

The Effect of Mobile Learning Quality on User Satisfaction: Evidence from Malaysian Research Students

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ABSTRACT

The increasing adoption of mobile learning and artificial intelligence (AI)-enabled technologies has transformed teaching, learning, and research practices in higher education. As research students increasingly rely on mobile learning platforms to support literature searching, academic writing, collaboration, and knowledge development, ensuring the quality of these digital learning environments has become essential. This study examines the effect of mobile learning quality on user satisfaction among Malaysian research students based on the Information Systems Success Model (ISSM). Specifically, the study investigates the influence of system quality, information quality, and service quality on user satisfaction. A quantitative cross-sectional research design was employed, and data were collected through an online questionnaire from 249 research students enrolled in Malaysian higher education institutions. The data were analysed using the Statistical Package for the Social Sciences (SPSS), including descriptive statistics, reliability analysis, Pearson correlation, and multiple regression analysis. The findings revealed that all three dimensions of mobile learning quality significantly and positively influenced user satisfaction. Among the predictors, information quality emerged as the strongest determinant of user satisfaction, followed by service quality and system quality. The regression model explained 61.9% of the variance in user satisfaction, indicating that mobile learning quality plays a substantial role in shaping research students' learning experiences. The findings support the Information Systems Success Model and extend its application to the context of Malaysian research students. The study contributes to the growing literature on mobile learning by providing empirical evidence on the importance of delivering reliable systems, high-quality academic information, and responsive support services within AI-enabled mobile learning environments. The findings also provide practical implications for higher education institutions, educators, system developers, and policymakers seeking to enhance mobile learning quality and improve students' satisfaction in an increasingly digital learning landscape.

Keywords: Mobile Learning Quality, User Satisfaction, Information Quality, System Quality, Service Quality, Information Systems Success Model, Artificial Intelligence

INTRODUCTION

The rapid advancement of digital technologies has significantly transformed teaching and learning practices in higher education. Mobile learning, commonly known as m-learning, enables students to access learning resources anytime and anywhere through mobile devices such as smartphones, tablets, and laptops (Crompton & Burke, 2018; Al Emran, Elsherif, & Shaalan, 2020). This learning approach supports flexibility, self-paced learning, and continuous access to academic materials, making it increasingly relevant for research students who rely on digital platforms to support their academic and research activities.

The emergence of artificial intelligence (AI)-enabled tools has further expanded the role of mobile learning in higher education. Research students now frequently use digital and AI-supported tools to search for information, organize academic tasks, improve writing, and support knowledge development. As mobile learning environments become more integrated with intelligent technologies, the quality of these systems becomes an

important factor in shaping students' learning experiences and satisfaction (Naveed, Muhammad & Qureshi, 2023; Rahman, Ahmad, & Alias, 2023).

Mobile learning quality is commonly associated with three major dimensions: system quality, information quality, and service quality. These dimensions are consistent with the Information Systems Success Model, which explains that the success of an information system can be assessed through the quality of the system, the quality of information provided, and the quality of services offered to users (DeLone & McLean, 1992; DeLone & McLean, 2003). In the context of mobile learning, system quality refers to the reliability, usability, accessibility, and technical performance of the platform, while information quality concerns the accuracy, relevance, timeliness, and usefulness of learning content. Service quality refers to the responsiveness, support, and assistance provided to users when using the system.

User satisfaction is also recognized as an important indicator of system success. Students who perceive mobile learning systems as reliable, easy to use, and capable of providing relevant learning content are more likely to report higher satisfaction levels (Al-Fraihat, Joy, & Sinclair, 2020; Chaka & Govender, 2020). Conversely, poor system performance, limited access to quality information, and inadequate support may reduce students' satisfaction and affect their learning experience. Therefore, understanding the effect of mobile learning quality on user satisfaction is important for higher education institutions that aim to improve digital learning environments.

