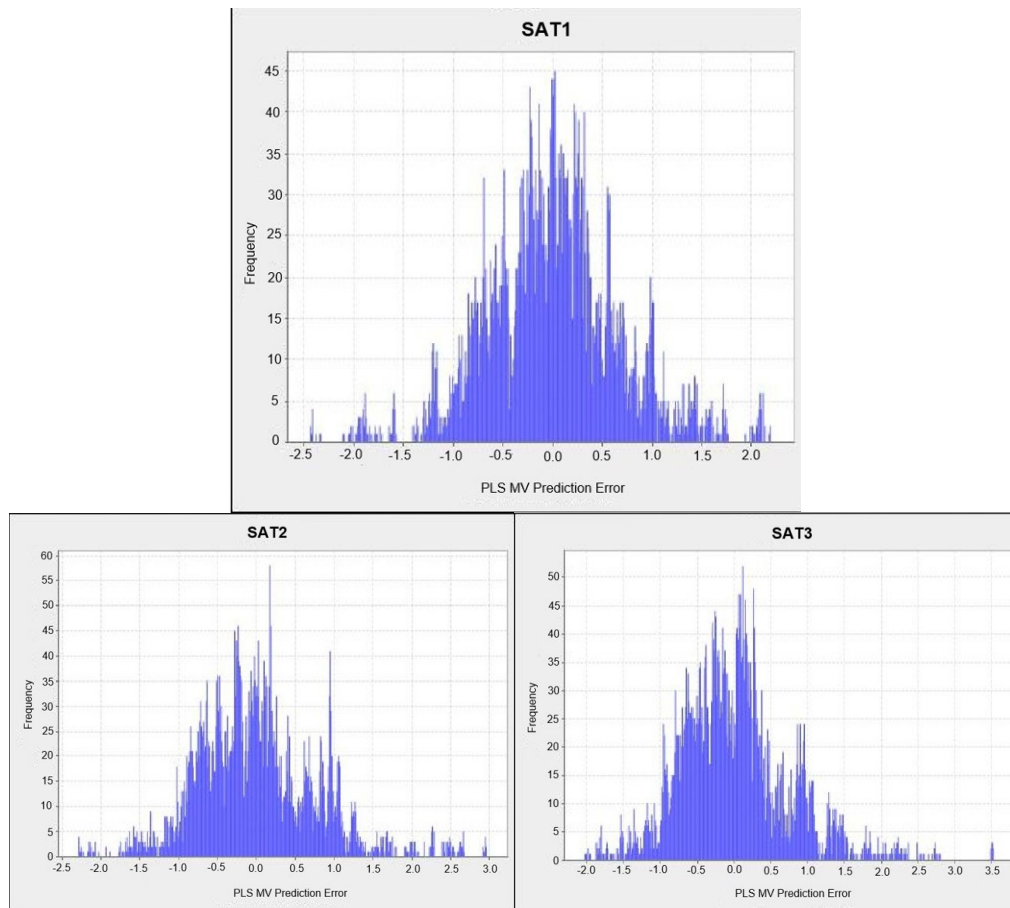


Figure 4. Partial least squares (PLS) manifest variables prediction error for endogenous variable learners' satisfaction

4. Discussion

Stimulating classroom teaching and learning through digital solutions, EdTech has been the catalytic agent enabling multifarious transformations. (Sharma, 2022). The study uses DeLone and McLean IS Success Model, 2003 to examine the impact of service quality of EdTech learning system on learners' satisfaction. The model was extended by incorporating role of teacher as moderating construct in facilitating the relationship between service quality and learner's satisfaction. This will help in exploring the learner's psychological position of being implicated in the e-learning system because of teacher's role in managing e-learning system, course materials quality, e-learning administrative as well as support service quality (Pham et al., 2019).

Based on the findings, H1 stands accepted as the results revealed information quality to be a significant predictor of learner's satisfaction, which is in consonance to the findings of the prior studies (Eppler et al., 2003; Jun & Kang, 2013; Kim & Lim, 2001). This indicates that if the information quality provided in EdTech platform is precise, legitimate, up-to-date, free of mistake, and correctly presented, learner's will be in a better position to understand the information, and thus, his satisfaction level will increase towards the EdTech platform.

