

Blended Learning Service Quality, Satisfaction, and Performance: Extended ISSM -Evidence from Higher Education Islamic Studies

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The objective of this study is to empirically examine the impact of blended learning service quality on student performance. The study applies the extended ISSM model where service quality is hypothesized to have a positive impact on student performance via the mediating mechanisms of student intention to use the intervention and student satisfaction with the intervention. The study employs a sample of 313 students at the college of Hadith and Islamic studies at the Islamic University of Medina where blended learning tools include the intervention of AI-driven Quran and Hadith reader head (Maqraa) allowing students to engage with a multitude of readers and a variety of dialects. The study results show that the impact of service quality on student performance is significant and well-pronounced at all traditional levels of statistical significance. The results also show that the two mitigating mechanisms tend to replicate service quality and meanwhile are replicated in student performance. The evidence reported in this study thus supports that student intention to use the intervention and student satisfaction with such intervention tend to strongly mediate the impact of service quality on student performance. The evidence, however, falls short of the full mediation criterion since the mediating variables fail to completely assume the role of service quality when explaining student performance

Key words: Service Quality, Mediating Mechanisms Of Student Intention, ISSM; Performance, Satisfaction

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Introduction

Blended learning is a holistic approach to the achievement of learning objectives via utilizing an optimal combination of two or more learning methods including traditional instruction, artificial intelligence (AI) interventions, and information and communication technology (hereafter, ICT) methods. The ultimate thesis of blended learning is to elevate the levels of student engagement, interaction, and collaboration while enriching the overall learning experience and environment (Fisher et al., 2021; Gao et al., 2020). When adopted in Islamic studies, blended learning may offer unique opportunities to enhance student learning, exploration, and engagement with respect to almost all areas of such studies including, e.g., Islamic philosophy, Islamic law, Islamic theology, and Islamic culture (Alzouebi, 2019). For instance, via blended learning, students in Islamic studies may attend lectures, traditional class meeting, and discussions in person, and meanwhile participate at a variety of online, personalized learning, and intelligence-driven activities covering aspects to learning and self-assessment. In this regard, blended learning allows students in Islamic studies to formally gain access to the wealth of online and digital resources flexibly, and at their own pace and convenience (Aziz et al., 2016). It follows that, under the umbrella of flexibility and self-paced learning, blended learning greatly complements AI-driven personalized learning activities that center on adapting the student learning experience to the learning styles, preferences, backgrounds, and strengths (Castro, 2019). Moreover, via blended learning, Islamic students may be able to adapt the learning environment and course content to their styles and preferences while formally receiving guided instruction and support from faculty (Hakak et al., 2018). Besides personalized learning, blended learning enhances the interaction, collaboration, engagement, and exchange of ideas among Islamic students and faculty in a fashion that stimulates meaningful discussions of critical, contemporary, and diverse issues (Dakduk et al., 2018).

A precursor to replicating the benefits of blended learning activities into student performance, however, is the utilization of AI educational interventions (Sabri, 2016). The extent to which such utilization is effective or value-added to the rather complex construct of student performance depends, among other factors, on the service quality of AI and ICT teams (hereafter, service quality) (Sabeh et al., 2021). Though student performance in higher education Islamic studies is a generic term that may be explained by a myriad of factors including student preparedness, study methods, learning resources, academic support, idiosyncratic factors, and assessment methods, the impact of service quality on such performance is often channeled through the rather behavioral aspects of student motivation, engagement, intention, and satisfaction (Alamri et al., 2022). As opposed to system quality and information quality, service quality sums up the quality of technical support students receive from well-trained, reliable, responsive, and empathetic AI and ICT teams (Marikyan and Papagiannidis, 2023). In this vein, service quality is often conceptualized across the dimension of reliability, responsiveness, assurance, empathy, and tangibles (Parasuraman et al., 1985). In view of the preceding, this study adheres to the extended information systems success model (hereafter, extended ISSM) where service quality is hypothesized to have a positive impact on student performance via the mediating mechanisms of student intention to use the intervention and student satisfaction with the intervention (DeLone and McLean, 2003).

The research by (AL-Hawamleh's 2024) explores user satisfaction with e-learning systems using the Information Systems Success Model and Technology Acceptance Model. The study reveals that high-quality, user-friendly systems lead to higher intention to continue using the platform. The study may not account for external factors that can influence user experience and continued use, such as access to technology, learning environment distractions, or individual learning styles.

This research (Mijač, Jadrić, and Ćukušić, 2024) examines how researchers measure the success of information systems used in higher education. The study emphasizes the need for more standardized approaches to measuring information systems success in higher education. While emphasizing the need for standardization, the study may not offer specific recommendations or frameworks for developing or implementing standardized metrics for measuring IS success.