Although previous studies have examined mobile learning adoption, cloud-based learning, and e-learning system success, there is still a need for further empirical evidence on how mobile learning quality influences user satisfaction among Malaysian research students. Earlier work has proposed a conceptual framework for assessing the quality of mobile learning through cloud-based records management among students, highlighting the importance of system usability, data accessibility, content quality, and student satisfaction. However, empirical validation remains necessary to further examine the relationship between mobile learning quality and user satisfaction in the Malaysian higher education context.

Accordingly, this study empirically investigates the effect of mobile learning quality on user satisfaction among Malaysian research students. Guided by the Information Systems Success Model (DeLone & McLean, 2003), the study conceptualizes mobile learning quality through three dimensions: system quality, information quality, and service quality. By empirically examining the relationship between these dimensions and user satisfaction, this study contributes to a better understanding of how the quality of mobile learning environments influences students' learning experiences within the context of Malaysian higher education.

Problem Statement

The rapid adoption of mobile learning and AI-enabled technologies has transformed the way higher education institutions support teaching, learning, and research activities. Research students increasingly rely on mobile learning platforms to access scholarly resources, communicate with supervisors, collaborate with peers, and utilize AI-supported tools for academic writing, information retrieval, and knowledge development. As these technologies become integral to research and learning processes, ensuring the quality of mobile learning systems has become increasingly important. High-quality mobile learning systems are expected to provide reliable system performance, accurate and relevant information, and responsive support services that enhance students' learning experiences and overall satisfaction. Previous studies have consistently reported that system quality, information quality, and service quality are important determinants of information systems success and user satisfaction (DeLone & McLean, 2003; Al-Fraihat et al., 2020). However, much of the existing literature has primarily emphasized technology adoption, acceptance, or continuance intention rather than examining how these quality dimensions directly influence user satisfaction within mobile learning environments.

Furthermore, empirical evidence remains limited regarding the relationship between mobile learning quality and user satisfaction among Malaysian research students. Although studies have investigated mobile learning across various educational settings, most have focused on undergraduate populations, general higher education users,

or e-learning systems without specifically addressing the unique learning needs of research students. Unlike general students, research students depend extensively on mobile learning technologies to support independent research, academic collaboration, and continuous knowledge acquisition. Consequently, understanding the factors that contribute to their satisfaction is essential for improving the effectiveness of mobile learning environments. The lack of empirical evidence in the Malaysian higher education context highlights the need for further investigation. Therefore, this study examines the effect of mobile learning quality, represented by system quality, information quality, and service quality, on user satisfaction among Malaysian research students, thereby contributing empirical evidence to the growing body of mobile learning research.

Research Objectives

This study aims to achieve two primary objectives through empirical investigation:

1. To examine the effect of mobile learning quality on user satisfaction among Malaysian research students.
2. To determine the effect of each mobile learning quality dimension, namely system quality, information quality, and service quality, on user satisfaction among Malaysian research students.

LITERATURE REVIEW

Mobile Learning in Higher Education

Mobile learning, or m-learning, has become an important component of higher education as digital technologies continue to reshape teaching, learning, and research practices. Unlike conventional classroom-based learning, mobile learning enables students to access educational resources, communicate with instructors and peers, and participate in learning activities regardless of time and location through mobile devices such as smartphones, tablets, and laptops (Crompton & Burke, 2018; Sung, Chang, & Liu, 2016). The flexibility and accessibility offered by mobile learning support independent learning, collaborative engagement, and continuous knowledge acquisition among university students.

The rapid development of wireless communication technologies, cloud computing, learning management systems, digital libraries, and mobile applications has further accelerated the adoption of mobile learning across higher education institutions. Previous systematic reviews have shown that mobile learning research in higher education has expanded significantly, with increasing attention given to learning achievement, engagement, collaboration, and user experience (Crompton & Burke, 2018; Fu & Hwang, 2018; Naveed et al., 2023). Similarly, Sophonhiranrak (2021) highlighted that mobile learning is influenced by factors such as learner readiness, learning design, system accessibility, and institutional support, indicating that the success of mobile learning depends not only on technology availability but also on how effectively it supports learning needs.