Furthermore, regarding the relationship between service quality and learner's satisfaction, the results are consistent with previous studies (Htang, 2021; Ibrahim et al., 2012; Jing & Yoo, 2013; Lee, 2010; Salameh et al., 2018; Tajuddin et al., 2013) and thus, H2 stands accepted. It is corroborated that e-learning service quality (including dimensions like online assistance, functionality, interactivity, response to service requests and quick solution to complaints) plays significant role for EdTech platform in upholding the number of learners by capturing the education market (Yeo, 2009).

H3 stands accepted as results revealed that system quality was found to be positively influencing learner's satisfaction. This signifies that system quality (set of desirable characteristics like user friendly, interaction between user and platform and speed of information access) is a significant attribute influencing user satisfaction in using an e-learning system. (Dreheeb et al., 2016; Dubey et al., 2012). Yakubu & Dasuki (2018) also signified that e-learning system if reliable, easy to use, and accessible – enhances learner's satisfaction.

In consonance with prior studies (Htang, 2021; Ibrahim et al., 2012), results from this study also backed the association between teacher's role and learner's satisfaction and hence H4 was accepted. This reveals that teacher's

specific factors like, enthusiasm, response to queries, individualised consideration and endeavour to motivate the user to put additional efforts etc also affects learner's satisfaction level as it aids in better understanding on EdTech platforms.

The main objective of the paper was to analyse the moderating role of teacher in affecting learners' satisfaction with system, service and information quality of EdTech platforms. Results of the study accepted H5 and validated teacher's role in moderating the relationship between information quality and learners' satisfaction as findings indicated positive interaction effects of teacher's role on information quality and learners' satisfaction.

The study also accepted H6 as it found positive interaction impact of teacher's role on the relationship between service quality and learners' satisfaction. There was dearth of literature attempting to examine this hypothesised relationship. These findings can be accrued to the fact that EdTech platforms place teacher at the heart of e-learning in services like management of course materials, interaction & co-ordination with the learner, feedback, evaluation etc – which in turn increases learner's focus on teacher's role in providing the e-learning services.

Furthermore, the results also pinpointed negative but significant interaction effect of teacher's role on the relationship between system quality and satisfaction with EdTech platforms. This signifies that when teacher involvement is high, the positive impact of system quality on learners' satisfaction tends to weaken. The substitution effect between technological functionality and human support could be one reason for this finding. Students may rely less on the platform's technical features, usability, or performance efficiency when teachers actively clarify explain, and customize learning experiences. Therefore, when there is robust human support available, the relative importance of system quality decreases.

Another possible mechanism relates to the rigidity of platform systems. The limited flexibility and standardized structures of many EdTech systems may make it difficult to tailor them to the needs of specific learners. On the other hand, teacher intervention introduces adaptability, contextual explanation, and emotional support, thereby compensating for technological limitations. In these hybrid environments, pedagogical engagement may have a greater influence on user satisfaction than system functionality alone. This contradicted the findings of the study conducted by Topal (2016) which posited that satisfaction level of the students increases with the increase in use of various learning management system by the teachers like survey, virtual classroom, animation, video, forum, chat, and email. The marginal contribution of system quality to satisfaction may decrease if teachers encourage alternatives to the system's functionality rather than complementing it. In order to maximize learner satisfaction in EdTech environments, future research in learning management system and blended learning contexts should further investigate the balance between technological robustness and adaptive teacher intervention.

4.1 Theoretical Implications

The study adds to the body of knowledge on IS success by introducing the teacher as a crucial boundary condition in determining students' satisfaction and by expanding the applicability of the DeLone and McLean IS Success Model to the context of K–12 digital learning environments. The study advances existing theory by validating the fundamental constructs of information quality, system quality, and service quality in a population that is still under represented in IS research i.e. school children in grades 5 through 12. Further, the study makes valuable contribution in the existing literature by adding teacher as moderator to identify whether the impact of service quality, information quality and system quality on learner's satisfaction becomes stronger in the presence of teacher as moderator.