The study employs a sample of 313 students at the college of Hadith and Islamic studies at the Islamic University of Medina where blended learning activities include AI-driven Quran and Hadith read head (Maqraa) allowing students to actively learn and engage with Quran and Hadith recitations done with both multiple readers and a latitude of dialects. The study advances and answers the following research questions:

RQ1: What is the impact of service quality on student performance?

RQ2: What is the extent to which student intention to use mediates the relationship between service quality and student performance?

RQ3: What is the extent to which student satisfaction mediates the relationship between service quality and student performance?

The rest of the study presents review of the extant literature relating service quality to higher education student performance, research design, data analysis & empirical results, and conclusion.

Literature Review

DeLone and McLean (1992) formulate ISSM. They rely on Mason's (1978) information influence theory, and propose that user performance primarily reflects the quality of information processing (i.e., system or process quality), and the quality of information output (i.e., information or output quality). DeLone and McLean (2003) update their original ISSM, and allow service quality to have an impact on user performance via the mediating influences of the variables intention to use and user satisfaction. Several studies have adopted the updated ISSM model (see, e.g., Sabeh et al., 2021; Sabri, 2016). In particular, Sabeh et al. (2021) offers a comprehensive and rigorous review of the updated ISSM model in the context of AI educational interventions and e-learning systems. In this regard, Ali et al. (2018) defines service quality as a fundamental challenge facing effective implementation of AI learning systems. Gunasinghe et al. (2020) report that service quality is considered by instructors in higher education a critical factor when adopting AI learning mechanisms. Kim et al. (2017) find that lack of service quality could lead to educational technology user resistance among higher education students. Hamidi and Chavoshi (2018) document that service quality is an essential for the utilization of AI educational technology and e-learning interventions among higher education students and faculty. Nikou and Economides (2017) evaluate service quality as a binding factor influencing the behavioral intention to use AI educational technology. Briz-Ponce et al. (2017) contend that service quality has a significant impact on the learning behavior of higher education students via AI educational technologies. Al-Rahmi et al. (2021) describe that service quality significantly affects the learning outcomes associated with AI and mobile learning tools in higher education. Alomari et al. (2020) incorporate service quality among the human factors responsible for the effectiveness of AI learning systems. Eom and Ashill (2018) formulate a system view of the success AI learning systems where service quality serves as an explanatory variable. Al-shargabi et al. (2021) provide Saudi higher education evidence that service quality influences the utilization and acceptance of AI learning systems. Al-Rahmi et al. (2021) synthesize innovation diffusion theory with the technology acceptance model, and show that service quality varies positively with student attitude toward AI-driven and online learning systems. Liu et al. (2012) summarize that service quality is an organizational factor conducive to the effectiveness of AI-powered learning platforms. Alhabeeb and Rowley (2018) explains that service quality tends to dictate the perception of faculty and

students with respect to the success of AI educational interventions and e-learning systems. Hassanzadeh et al. (2012) employees service quality as an exogenous variable specifying the success of higher education e-learning systems. Baber (2021) reiterates that service quality is indispensable for the social interaction features accommodated by AI educational interventions and online learning platforms in higher education. Manca (2020) highlights that service quality is paramount for the effectiveness of social media and AI-related applications in higher education. Bali and Liu (2018) conclude that student attitude toward AI learning interventions and e-learning systems depends non-trivially on service quality. Kurucay and Inan (2017) utilize the variable of service quality to mitigate the impact of interaction among learners on learner satisfaction in undergraduate higher education. Kim and Kim (2021) use service quality to explain the structural relationship between student satisfaction and student performance in sophisticated AI learning environments. Ansari and Khan (2020) analyze the impact of social media on the effectiveness of AI smart and collaborative learning systems via the role of service quality. Eid and Al-Jabri (2016) frame that service quality is an antecedent to social networking, idea generation, and knowledge sharing in AI learning systems in higher education. Gao et al. (2020) point that service quality mediates the impact of AI blended learning platforms on student engagement and satisfaction. Fisher et al. (2021) proposed that the positive association between AI blended learning interventions and student engagement (and academic achievement) hinges on the variable of service quality. Hizam et al. (2021) draw the conclusion that service quality may enhance the digital competency of faculty in AI learning environments. Mwalumbwe and Mtebe (2017) relate the predictive accuracy of AI learning analytics when inferring future student performance to the variable of service quality. Pham et al. (2019) report empirical evidence that service quality directly influences student satisfaction and loyalty in AI learning interventions and e-learning systems in higher education.