More recently, the integration of artificial intelligence (AI)-enabled tools has further expanded the role of mobile learning in higher education. AI-supported applications, including intelligent writing assistants, generative AI tools, personalized learning systems, and academic support platforms, have created new opportunities for students to retrieve information, generate ideas, improve writing, and support knowledge development. Studies on generative AI in education suggest that such tools can enhance productivity, support personalized learning, and assist students in complex academic tasks, although their use also requires digital literacy, ethical awareness, and critical evaluation of information quality (Dwivedi et al., 2023; Kasneci et al., 2023). Therefore, mobile learning is no longer limited to content access but increasingly functions as part of a broader digital learning ecosystem that supports academic and research activities.

For research students, mobile learning plays an even more significant role because their learning extends beyond formal classroom instruction. Research students frequently rely on mobile technologies to search scholarly databases, review literature, communicate with supervisors, collaborate with research teams, organize references, and access AI-assisted tools that facilitate academic writing and knowledge synthesis. The flexibility provided by mobile learning enables research activities to be conducted across different environments while

maintaining continuous access to digital academic resources. Consequently, mobile learning has become an integral platform that supports research productivity, lifelong learning, and knowledge development within higher education institutions.

Despite its growing importance, the effectiveness of mobile learning depends not only on its availability but also on the quality of the learning environment provided. Students are more likely to benefit from mobile learning when the system is reliable, the information provided is accurate and relevant, and adequate technical and user support is available. Prior studies have shown that mobile and digital learning environments are most effective when they enhance learning performance, support engagement, and provide meaningful learning experiences (Sung et al., 2016; Crompton & Burke, 2018; Naveed et al., 2023). Therefore, evaluating the quality of mobile learning systems has become increasingly important for higher education institutions seeking to improve students' learning experiences and satisfaction.

Mobile Learning Quality

Mobile learning quality has become a critical factor in determining the effectiveness of digital learning environments in higher education. While advances in mobile technologies have increased the accessibility and flexibility of learning, the success of mobile learning depends largely on the quality of the system and the learning experience it provides. Universities increasingly integrate mobile applications, cloud-based platforms, and AI-enabled learning technologies into teaching and research activities, making the evaluation of mobile learning quality an important area of educational and information systems research. A high-quality mobile learning environment enables students to access reliable information, interact effectively with learning platforms, and receive adequate support throughout their learning process (Al-Fraihat et al., 2020; Naveed et al., 2023; Sophonhiranrak, 2021).

One of the most widely accepted theoretical frameworks for evaluating information system quality is the Information Systems Success Model (ISSM) proposed by DeLone and McLean (1992) and subsequently updated by DeLone and McLean (2003). The updated model identifies system quality, information quality, and service quality as three fundamental dimensions influencing user satisfaction and overall information system success. Over the past two decades, the model has been extensively applied to evaluate information systems, e-learning platforms, learning management systems, and mobile learning environments because of its ability to explain users' perceptions and experiences with digital technologies (Petter, DeLone, & McLean, 2008; Urbach & Müller, 2012). Recent studies continue to confirm the relevance of the ISSM in assessing digital learning quality within higher education settings (Almaiah & Alismaiel, 2019; Al-Fraihat et al., 2020).

Within the ISSM framework, system quality refers to the technical characteristics of a mobile learning platform, including reliability, usability, accessibility, response time, ease of navigation, and overall system performance. Information quality refers to the quality of learning content, encompassing its accuracy, relevance, completeness, timeliness, and usefulness in supporting learning and research activities. Service quality, meanwhile, reflects the effectiveness of technical support and assistance provided to users, including responsiveness, reliability, and the ability to resolve users' problems efficiently (DeLone & McLean, 2003; Petter et al., 2008). Together, these three dimensions determine users' perceptions of mobile learning quality and contribute to positive learning experiences.