The study concludes digital learning as socio-technical tool as human facilitation can either amplify or dampen perceived satisfaction of learners. Human support can offset technological complexity and shift learners' evaluation focus from interface features to pedagogical usefulness. This study goes beyond previous validation studies that primarily examined the functionality of the model's measures and relationships. Rather, it transforms the model by demonstrating that platform attributes and the role of the teacher work together to create learners' satisfaction rather than just technology. This repositioning opens up new theoretical discussions about how interactions between pedagogical actors and technological features lead to user satisfaction.

4.2 Managerial Implications

The managerial implications of this study are quadruplex. First, the results of this study help EdTech service providers to understand the satisfaction professed by the students in e-learning using EdTech platforms. They would be in a better position to pay attention in building their e-learning platforms in the illumination of various dimensions of learners' quality insight.

Secondly, the extended DeLone and McLean IS Success Model offers a greater insight into interrelationships of its various constructs and the moderating role of teacher in enhancing learner's satisfaction with EdTech platforms. As findings of the study indicated that teacher's presence enhances the impact of information and service quality on learners' satisfaction hence teachers are inevitable in the education system and cannot be eliminated. It also implies that an effective e-learning environment is created by not only the definite use but also

on its capacity to improve learner's satisfaction; hence, EdTech service providers are urged to promote teacher's proficiency regarding information, service, and system quality. EdTech platforms should organise workshops and training programs to support teachers in conniving course structure and content to enhance user's learning outcomes.

Thirdly, the results persuade policy makers to stimulate the use of EdTech for e-learning as technological development coupled with greater accessibility has offered multiplex opportunities and ease to the learners. Though overall results of the study demonstrated that technology alone cannot not be used as a surrogate to substitute human-to-human communiqué with computer mediated interaction and learning tools, but significant finding was obtained from the study that teacher's presence weakens the impact of system quality on the satisfaction. This may be due to the reason that systems are designed in an inflexible manner leaving little space for customisations and modifications. On the contrary, human interventions can lead to customisation of processes considering the needs of the learners. Hence, EdTech platforms providing education to the students should be flexible and customisable, so that teacher can change it according to the need and level of the learner.

Finally, as the results of this study have underlined that user's satisfaction have been scaled with information quality, service quality, and system quality (DeLone and McLean IS Success Model) in e-learning environment – hence there should correspondingly be passable support and training for users which will rally the espousal of eLearning on EdTech platforms.

5. Conclusions

As digital mode became gradually crucial to education, prospects for educational parity are jammed more firmly on educational technology providers. To this end, this study was an endeavour to examine the impact of service quality of EdTech platforms on learner's satisfaction by using DeLone and McLean IS Success Model, 2003. The study extended the model and added teacher's role as moderating variable. It then explored the role of teacher on EdTech platform in affecting the relationship between model constructs and satisfaction. Overall results of the study confirmed significant positive relationship between IS success model constructs and learners' satisfaction. Also, moderating role of teachers has been established between DeLone and McLean IS Success Model constructs and learners' satisfaction. The impact of service and information quality on learners' satisfaction is enhanced in the presence of teacher whereas impact of system quality is decreased in teacher's presence. Hence, it can be concluded that teachers can't be eliminated from EdTech platforms. Human intervention is certainly required for making inflexible, pre-formatted EdTech systems work efficiently to enhance learners' satisfaction.

5.1 Limitations of the Study

Although research has resulted into both theoretical and practical additions to existing literature, but some limitations were unavoidable. Firstly, the data was collected using the snowball sampling method, the results could have been affected in a number of ways due to limitations of the method. The sample may be homogeneous, reflecting similar traits, educational backgrounds, or platform preferences as participants were selected through referrals. This may restrict the diversity of responses and result in selection bias. Additionally, certain groups of students (e.g., those less socially connected or less active on EdTech platforms) may have been underrepresented, affecting the generalizability of the findings. Secondly, while carrying out research, only learners' perspective was covered, whereas teacher's perspective is equally important. Hence, future studies can focus on analysing teachers' experience as well as satisfaction with the EdTech platforms. Thirdly, the study conducted was cross-sectional, and learners' perceptions may change while using EdTech platforms over time and this cannot be traced in conjunction with a cross-sectional study. These limitations provide ample scope for future research. As technology is evolving swiftly, it will be advantageous to substantiate the results in longitudinal settings to investigate in what way technological innovation affects learners' satisfaction with EdTech platforms.