In light of the preceding review, studies of the service quality of blended learning and AI educational interventions in the context of higher education Islamic studies are scantily reported. This study contributes to filling this gap by documenting empirical evidence with respect to the impact of blended learning service quality on student performance in higher education Islamic studies at the university of Medina.

Research Design

This study applies the quantitative paradigm to explain student performance in higher education Islamic studies in terms of blended learning service quality and via the mediating effects of student intention to use the AI education intervention and student satisfaction with such intervention. The study thus adopts all relevant ontological, epistemological, and axiological assumptions underlying the quantitative paradigm (Creswell, 2003). Ontologically, the study assumes that the variables of system quality, student intention to use the intervention, student satisfaction with the intervention, and student performance are observable and objectively measurable. Epistemologically, the study maintains that the individual impact of service quality on student intention, satisfaction, and performance can be objectively measured and tested. Axiologically, the study holds that investigating and capturing the impact of the service quality of the AI educational intervention on student intention to use the intervention, and student satisfaction with the intervention will inform the design of future AI interventions in higher education. Along the same lines, the study further assumes that documenting the impact of student intention to use the intervention and satisfaction with such intervention on student performance will inform educational theory and models of student learning behavior.

Study Sample

The study employs a sample size of 313 students at the college of Hadith and Islamic studies at the Islamic University of Medina. The study applies Cochran's (1977) sample size determination framework to a total student population of 1669 at a 95% confidence interval, 5% margin of error, and 50% population proportion as follows: $313 = [(1.96^2) * 0.5 * (1-0.5) * (0.05^2)] / [1 + \{(1.96^2) * 0.5 * (1-0.5) * (0.05^2) * (1669-1)\}]$.

Variables' Measurement and coding

Service quality is measured according to the validated scale measurement of SERVQUAK (Parasuraman et al., 1985) (Table 1). Student intention to use the optional AI intervention of Hadith reader head (Maqraa) is measured according to the validated scale measurement of use intention (Teo, 2019) (Table 2). Student satisfaction is measured according to the validated scale measurement of satisfaction (Roca et al., 2006) (Table 3). Student performance is measured as GPA scaled from 1 to 5. All items to variable measurements are captured on a five-point Likert-type scale. All variables are measured based on average item score and are coded as 1 for lowest score, 2 for lower score, 3 for average score, 4 for high score, and 5 for highest score.

Table1: measurement of service quality

Reliability
Support services provided as promised
Support team dependable in handling student service problems
Services performed right the first time
Services performed at the promised time
Responsiveness
Support team keeps students informed when services will be performed
Support team willing to help students

Support team ready to respond to student inquiries
Assurance
Support team instills confidence in students
Support team makes students feel safe while using the intervention
Support team members have the knowledge to answer student questions
Empathy
Support team gives students individual attention
Support team members deal with students in caring fashion
Support team members have convenient work hours
Support team members understand student needs
Tangibles
Support team members have neat professional appearance
Support team members use visually appealing facilities

Table 2: Measurement of Student Intention to Use the Optional Maqraa

Statement	Likert Scale	Scores
I will use the Maqraa in the future.	1 (Strongly Disagree) to 5 (Strongly Agree)	Higher scores indicate a stronger intention to use the Maqraa.
I plan to use the Maqraa often.	1 (Strongly Disagree) to 5 (Strongly Agree)	Higher scores indicate a plan for frequent Maqraa usage.

Table 3: Measurement of Satisfaction with Maqraa

Statement	Likert Scale	Scores
I am satisfied with the performance of the Maqraa.	1 (Strongly Disagree) to 5 (Strongly Agree)	Higher scores indicate greater satisfaction with the Maqraa's functionality.
I am pleased with the experience of using the Maqraa.	1 (Strongly Disagree) to 5 (Strongly Agree)	Higher scores indicate a positive experience using the Maqraa.

Mediating Variables

This study employs the mitigating mechanisms of student intention to use the intervention and student satisfaction with such intervention to explain the relationship between service quality and student performance. The study, therefore, tests whether both variables of student intention to use the intervention and student satisfaction with such intervention are impacted by service quality and meanwhile have an impact on student performance.