Previous empirical studies have consistently reported positive relationships between mobile learning quality and user satisfaction. Almaiah and Alismaiel (2019) demonstrated that system quality, information quality, and service quality significantly influence students' satisfaction with mobile learning systems in higher education. Likewise, Al-Fraihat et al. (2020) concluded that high-quality digital learning environments improve user satisfaction and overall information system success. Similar findings have also been reported in studies examining e-learning and mobile learning systems across higher education institutions, suggesting that learners are more satisfied when digital platforms provide reliable system performance, relevant information, and responsive support services (Cidral, Oliveira, Di Felice, & Aparicio, 2018; Aparicio, Bacao, & Oliveira, 2017).

Despite these consistent findings, empirical evidence focusing specifically on Malaysian research students remains limited. Given that research students rely extensively on mobile learning technologies to support literature searching, academic writing, collaboration, and knowledge creation, further empirical investigation is required to better understand how mobile learning quality influences their satisfaction within the Malaysian higher education context.

Relationship between Mobile Learning Quality and User Satisfaction

The relationship between mobile learning quality and user satisfaction has been extensively examined within information systems, e-learning, and educational technology research. The Information Systems Success Model (ISSM) developed by DeLone and McLean (2003) posits that user satisfaction is primarily influenced by three quality dimensions: system quality, information quality, and service quality. According to the model, users are more likely to experience higher satisfaction when digital learning systems provide reliable system performance, accurate and relevant information, and responsive support services. Owing to its comprehensive framework, the ISSM has become one of the most widely adopted theoretical models for evaluating the success of e-learning, learning management systems, and mobile learning environments (Petter, DeLone, & McLean, 2008; Urbach & Müller, 2012).

A growing body of empirical evidence consistently demonstrates that mobile learning quality positively influences user satisfaction. Almaiah and Alismaiel (2019) reported that system quality, information quality, and service quality significantly enhanced students' satisfaction with mobile learning systems in higher education. Likewise, Al-Fraihat et al. (2020) found that these quality dimensions were among the strongest predictors of user satisfaction and overall e-learning success. Similar findings have been reported by Cidral et al. (2018) and Aparicio, Bacao, and Oliveira (2017), who concluded that students are more satisfied when digital learning platforms provide reliable system functionality, high-quality learning content, and effective technical support. Collectively, these studies suggest that user satisfaction is not determined by technological infrastructure alone but also by the overall quality of information and services supporting the learning process.

Recent developments in artificial intelligence, cloud computing, and mobile technologies have further transformed students' expectations of digital learning environments. AI-enabled learning applications, intelligent tutoring systems, and generative AI tools increasingly support academic writing, information retrieval, personalized learning, and knowledge creation. Consequently, research students expect mobile learning platforms not only to provide stable technical performance but also to deliver accurate, timely, and trustworthy academic information together with responsive user support. Recent studies have suggested that the successful integration of AI into higher education depends heavily on the quality, reliability, and usability of digital learning environments that facilitate effective learning experiences (Dwivedi et al., 2023; Kasneci et al., 2023; Tlili et al., 2023).

Despite the growing body of international literature, empirical evidence examining the relationship between mobile learning quality and user satisfaction among Malaysian research students remains limited. Most previous studies have concentrated on technology acceptance, behavioural intention, or general university students, with relatively few investigations focusing specifically on research students whose academic activities depend extensively on mobile learning technologies throughout the research process. Given the increasing reliance on AI-supported mobile learning for literature searching, academic writing, collaboration, and knowledge development, further empirical investigation is warranted. Accordingly, the present study examines the effects of system quality, information quality, and service quality on user satisfaction among Malaysian research students.