Author Contributions

Conceptualization, M.K. and K.S.; methodology and data collection, M.K. and P.M.; analysis, J.J.; writing—original draft, J.J.; review and editing, K.S. and P.M.; supervision, K.S. All authors have read and agreed to the published version of the manuscript.

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability

The data used to support the research findings are available from the corresponding author upon request.

Conflicts of Interest

The authors declare no conflict of interest.

References

- Al Mulhem, A. (2020). Investigating the effects of quality factors and organizational factors on university students' satisfaction of e-learning system quality. *Cogent Educ.*, 7(1), 1787004. <https://doi.org/10.1080/2331186X.2020.1787004>.
- Albelbisi, N. A., Al-Adwan, A. S., & Habibi, A. (2021). Impact of quality antecedents on satisfaction toward MOOC. *Turk. Online J. Dist. Educ.*, 22(2), 164–175. <https://doi.org/10.17718/tojde.906843>.
- Aldholay, A., Isaac, O., Abdullah, Z., Abdulsalam, R., & Al-Shibami, A. H. (2018). An extension of DeLone and McLean IS Success Model with self-efficacy: Online learning usage in Yemen. *Int. J. Inf. Learn. Technol.*, 35(4), 285–304. <https://doi.org/10.1108/IJILT-11-2017-0116>.
- Alexandris, K., Zahariadis, P., Tsorbatzoudis, C., & Grouios, G. (2004). An empirical investigation of the relationships among service quality, customer satisfaction and psychological commitment in a health club context. *Eur. Sport Manag. Q.*, 4(1), 36–52. <https://doi.org/10.1080/16184740408737466>.
- Al-Fraihat, D., Joy, M., Masa'deh, R. E., & Sinclair, J. (2020). Evaluating e-learning systems success: An empirical study. *Comput. Hum. Behav.*, 102, 67–86. <https://doi.org/10.1016/j.chb.2019.08.004>.
- Almarashdeh, I. (2016). Sharing instructors experience of learning management system: A technology perspective of user satisfaction in distance learning course. *Comput. Hum. Behav.*, 63, 249–255. <https://doi.org/10.1016/j.chb.2016.05.013>.
- Alotaibi, R. S. (2021). Measuring students' readiness to use e-learning platforms: Shaqra University as a case study. In *2021 International Conference on Electrical, Computer, Communications and Mechatronics Engineering (ICECCME)* (pp. 1–9). IEEE. <https://doi.org/10.1109/ICECCME52200.2021.9590942>.
- Al-Shargabi, B., Sabri, O., & Aljawarneh, S. (2021). The adoption of an e-learning system using information systems success model: A case study of Jazan University. *PeerJ Comput. Sci.*, 7, e723. <https://doi.org/10.7717/peerj-cs.723>.
- Alyoussef, I. Y. (2023). Acceptance of e-learning in higher education: The role of task-technology fit with the information systems success model. *Heliyon*, 9(3), e13751. <https://doi.org/10.1016/j.heliyon.2023.e13751>.
- Annamdevula, S. & Bellamkonda, R. S. (2016). The effects of service quality on student loyalty: The mediating role of student satisfaction. *J. Model. Manag.*, 11(2), 446–462. <https://doi.org/10.1108/JM2-04-2014-0031>.
- Bala, R., Singh, S., Sood, K., & Grima, S. (2025). Sustainable finance and investment analytics: A systematic literature review and meta-analysis approach. *J. Econ. Sci.: Theory Pract.*, 82(2), 89–106.
- Caruana, A., Money, A. H., & Berthon, P. R. (2000). Service quality and satisfaction—The moderating role of value. *Eur. J. Mark.*, 34(11–12), 1338–1353. <https://doi.org/10.1108/03090560010764432>.
- Çelik, K. & Ayaz, A. (2022). Validation of the DeLone and McLean Information Systems Success Model: A study on student information system. *Educ. Inf. Technol.*, 27(4), 4709–4727. <https://doi.org/10.1007/s10639-021-10798-4>.
- Chang, C. S., Chen, S. Y., & Lan, Y. T. (2012). Motivating medical information system performance by system quality, service quality, and job satisfaction for evidence-based practice. *BMC Med. Inform. Decis. Mak.*, 12(1), 135. <https://doi.org/10.1186/1472-6947-12-135>.
- Darawong, C. & Sandmaung, M. (2019). Service quality enhancing student satisfaction in international programs of higher education institutions: A local student perspective. *J. Mark. High. Educ.*, 29(2), 268–283. <https://doi.org/10.1080/08841241.2019.1647483>.
- De Paula, A. S. D. N. (2021). The learning-market of EdTech in Brazilian education: The impacts of the Covid-19 pandemic on the educational sector. *J. Crit. Educ. Policy Stud.*, 19(1), 249–270.
- DeLone, W. H. & McLean, E. R. (2003). The DeLone and McLean Model of Information Systems Success: A ten-year update. *J. Manag. Inf. Syst.*, 19(4), 9–30. <https://doi.org/10.1080/07421222.2003.11045748>.
- Dennen, V. P., Aubteen Darabi, A., & Smith, L. J. (2007). Instructor–learner interaction in online courses: The relative perceived importance of particular instructor actions on performance and satisfaction. *Distance Educ.*, 28(1), 65–79. <https://doi.org/10.1080/01587910701305319>.
- Diamantopoulos, A. & Siguaw, J. A. (2006). Formative versus reflective indicators in organizational measure development: A comparison and empirical illustration. *Br. J. Manag.*, 17(4), 263–282. <https://doi.org/10.1111/j.1467-8551.2006.00500.x>.
- Doan, T. T. T. (2021). The effect of service quality on student loyalty and student satisfaction: An empirical study