Data Analysis and Empirical Results

To answer RQ1, the study estimates a linear model to explain student performance in terms of service quality. The model estimation is carried out according the functional form:

$$FF(1): \text{student performance} = f(\text{service quality})$$

The model is specified as follows while assuming that the underlying data generating process satisfies the Gauss-Markov properties of correct specification and identically and independently distributed error terms with zero mean and constant variance:

$$SF(1): \text{student performance } (i) = b_0 + b_1 * \text{service quality } (i) + e(i)$$

Where (i) is an index for the student included in the dataset and takes discrete values between 1 and 313; b_0 is an intercept parameter estimate; b_1 is coefficient or parameter estimate; and e is a Gauss-Markov error term with an average value of zero and constant variance everywhere across the study sample.

The statistical model output shows that the model has a significant explanatory power as measured by adjusted R squared (see Table 4). The statistical output also shows that service quality is replicated positively in student performance with a well-pronounced parameter estimate at all traditional levels of statistical significance.

Table 4: Answering RQ1 (Regressing student performance on service quality)

SUMMARY OUTPUT							
Regression Statistics							
Multiple R	0.440317						
R Square	0.193879						
Adjusted R Square	0.191287						
Standard Error	1.068876						

Observations	313							
ANOVA								
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	1	85.45673	85.45673	74.79824	2.83E-16			
Residual	311	355.3164	1.142497					
Total	312	440.7732						
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	1.824601	0.195354	9.339976	1.92E-18	1.440219	2.208984	1.440219	2.208984
Service Quality	0.444651	0.051413	8.648597	2.83E-16	0.343489	0.545812	0.343489	0.545812

To answer RQs, the study estimates two linear models to explain student intention in terms of service quality and student performance in terms of student intention. The model estimations are carried out according to the functional forms:

FF (2): $\text{student intention} = f(\text{service quality})$

FF (3): $\text{student performance} = f(\text{student intention})$

The models are specified as follows while assuming that the underlying data generating processes satisfy the Gauss-Markov properties of correct specification and identically and independently distributed error terms with zero mean and constant variance:

SF (2): $\text{student intention} (i) = b_0 + b_1 \cdot \text{service quality} (i) + e (i)$

SF (3): $\text{student performance} (i) = b_0 + b_1 \cdot \text{student intention} (i) + e (i)$

Where (i) is an index for the student included in the dataset and takes discrete values between 1 and 313; b_0 is an intercept parameter estimate; b_1 is coefficient or parameter estimate; and e is a Gauss-Markov error term with an average value of zero and constant variance everywhere across the study sample.

The statistical model outputs show that the models have significant explanatory power as measured by adjusted R squared (see Table 5 and Table 6). The statistical output also shows that student intention replicates service quality and is replicated in student performance with well-pronounced parameter estimates at all traditional levels of statistical significance. This suggests that student intention significantly mediates the relationship between service quality and student performance.

Table 5: Answering RQ2 (Regressing student intention on service quality)

SUMMARY OUTPUT								
<i>Regression Statistics</i>								
Multiple R	0.516702							
R Square	0.26698							
Adjusted R Square	0.264624							
Standard Error	0.980774							
Observations	313							
ANOVA								
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	1	108.9587	108.9587	113.2725	9.2E-23			
Residual	311	299.1563	0.961917					
Total	312	408.115						
	<i>Coefficients</i>	<i>Standard</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper</i>	<i>Lower</i>	<i>Upper</i>

		Error				95%	95.0%	95.0%
Intercept	1.706525	0.179252	9.520268	5.04E-19	1.353826	2.059225	1.353826	2.059225
Service Quality	0.502084	0.047175	10.64295	9.2E-23	0.409261	0.594908	0.409261	0.594908

Table6: Answering RQ2 (Regressing student performance on student intention)

SUMMARY OUTPUT									
Regression Statistics									
Multiple R	0.534498								
R Square	0.285688								
Adjusted R Square	0.283391								
Standard Error	1.00617								
Observations	313								
ANOVA									
	df	SS	MS	F	Significance F				
Regression	1	125.9236	125.9236	124.3839	1.6E-24				
Residual	311	314.8496	1.012378						
Total	312	440.7732							
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%	
Intercept	1.475622	0.184347	8.004605	2.41E-14	1.112898	1.838347	1.112898	1.838347	
Student intention	0.555472	0.049806	11.15275	1.6E-24	0.457473	0.653471	0.457473	0.653471	

To answer RQ3, the study estimates two linear models to explain student satisfaction in terms of service quality and student performance in terms of student satisfaction. The model estimations are carried out according the functional forms:

FF (4): $student\ satisfaction = f(service\ quality)$

FF (5): $student\ performance = f(student\ satisfaction)$

The models are specified as follows while assuming that the underlying data generating processes satisfy the Gauss-Markov properties of correct specification and identically and independently distributed error terms with zero mean and constant variance:

SF (4): $student\ satisfaction(i) = b_0 + b_1 * service\ quality(i) + e(i)$

SF (5): $student\ performance(i) = b_0 + b_1 * student\ satisfaction(i) + e(i)$

Where (i) is an index for the student included in the dataset and takes discrete values between 1 and 313; b_0 is an intercept parameter estimate; b_1 is coefficient or parameter estimate; and e is a Gauss-Markov error term with an average value of zero and constant variance everywhere across the study sample.

