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Student Engagement Mechanism of Online Learning: The Effect of Service Quality on Learning Management System

Hartiwi Prabowo^a, Yuniarty^{a,*}, Ridho Bramulya Ikhsan^a

^a Management Department, BINUS Online Learning, Bina Nusantara University, Jakarta, 11480, Indonesia Corresponding author: ^{*}yuniarty@binus.ac.id

Abstract— Since typical classrooms do not include discussions, collaborative learning, or interactive learning activities, engagement is a major challenge in distant learning. Online learning satisfaction levels should be measured as evaluation material for future implementation. Although online learning has many advantages, a high dropout rate remains a significant challenge. This study investigates how higher education students' engagement and satisfaction with online learning are enhanced by information, system, and service aspects. The research design was quantitative research, and we used a questionnaire to collect data. The questionnaire was designed on a five-rating interval scale. The sampling technique was simple random sampling. The target minimum sample was counted using the Slovin method, and 206 undergraduate students taking online courses were surveyed online. The model was tested using structural equation modeling partial least squares (SEM PLS). This method is useful for investigating the relationship between constructs. The model was tested with the application of the SmartPLS program. The results revealed a positive and significant effect of system quality, information quality, service quality to student engagements, and their impact on student satisfaction, both direct and indirect. This study answers the literature gap and verifies the importance of online learning quality factors on students' satisfaction and engagement. These results are expected to help to improve online learning in higher education settings, specifically on students' engagement and satisfaction, leading to perseverance and success.

Keywords- Service quality; online learning; LMS; student; engagement; satisfaction.

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I. INTRODUCTION

Students must establish an active learning environment that encourages more people to pursue online education. This is essential for improved student experiences, academic success, and retention rates [1]. In higher education, significant efforts have been made to involve students in collaborative notetaking and boost their engagement with the material for more substantial and expressive learning [2]. Distance learning reduces social connection, student well-being, and studentteacher engagement in general. Creating digital content that promotes active learning and student participation makes it challenging.

E-learning is made possible by several factors, including the Learning Management System (LMS) (communication gateway), educators (content authors), teaching staff (teacherstudent link), and students (LMS users) [3]. The educational sector frequently discusses using technology in lecture sessions to improve teaching and learning activities. Engagement in all treatments shows that novelty technology affects engagement [4].

Previous research studied the antecedents of behavioral intention to use and actual use based on the Technology Adoption Model (TAM) or Unified Theory of Acceptance and Use of Technology (UTAUT) [5], [6], [15], [16], [7]–[14] and its extensions, but fails to support a vital construct truly reflects online learning, namely customer engagement. Other studies apply the Delone, and McLean IS success model but again fail to support customer engagement [6], [12], [17]–[21]. Thus, this study was conducted to answer the literature gap and verify the importance of service quality, information quality, and system quality factors on student satisfaction and their impact on student engagement.

High levels of participation during classes and tutorials positively impact students' performance. Because behavioral and cognitive engagement functions are exciting, evaluation, thinking, and technology advancements influence students' attendance and involvement in class. There are critical debates on whether attendance or behavioral and cognitive engagement affects performance. Attendance is distributed through technology and students' evaluative thinking, which aids in investigating how official attendance and class engagement are connected. Using internet platforms to deliver slides in class impacts students' attentiveness. This implies that attendance at tutorials and courses is not an issue compared to the criteria utilized.

An online learning system offers the flexibility to study without time limits, geographic location, and physical appearance, attracting most students. Online learning can be carried out anywhere and anytime, and students can manage their studies and plan time for work and family. Although online learning has many advantages, a high dropout rate remains a significant challenge.

Lectures use monotonous methods on learners, leading to stress, boredom, and complaints regarding assignments. Therefore, evaluation is necessary for effective online learning. Interaction between students, lecturers, and tutors during online learning is ideal for dealing with isolation and separation feelings. The Learning Management System (LMS), characterized by the management of lesson content, learning processes, evaluations, online exams, subject administration, chat, and discussion, is an integrated and comprehensive system used as an e-learning platform. In general, e-learning content availability varies from institution to institution, depending on the provider (Higher Education). This is due to the lack of a standard to regulate the content to be used. After implementing E-learning, its effectiveness and positive impact on learning is a significant concern. Moreover, student engagement in online education is essential to increase student satisfaction. This research examines how to improve student satisfaction from the system, information, and service quality, mediated by student engagement in distance learning education.