- of universities in Vietnam. *J. Asian Finance Econ. Bus.*, 8(8), 251–258. <https://doi.org/10.13106/jafeb.2021.vol8.no8.0251>.
- Dreheeb, A. E., Basir, N., & Fabil, N. (2016). Impact of system quality on users' satisfaction in continuation of the use of e-learning system. *Int. J. e-Educ., e-Bus., e-Manag. e-Learn.*, 6(1), 13. <https://doi.org/10.17706/ijeeec.2016.6.1.13-20>.
- Dubey, S. K., Rana, A., & Sharma, A. (2012). Usability evaluation of object oriented software system using fuzzy logic approach. *Int. J. Comput. Appl.*, 43(19), 1–6.
- Dwivedi, M. K. & Virmani, N. (2023). Disruptive innovation of EdTech companies in emerging economy during COVID-19. *Int. J. Learn. Technol.*, 18(4), 388–408. <https://doi.org/10.1504/IJLT.2023.135905>.
- Eppler, M. J., Algesheimer, R., & Dimpfel, M. (2003). Quality criteria of content-driven websites and their influence on customer satisfaction and loyalty: An empirical test of an information quality framework. In *Proceedings of the Eighth International Conference on Information Quality* (pp. 108–120).
- Farahmandian, S., Minavand, H., & Afshardost, M. (2013). Perceived service quality and student satisfaction in higher education. *J. Bus. Manag.*, 12(4), 65–74.
- Fornell, C. & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *J. Mark. Res.*, 18(1), 39–50. <https://doi.org/10.1177/002224378101800104>.
- Gay, G. H. (2016). An assessment of online instructor e-learning readiness before, during, and after course delivery. *J. Comput. High. Educ.*, 28(2), 199–220. <https://doi.org/10.1007/s12528-016-9115-z>.
- Gürkut, C. & Nat, M. (2017). Important factors affecting student information system quality and satisfaction. *EURASIA J. Math. Sci. Technol. Educ.*, 14(3), 923–932. <https://doi.org/10.12973/ejmste/81147>.
- Hackman, S. T. & Reindl, S. (2022). Challenging EdTech: Towards a more inclusive, accessible and purposeful version of EdTech. *Knowl. Cult.*, 10(1), 7–21.
- Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2016). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*. Sage.
- Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *Eur. Bus. Rev.*, 31(1), 2–24. <https://doi.org/10.1108/EBR-11-2018-0203>.
- Hasan, H. F. A., Ilias, A., Rahman, R. A., & Razak, M. Z. A. (2008). Service quality and student satisfaction: A case study at private higher education institutions. *Int. Bus. Res.*, 1(3), 163–175.
- Hew, K. F., Hu, X., Qiao, C., & Tang, Y. (2020). What predicts student satisfaction with MOOCs: A gradient boosting trees supervised machine learning and sentiment analysis approach. *Comput. Educ.*, 145, 103724. <https://doi.org/10.1016/j.compedu.2019.103724>.
- Htang, L. K. (2021). A look at university student service quality and satisfaction. *Qual. Assur. Educ.*, 29(2–3), 101–115. <https://doi.org/10.1108/QAE-09-2020-0108>.
- Huang, Q. (2009). The relationship between service quality and student satisfaction in higher education sector: A case study on the undergraduate sector of Xiamen University of China. *J. Mod. Educ. Res.*, 30(3), 38–60.
- Ibrahim, M. Z., Rahman, M. N. A., & Yasin, R. M. (2012). Assessing students perceptions of service quality in technical educational and vocational training (TEVT) institution in Malaysia. *Procedia Soc. Behav. Sci.*, 56, 272–283. <https://doi.org/10.1016/j.sbspro.2012.09.655>.
- Jing, G. & Yoo, I. S. (2013). An empirical study on the effect of e-service quality to satisfaction. *Int. J. Manag. Sci. Bus. Res.*, 2(10), 25–31.
- Jun, B. H. & Kang, B. G. (2013). Effects of information quality on customer satisfaction and continuous intention to use in social commerce. *J. Korea Soc. Comput. Inf.*, 18(3), 127–139.
- Kim, S. Y. & Lim, Y. J. (2001). Consumers' perceived importance of and satisfaction with internet shopping. *Electron. Mark.*, 11(3), 148–154. <https://doi.org/10.1080/101967801681007988>.
- Kiriakidis, P. (2007). Online learner satisfaction: Learner-instructor discourse. In *Proceedings of TCC 2007* (pp. 147–158). TCCHawaii.
- Kock, N. (2015). Common method bias in PLS-SEM: A full collinearity assessment approach. *Int. J. e-Collab.*, 11(4), 1–10. <https://doi.org/10.4018/ijec.2015100101>.
- Koh, J. H. L. & Kan, R. Y. P. (2020). Perceptions of learning management system quality, satisfaction, and usage: Differences among students of the arts. *Australas. J. Educ. Technol.*, 36(3), 26–40. <https://doi.org/10.14742/ajet.5187>.
- Ladyshevsky, R. K. (2013). Instructor presence in online courses and student satisfaction. *Int. J. Scholarsh. Teach. Learn.*, 7(1), 13.
- Lala, V., Arnold, V., Sutton, S. G., & Guan, L. (2002). The impact of relative information quality of e-commerce assurance seals on Internet purchasing behavior. *Int. J. Account. Inf. Syst.*, 3(4), 237–253. [https://doi.org/10.1016/S1467-0895\(02\)00069-6](https://doi.org/10.1016/S1467-0895(02)00069-6).
- Laufer, M., Leiser, A., Deacon, B., Perrin de Brichambaut, P., Fecher, B., Kobsda, C., & Hesse, F. (2021). Digital higher education: A divider or bridge builder? Leadership perspectives on EdTech in a COVID-19 reality. *Int. J. Educ. Technol. High. Educ.*, 18(1), 51. <https://doi.org/10.1186/s41239-021-00287-6>.
- Lee, J. W. (2010). Online support service quality, online learning acceptance, and student satisfaction. *Internet*