The statistical model outputs show that the models have significant explanatory power as measured by adjusted R squared (see Table7 and Table8). The statistical output also shows that student satisfaction replicates service quality and is replicated in student performance with well-pronounced parameter estimates at all traditional levels of statistical significance. This suggests that student satisfaction significantly mediates the relationship between service quality and student performance.

Table7: Answering RQ3 (Regressing student satisfaction on service quality)

SUMMARY OUTPUT								
<i>Regression Statistics</i>								
Multiple R	0.519189							
R Square	0.269557							
Adjusted R Square	0.267208							
Standard Error	0.912103							
Observations	313							
ANOVA								
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	1	95.47994	95.47994	114.7689	5.3E-23			
Residual	311	258.7309	0.831932					
Total	312	354.2109						
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	1.790496	0.166701	10.74075	4.25E-23	1.462491	2.1185	1.462491	2.1185
Service Quality	0.470004	0.043872	10.71302	5.3E-23	0.38368	0.556328	0.38368	0.556328

Table8: Answering RQ3 (Regressing student performance on student satisfaction)

SUMMARY OUTPUT								
<i>Regression Statistics</i>								
Multiple R	0.57199							
R Square	0.327172							
Adjusted R Square	0.325009							
Standard Error	0.976516							
Observations	313							
ANOVA								
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	1	144.2088	144.2088	151.2284	1.36E-28			
Residual	311	296.5643	0.953583					
Total	312	440.7732						
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	1.205217	0.189248	6.36845	6.85E-10	0.832848	1.577586	0.832848	1.577586
Student satisfaction	0.638065	0.051886	12.29749	1.36E-28	0.535974	0.740157	0.535974	0.740157

In view of the preceding analysis, the results of this study show that student intention to use the Maqraa and student satisfaction with it tend to strongly mediate the relationship between service quality and student performance. To test whether student intention and student satisfaction fully mediate the main relationship of the study, student

performance is regressed on student satisfaction, student intention, and service quality. The test results (Table9) show that, though student satisfaction and student intention strongly mediate the impact of service quality on student performance, such mediation is short of the full mediation criterion since the parameter estimate associated with service quality is still statistically significant at all traditional levels.

Table9: Level of mediation (Regressing student performance on student satisfaction, student intention, and service quality)

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.628765							
R Square	0.395346							
Adjusted R Square	0.389475							
Standard Error	0.928714							
Observations	313							
ANOVA								
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	3	174.2579	58.08595	67.34532	1.55E-33			
Residual	309	266.5153	0.862509					
Total	312	440.7732						
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	0.655912	0.205127	3.197585	0.001529	0.252289	1.059534	0.252289	1.059534
Student satisfaction	0.123175	0.054835	2.246307	0.02539	0.015279	0.231071	0.015279	0.231071
Student Intention	0.271513	0.060021	4.52361	8.68E-06	0.153411	0.389616	0.153411	0.389616
Service Quality	0.393938	0.06454	6.10376	3.1E-09	0.266944	0.520933	0.266944	0.520933

Conclusion

This research empirically studied the impact of blended learning service quality on student performance. It utilizes an extended Information Systems Success Model (ISSM) where service quality, encompassing the AI-driven Quran and Hadith reader head (Maqraa), is hypothesized to influence student performance. The study theorizes that student intention to use this intervention and satisfaction with it act as mediating mechanisms. Data from 313 students at the Islamic University of Medina's College of Hadith and Islamic Studies was analyzed. The results provide strong evidence that service quality significantly enhances student performance. Interestingly, both student intention to use the AI tool and satisfaction with it replicate the impact of service quality, further influencing student achievement. The study establishes that student intention and satisfaction play a crucial role in mediating the relationship between service quality and student performance. However, it uncovers a partial mediation effect. This means while these factors influence performance, service quality retains a direct and statistically significant impact. This suggests the presence of additional mediating factors influencing the effectiveness of AI interventions in Islamic Studies education. Future research can explore these "missing pieces" by investigating other behavioral and institutional influences that may bridge the gap between AI success factors and student achievement in higher education. By identifying these additional mediators, we can further optimize blended learning environments, maximizing their positive impact on student learning outcomes.

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