II. MATERIALS AND METHOD

When using an information system, the information is relevant, easy to comprehend, timely, and completes the data received [22]. Since the introduction of the current IS success model in 2003, several studies have supported its utility and application, including ePortfolio [23], online learning [24], [25], and the e-learning 2.0 system [26].

Information quality is a critical component of education and may affect the learning system in case it is poor. However, it can be a system's accomplishment, particularly in online classes or mobile learning. System quality involves easily utilizing information systems to affect the intention to use it. The information includes the system's availability, response rate, user-friendliness, and screen features (interface). A poor quality system results in students' dissatisfaction [22]. In case it becomes complicated to use, deliberate attempts to destroy it are made. In our study, a learning management system refers to a system used to present and publish information. It includes technical features that affect students' perceptions of the quality of web platforms.

Service quality refers to how a user is assisted and responded to in information systems. This includes genuine attention in resolving a problem, personalization, trust, and understanding of the user's individual needs [22]. Service quality takes precedence as the main tool for service quality. The service quality model continues to be a reliable tool for evaluating service quality in various service sectors, including the education sector [27]. Study shows that information, system and service qualities, user satisfaction, intention to use, and net benefits help to achieve the intended use of technology in online learning [6], [12], [17]–[21].

Engagement refers to the time and effort students devote to instructional activities. Teaching desires can easily be achieved depending on students' efforts and dedicated time [28]. Students' purposeful behaviors or practices effectively show academic growth [29] and boost participation and learning [30]. In general, engagement has proved to be essential in determining learning outcomes [31], [32]. Academic engagement is the students' effort to perform well in class and achieve their goals [29]. This involves a cognitive process, active participation, and emotional involvement in learning methods, assignments, or values. However, previous studies did not emphasize engagement with its aspects, including behavioral, cognitive, and emotional engagement [33]. The benefits of classroom involvement on performance are primarily found in elementary and high school education studies [33], [34]. Scales for gauging classroom involvement are either designed for study or are challenging to translate to the Indonesian distance learning higher education scene. Furthermore, class size is an essential aspect of Indonesian higher education. For instance, 240 students enroll in economics or business management courses.

Perceived satisfaction is among the critical marketing principles to be implemented in online learning and significantly affects user behavior intentions (Caruana et al., 2016; I. Pozón-López et al., 2019; Irma Pozón-López et al., 2020). Users' may willingly stick to technology depending on their level of satisfaction and perceived utility [3], [35]. Satisfaction is the level at which a student expresses pleasant feelings about a service interaction. Furthermore, users' delight depends on confirmation and perceived usefulness. Studies show that collaborative learning information exchange can be supported by an e-learning system [36], [37]. Web-based solutions help create, exchange, perceive knowledge, and build a virtual community for collaborative and interactive learning [38]. Moreover, interactive communication may be affected by different services in the information system (IS). According to studies, information, system, and service qualities affect student satisfaction [3].

Therefore, it this study proposes hypotheses as follows:

- H1: System Quality significantly influences Student Satisfaction
- H2: Information Quality significantly influences Student Satisfaction
- H3: Service Quality significantly influences Student Satisfaction
- H4: System Quality significantly influences Student Engagement
- H5: Information Quality significantly influences Student Engagement
- H6: Service Quality significantly impacts Student Engagement
- H7: Student Satisfaction significantly influences Student Engagement

Based on the literature study, the conceptual model in Fig. 1 was generated based on the literature study to investigate

the correlation between system, information, and service qualities, student satisfaction, and engagement.



This study used an exploratory design to understand the questions and capture the exploratory findings in the related descriptive studies. The data was collected over a "one shoot" cross-sectional once in a certain period for a particular subject. Specifically, questionnaires with a scale of 1 to 5 (where 1=strongly disagree, and 5 = strongly agree) were used to collect data. The unit of analysis was undergraduate students in Jakarta, Indonesia. A total of 206 respondents were selected using a random probability sampling technique.

The Partial Least Squares-Structural Equation Modeling (PLS-SEM) method was used to analyze the relationship between variables through the SmartPLS version 3 application. Based on a knowledge base, the link between particular variables is stated (theory). Each variable specifically served as a latent variable for a theoretical idea. PLS was helpful in mapping all possible routes to several dependent variables using a comparable research methodology. Additionally, it was essential to evaluate all directions in the structural model. [39].