- High. Educ.*, 13(4), 277–283. <https://doi.org/10.1016/j.iheduc.2010.08.002>.
- Lee, S. J., Lee, H., & Kim, T. T. (2018). A study on the instructor role in dealing with mixed contents: How it affects learner satisfaction and retention in e-learning. *Sustainability*, 10(3), 850. <https://doi.org/10.3390/su10030850>.
- Lee, S. W., Sung, H. J., & Jeon, H. M. (2019). Determinants of continuous intention on food delivery apps: Extending UTAUT2 with information quality. *Sustainability*, 11(11), 3141. <https://doi.org/10.3390/su11113141>.
- Lin, H. F. (2007). Measuring online learning systems success: Applying the updated DeLone and McLean model. *Cyberpsychol. Behav.*, 10(6), 817–820. <https://doi.org/10.1089/cpb.2007.9948>.
- Melastri, K. & Giantari, I. G. A. K. (2019). Effect of service quality, company image, and customer satisfaction in word of mouth. *Int. Res. J. Manag. IT Soc. Sci.*, 6(4), 127–134. <https://doi.org/10.21744/irjmis.v6n4.666>.
- Micari, M. & Pazos, P. (2016). Fitting in and feeling good: The relationships among peer alignment, instructor connectedness, and self-efficacy in undergraduate satisfaction with engineering. *Eur. J. Eng. Educ.*, 41(4), 380–392. <https://doi.org/10.1080/03043797.2015.1079814>.
- Mulyono, H., Hadian, A., Purba, N., & Pramono, R. (2020). Effect of service quality toward student satisfaction and loyalty in higher education. *J. Asian Finance Econ. Bus.*, 7(10), 929–938. <https://doi.org/10.13106/jafeb.2020.vol7.no10.929>.
- Nardi, P. M. (2018). *Doing Survey Research: A Guide to Quantitative Methods*. Routledge.
- Ng, M. M. & Priyono, I. (2018). The effect of service quality on student satisfaction and student loyalty: An empirical study. *J. Soc. Stud. Educ. Res.*, 9(3), 109–131.
- Nicolaou, A. I. & McKnight, D. H. (2006). Perceived information quality in data exchanges: Effects on risk, trust, and intention to use. *Inf. Syst. Res.*, 17(4), 332–351. <https://doi.org/10.1287/isre.1060.0103>.
- Oh, H. (1999). Service quality, customer satisfaction, and customer value: A holistic perspective. *Int. J. Hosp. Manag.*, 18(1), 67–82. [https://doi.org/10.1016/S0278-4319\(98\)00047-4](https://doi.org/10.1016/S0278-4319(98)00047-4).
- Pham, L., Limbu, Y. B., Bui, T. K., Nguyen, H. T., & Pham, H. T. (2019). Does e-learning service quality influence e-learning student satisfaction and loyalty? Evidence from Vietnam. *Int. J. Educ. Technol. High. Educ.*, 16(1), 1–26. <https://doi.org/10.1186/s41239-019-0136-3>.
- Phuong, N. N. D. & Dai Trang, T. T. (2018). Repurchase intention: The effect of service quality, system quality, information quality, and customer satisfaction as mediating role: A PLS approach of m-commerce ride hailing service in Vietnam. *Mark. Brand. Res.*, 5, 78–91.
- Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2012). Sources of method bias in social science research and recommendations on how to control it. *Annu. Rev. Psychol.*, 63(1), 539–569. <https://doi.org/10.1146/annurev-psych-120710-100452>.
- Ringle, C., Da Silva, D., & Bido, D. (2015). Structural equation modeling with the SmartPLS. *Braz. J. Mark.*, 13(2).
- Rodriguez-Segura, D. (2022). EdTech in developing countries: A review of the evidence. *World Bank Res. Observ.*, 37(2), 171–203. <https://doi.org/10.1093/wbro/lkab011>.
- Rulinawaty, Samboteng, L., Purwanto, A. J., Kuncoro, S., Jasrial, Tahilili, M. H., Efendi, Y., & Karyana, A. (2024). Investigating the influence of the updated DeLone and McLean Information System (IS) Success Model on the effectiveness of learning management system (LMS) implementation. *Cogent Educ.*, 11(1), 2365611. <https://doi.org/10.1080/2331186X.2024.2365611>.
- Salameh, A. A. M., Ahmad, H., Zulhumadi, F., & Abubakar, F. M. (2018). Relationships between system quality, service quality, and customer satisfaction: M-commerce in the Jordanian context. *J. Syst. Inf. Technol.*, 20(1), 73–102. <https://doi.org/10.1108/JSIT-03-2017-0016>.
- Sharma, H. (2022). Mapping the global EdTech revolution during the pandemic: From ‘determinism’ to ‘solutionism’. In *Re-imagining Educational Futures in Developing Countries* (pp. 119–137). Springer International Publishing. https://doi.org/10.1007/978-3-030-88234-1_7.
- Shmueli, G., Sarstedt, M., Hair, J. F., Cheah, J. H., Ting, H., Vaithilingam, S., & Ringle, C. M. (2019). Predictive model assessment in PLS-SEM: Guidelines for using PLSpredict. *Eur. J. Mark.*, 53(11), 2322–2347. <https://doi.org/10.1108/EJM-02-2019-0189>.
- Song, J., Migliaccio, G. C., Wang, G., & Lu, H. (2017). Exploring the influence of system quality, information quality, and external service on BIM user satisfaction. *J. Manag. Eng.*, 33(6), 04017036. [https://doi.org/10.1061/\(ASCE\)ME.1943-5479.0000549](https://doi.org/10.1061/(ASCE)ME.1943-5479.0000549).
- Spreng, R. A. & Mackoy, R. D. (1996). An empirical examination of a model of perceived service quality and satisfaction. *J. Retail.*, 72(2), 201–214. [https://doi.org/10.1016/S0022-4359\(96\)90014-7](https://doi.org/10.1016/S0022-4359(96)90014-7).
- Streukens, S., Leroi-Werelds, S., & Willems, K. (2017). Dealing with nonlinearity in importance-performance map analysis (IPMA): An integrative framework in a PLS-SEM context. In *Partial Least Squares Path Modeling: Basic Concepts, Methodological Issues and Applications* (pp. 367–403). Springer International Publishing. https://doi.org/10.1007/978-3-319-64069-3_17.
- Tabachnick, B. G., Fidell, L. S., & Ullman, J. B. (2007). *Using Multivariate Statistics*. Pearson.