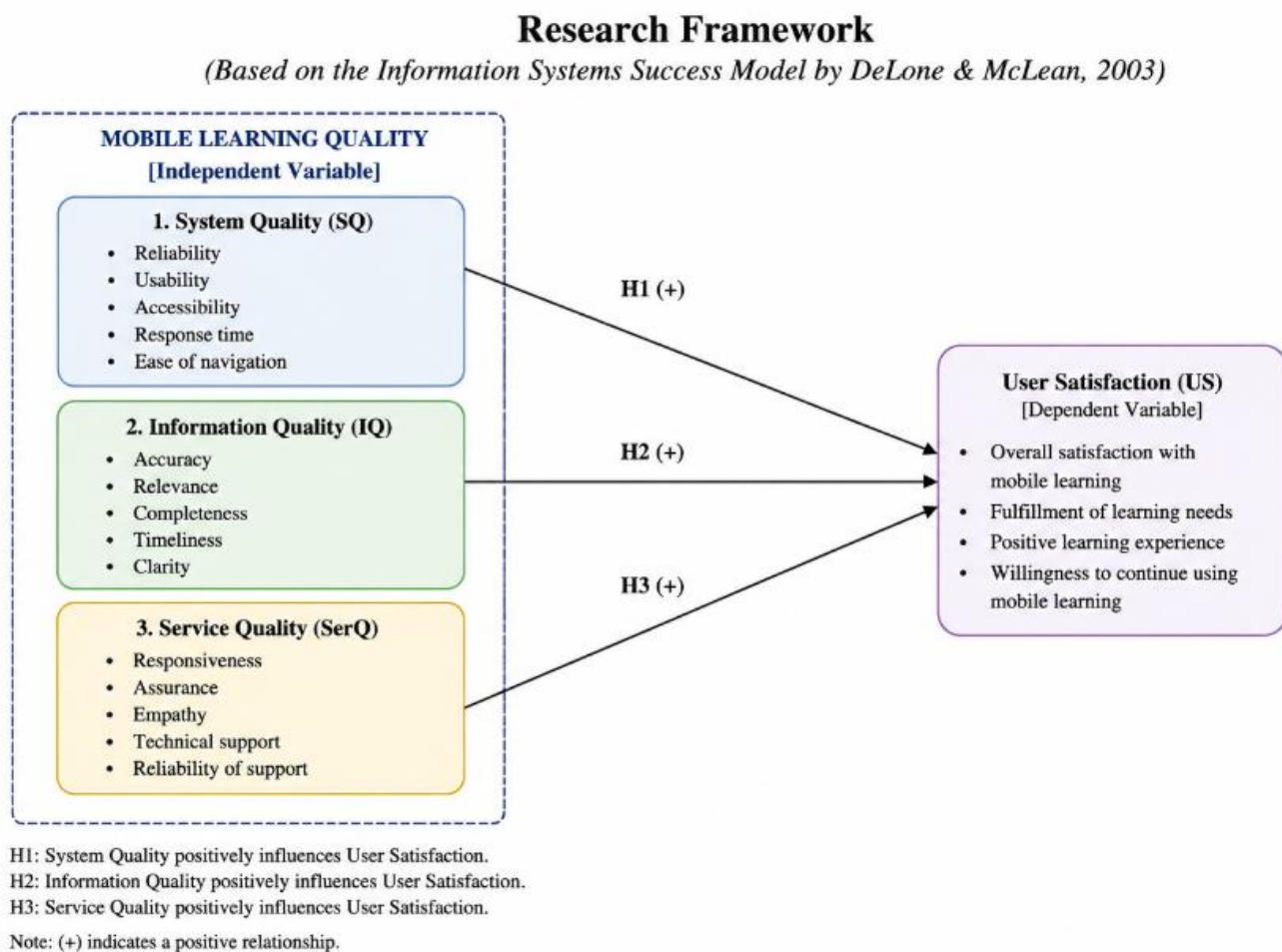
Research Framework and Hypotheses

The present study adopts the Information Systems Success Model (DeLone & McLean, 2003) as the underlying theoretical framework to examine the effect of mobile learning quality on user satisfaction among Malaysian research students. Consistent with the model, mobile learning quality is conceptualized through three

dimensions: system quality, information quality, and service quality. These dimensions are proposed to positively influence user satisfaction with mobile learning systems. Based on the literature reviewed, the research framework is presented in Figure 1. Accordingly, the following hypotheses are proposed:

- H1: System quality has a positive effect on user satisfaction among Malaysian research students.
H2: Information quality has a positive effect on user satisfaction among Malaysian research students.
H3: Service quality has a positive effect on user satisfaction among Malaysian research students.