III. RESULT AND DISCUSSION

Table 1 shows the respondents' characteristics, specifically 104 and 102 men and women. It involved students and private employee respondents with 36, 52, 79, 26, and 13 from the Accounting, Management, Information System, Industrial Engineering, and Computer Science study programs from Indonesia's top three distance learning universities. Most students (134) access the learning management system (LMS) from 1 to 3 hours, 47 less than 1 hour, and 25 more than 3 hours per day.

VALIDITY TEST									
Gender	Major	Amount of Time in Accessing LMS (hour(s) per day)	Civil Servant	Private Employee	Student	Entrepreneur	Other		
Male	Accounting	< 1		2	1				
		1 - 3	1	7	2				
		> 3	1						
	Management	< 1	1	2		2			
		1 - 3		10	1	1			
		> 3					1		
	Information System	< 1		8	3				
		1 - 3	3	21	3		3		
		> 3		2	1				
	Industrial	< 1		2	1	1	1		
	Engineering	1 - 3	2	7			1		
		> 3		4			1		
	Computer Science	< 1		1	1	2			
	-	1 - 3		3	1				
Female	Accounting	< 1	1	1		1			
		1 - 3		10	2		2		
		> 3			4		1		
	Management	< 1		4		2	1		
		1 - 3		13	9		1		
		> 3		2	1	1			
	Information System	< 1		4	3		2		
		1 - 3	2	11	5		3		
		> 3		4	1				
	Industrial	1 - 3		5					
	Engineering	> 3		1					
	Computer Science	1 - 3		3	2				

TABLE I Validity test

The convergent validity test shown in Table II demonstrates the strong correlation value shared by all indicators. The P-value is less than 0.05, and the loading coefficient value is significant at or above 0.60. As a result,

using the loading factor approach, the apparatus or questionnaire was created to have strong convergent validity.

TABLE II CONVERGENT VALIDITY TEST

Indicator		0	ST DEV	O/STDEV	P Values		
System Q	uality (18,40–42)						
SyQ1 <- SyQ	easy to use	0.853	0.024	35.361	0.000		
SyQ2 <- SyQ	flexible to interact	0.826	0.034	24.291	0.000		
SyQ3 <- SyQ	clear & understandable	0.883	0.018	47.812	0.000		
Informatio	on Quality						
IQ1 <- IQ	up-to-date knowledge	0.812	0.040	20.305	0.000		
IQ2 <-	accurate	0.871	0.022	40.428	0.000		
IQ IQ3 <-	relevant	0.897	0.017	51.307	0.000		
IQ IQ4 <-	comprehensive	0.850	0.029	29.705	0.000		
IQ IQ5 <-	organized	0.832	0.031	26.669	0.000		
IQ	knowledge						
Service Q	uality						
SQ1 <- SQ	could use at any time and anywhere	0.712	0.052	13.696	0.000		
SQ2 <- SQ	academic advice support	0.905	0.016	55.179	0.000		
SQ3 <- SQ	enables interactive communication	0.845	0.029	28.884	0.000		
SQ4 <- SQ	support and dedicated call	0.911	0.018	49.562	0.000		
	center						
Student E	ngagement (33)						
SK1 <- SE	effort in the tutorials	0.658	0.058	11.304	0.000		
SK2 <- SE	take notes down during the tutorials	0.749	0.037	20.212	0.000		
SK3 <- SE	understand the material	0.779	0.033	23.641	0.000		
SK4 <- SE	listening carefully	0.750	0.042	17.646	0.000		
SK5 <- SE	prepare the tutorials regularly	0.805	0.032	24.830	0.000		
SK6 <- SE	well organized	0.807	0.029	28.298	0.000		
SK7 <- SE	complete all of the exercises	0.685	0.058	11.878	0.000		
Par1 <- SE	frequently raise hands in the tutorials	0.625	0.054	11.681	0.000		
Par2 <- SE	participate in small-group discussions	0.807	0.035	22.829	0.000		
Par3 <- SE	helping fellow students	0.743	0.043	17.366	0.000		
Par4 <- SE	having fun	0.724	0.032	22.528	0.000		
Par5 <- SE	ask questions	0.545	0.078	7.003	0.000		
Satisfaction (Aldholay et al., 2018							
SAT1 <- SAT	deciding to use online learning	0.885	0.022	39.720	0.000		
SAT2 <- SAT	met expectations	0.929	0.014	68.789	0.000		
SAT3 <- SAT	pleased with the online education	0.910	0.018	51.446	0.000		