- Tajuddin, R. A., Baharudin, M., & Hoon, T. S. (2013). System quality and its influence on students' learning satisfaction in UiTM Shah Alam. *Procedia Soc. Behav. Sci.*, 90, 677–685. <https://doi.org/10.1016/j.sbspro.2013.07.140>.
- Thanasi-Boçe, M. (2021). The role of the instructor, motivation, and interaction in building online learning satisfaction during the COVID-19 pandemic. *J. e-Learn.*, 19(5), 401–415. <https://doi.org/10.34190/ejel.19.5.2475>.
- Tj, H. W. & Tanurahrjo, H. H. (2020). The effect of online learning service quality on student satisfaction during COVID19 pandemic in 2020. *J. Manaj. Indones.*, 20(3), 240–251. <https://doi.org/10.25124/jmi.v20i3.3520>.
- Topal, A. D. (2016). Examination of university students' level of satisfaction and readiness for e-courses and the relationship between them. *Eur. J. Contemp. Educ.*, 15(1), 7–23.
- Wagner, D., Vollmar, G., & Wagner, H. T. (2014). The impact of information technology on knowledge creation: An affordance approach to social media. *J. Enterp. Inf. Manag.*, 27(1), 31–44. <https://doi.org/10.1108/JEIM-09-2012-0063>.
- Williamson, B. (2021). Meta-EdTech. *Learn. Media Technol.*, 46(1), 1–5. <https://doi.org/10.1080/17439884.2021.1876089>.
- Winarsih, T. (2025). Analysis of the extended technology acceptance model as a basis for the adoption of educational technology startup platforms. *Eastasouth Manag. Bus.*, 3(2), 329–337. <https://doi.org/10.58812/esmb.v3i02.409>.
- Yakubu, M. N., & Dasuki, S. I. (2018). Assessing eLearning systems success in Nigeria: An application of the DeLone and McLean Information Systems Success Model. *J. Inf. Technol. Educ.: Res.*, 17, 183–203. <https://doi.org/10.28945/4077>.
- Yeo, R. K. (2009). Service quality ideals in a competitive tertiary environment. *Int. J. Educ. Res.*, 48(1), 62–76. <https://doi.org/10.1016/j.ijer.2009.03.004>.