Note: SyQ – System Quality, IQ - Information Quality, SQ - Service Quality, SK - Skill, Par - Participation, SAT – Satisfaction

In the cross-loading test, the indicator load value is compared to its latent variable as well as other latent variables. For this cross-load test, it is acceptable if the loadrelated p-value is 0.05 and the load factor is 0.70, or between ranges of 0.60 to 0.70 [40]. The correlation loads between each indicator and the latent variables that have a larger value than the other variables are shown in Table III. Cross-loading is the basis for the instrument or questionnaire discriminant validity.

TABLE III CROSS-LOADING TEST

	SyQ	IQ	SQ	SE	SAT
SyQ1	0.853	0.623	0.603	0.594	0.639
SyQ2	0.826	0.506	0.470	0.533	0.544
SyQ3	0.883	0.655	0.575	0.644	0.602
IQ1	0.508	0.812	0.629	0.589	0.580
IQ2	0.590	0.871	0.591	0.615	0.635
IQ3	0.632	0.897	0.723	0.644	0.696
IQ4	0.597	0.850	0.589	0.602	0.581
IQ5	0.652	0.832	0.621	0.654	0.572
SQ1	0.509	0.527	0.712	0.605	0.584
SQ2	0.595	0.716	0.905	0.658	0.727
SQ3	0.457	0.574	0.845	0.568	0.618
SQ4	0.614	0.674	0.911	0.631	0.728
SK1	0.437	0.501	0.517	0.658	0.445
SK2	0.488	0.533	0.580	0.749	0.526
SK3	0.506	0.560	0.549	0.779	0.576
SK4	0.513	0.576	0.501	0.750	0.607
SK5	0.567	0.577	0.579	0.805	0.606
SK6	0.617	0.614	0.625	0.807	0.652
SK7	0.502	0.501	0.497	0.685	0.485
Par1	0.430	0.368	0.400	0.625	0.374
Par2	0.523	0.579	0.571	0.807	0.541
Par3	0.470	0.505	0.513	0.743	0.465
Par4	0.472	0.560	0.573	0.724	0.515
Par5	0.503	0.427	0.404	0.545	0.380
SAT1	0.607	0.608	0.643	0.648	0.885
SAT2	0.660	0.690	0.762	0.661	0.929
SAT3	0.634	0.663	0.742	0.645	0.910

Note: SyQ – System Quality, IQ - Information Quality, SQ - Service Quality, SK - Skill, Par - Participation, SAT – Satisfaction

After examining the convergence and discriminant of validity, the reliability test was carried out on each component. The R-squared factor, composite reliability (CR), Cronbach's Alpha, and AVE scores are a few of the reliability test's components. Cronbach's alpha (0.50), combined reliability (CR) (> 0.70), and the AVE value of the reliability (0.50) are used to describe the reliable components of the search. A setup with a trustworthy questionnaire and an AVE value of at least 0.5 can account for more than 50% of the variance [41].

TABLE IV RELIABILITY TEST

	Cronbach's	rho_A	Composite	Average Variance			
	Alpha		Reliability	Extracted (AVE)			
IQ	0,906	0,908	0,930	0,727			
SAT	0,894	0,896	0,934	0,825			
SE	0,917	0,923	0,930	0,529			
SQ	0,865	0,873	0,910	0,717			
SyQ	0,815	0,821	0,890	0,730			

Note: SyQ – System Quality, IQ - Information Quality, SQ - Service Quality, SK - Skill, Par - Participation, SAT – Satisfaction

Table V is an example of a path coefficient test comparing configurations to verify the magnitude and force of the impact and test the hypothesis. The hypothesis was supported if T-Statistics were greater than 1.96 (alpha = 5%). The findings

of the hypothesis test and the comments are presented in Table III.

TABLE V Hypothesis test								
O ST O/ P DEV STDEV Values Note								
IQ -> PI	0,083	0,037	2,252	0,025	Significant			
IQ -> SAT	0,168	0,058	2,900	0,004	Significant			
SAT -> PI	0,094	0,044	2,111	0,035	Significant			
SQ -> PI	0,738	0,038	19,466	0,000	Significant			
SQ -> SAT	0,358	0,085	4,222	0,000	Significant			
SyQ -> PI	0,099	0,048	2,052	0,041	Significant			
SyQ ->	0,401	0,086	4,681	0,000	Significant			
SAT								

Note: SyQ – System Quality, IQ - Information Quality, SQ - Service Quality, SK - Skill, Par - Participation, SAT – Satisfaction



Mediation occurred when the third mediating variable interfered with the other two related components. The intermediate test results are illustrated in Table VI.

TABLE VI MEDIATION TEST

Through	Indirect	P-	Direct	P-	Total	P-
Student Satisfaction	Effect	v alues for	Effect	v alues for	Effect	v arues for
		Indirect		Direct		Total
		Effect		Effect		Effect
IQ -> SE	0.030	0.111	0.254	0.001	0.284	0.000
SQ -> SE	0.083	0.039	0.493	0.000	0.341	0.000
$SvO \rightarrow SE$	0.042	0.112	0.231	0.000	0.274	0.000

Note: SyQ – System Quality, IQ - Information Quality, SQ - Service Quality, SK - Skill, Par - Participation, SAT – Satisfaction

Students become more skillful at managing complexity, tolerating ambiguity, and working with people with different opinions. Beneficial educational activities help in skills and attitude development for a better future. Effective communication from the lecturers helps to improve student concentration. Higher education should promote effective system organization, monitor students learning progress, respect them, and accurately evaluate their work.

The need to create and build courses before the actual distribution of the material will help to improve online course distribution. Teacher-student interaction, curriculum

The findings and parameter values for each observable (indicator), external latent, and internal variable are shown in detail in Fig. 2, along with the impacts of each variable as shown by the path factor and p-value. The latent predictors and norms are represented in columns and rows.

Student Engagement before mediation through satisfaction with a p-value of 0.000 (less than 0.05) is directly influenced by Information, System, and Service Qualities. However, the indirect effect between Service Quality with a p-value of 0.000 (less than 0.05) was also significant. Therefore, Student Engagement is indirectly influenced by Service Quality. Indirect impacts of Information and System Qualities are insignificant to the Student Engagement mediated by students' satisfaction with a p-value of 0.111 and 0.112 (\geq 0.05).



Fig. 2 Conceptual Framework

structure, communication, and lecture attendance lead to effective class implementation [42]. Furthermore, teachers' active learning practices lengthen students' concentration [43]. Specifically, students will be more interested and participate in the learning process.

Students are engaged to thrive and grow due to teacher efforts and performance, creating an engaging experience. The teacher performance is distributed along with the learning in the system. It has been proven that student progress is influenced by the teacher's personality, expertise, evaluation tools, and other factors and the classroom environment.

IV. CONCLUSION

The study analyzed the factors that influenced student satisfaction and engagement. Quality learning is significantly affected by students' satisfaction. Therefore, evaluation is necessary to measure the effectiveness of online learning, including increased knowledge, skills, and development positive attitudes. Exams can be used to measure the knowledge level in students, including quizzes, structured tasks, mid and final tests. The satisfaction with using elearning is evidenced through the process. According to students, online learning is less supportive in the teaching and learning process. Therefore, groups should facilitate them to promote interaction and a conducive learning environment. Conclusively, System, Information, and Service Qualities significantly affect Student Satisfaction.

It is easy to use the system when provided with an orientation about the program and technical matters using KMS features. This orientation could prepare students to participate in the existing system's learning process actively. Program flexibility should accommodate students' context and conditions while accessing materials, participating in discussions, and submitting assignments. Furthermore, online program organizers and developer lecturers should understand online pedagogy. Participants actively interact with students, lecturers, and materials through online programs.

There is a need to design various activities and assignments to have an interactive and active learning environment in online programs. Moreover, role-playing and case studies commonly used during physical learning help to promote interaction and are packaged in online programs using media and communication at different times (asynchronous) and simultaneously (synchronous). University officials must address this problem through gamification by providing more interactive educational content in various formats, such as video clips. Also, providing an interactive graphical interface will serve as a viable tool for engaging students, ultimately contributing to their intention to continue learning. However, System, Information, and Service Quality significantly affect Student Engagement.

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