Figure 1. Conceptual Framework



METHODOLOGY

This study employed a quantitative, cross-sectional research design to examine the effect of mobile learning quality on user satisfaction among Malaysian research students. Data were collected through a structured online questionnaire distributed to research students enrolled in Malaysian higher education institutions. A total of 249 valid responses were obtained and used for data analysis. The questionnaire consisted of two sections. The first section gathered respondents' demographic information, while the second measured the study constructs: system quality, information quality, service quality, and user satisfaction. All measurement items were adapted from established studies to ensure content validity and relevance to the mobile learning context. Responses were measured using a seven-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

The collected data were analysed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics were employed to summarise the respondents' demographic characteristics, while Cronbach's alpha was used to assess the internal consistency of the measurement scales. Pearson correlation analysis was conducted to examine the relationships among the study variables, followed by multiple regression analysis to

determine the effects of system quality, information quality, and service quality on user satisfaction. The measurement constructs adapted from DeLone & McLean (2003); Almaiah & Alismaiel (2019) and Al-Fraihat et al. (2020).

RESULTS

Respondent Profile

The demographic profile of the respondents is presented in Table 1. Of the 249 research students who participated in the study, 184 (73.9%) were female, while 65 (26.1%) were male, indicating that female respondents constituted most of the sample. In terms of age, most respondents were between 21 and 25 years old (64.3%), followed by those aged 26–30 years (13.7%). Respondents aged 41 years and above accounted for 10.0%, whereas those in the 31–35 years and 36–40 years age groups each represented 6.0% of the sample.

Regarding the frequency of AI tools usage, 47.4% of the respondents reported using AI tools daily, while 31.7% used them weekly. In addition, 17.3% indicated that they used AI tools occasionally, and only 3.6% reported rare usage. These findings indicate that the respondents were active users of AI-supported mobile learning technologies, supporting the suitability of the sample for investigating the relationship between mobile learning quality and user satisfaction.

Table 1. Demographic Profile of Respondents

Characteristic	Category	Frequency (n)	Percentage (%)
Gender	Male	65	26.1
	Female	184	73.9
Age Group	21–25 years	160	64.3
	26–30 years	34	13.7
	31–35 years	15	6.0
	36–40 years	15	6.0
	41 years and above	25	10.0
Frequency of AI Tools Usage	Daily	118	47.4
	Weekly	79	31.7
	Occasionally	43	17.3
	Rarely	9	3.6

Reliability Analysis

The internal consistency of the measurement scales was assessed using Cronbach's alpha, and the results are presented in Table 2 below. The Cronbach's alpha coefficients ranged from 0.829 to 0.949, indicating good to excellent internal consistency for all constructs. Specifically, System Quality recorded a Cronbach's alpha of 0.829, Information Quality achieved 0.893, Service Quality obtained 0.861, while User Satisfaction demonstrated the highest reliability with a coefficient of 0.949. According to Hair et al. (2019), Cronbach's alpha values exceeding 0.70 indicate acceptable reliability, whereas values above 0.80 reflect good internal consistency. Therefore, all measurement constructs were considered reliable and suitable for subsequent statistical analyses.

Table 2. Reliability Assessment of Measurement Construct

Construct	Number of Items	Cronbach's Alpha	Interpretation
System Quality	9	0.829	Good
Information Quality	8	0.893	Good
Service Quality	6	0.861	Good
User Satisfaction	7	0.949	Excellent

Correlation Analysis

Table 3 presents the descriptive statistics and Pearson correlation coefficients for the study variables. The mean scores ranged from 3.865 to 4.122, indicating that respondents generally reported favourable perceptions of mobile learning quality and user satisfaction. Among the four constructs, User Satisfaction recorded the highest mean score ($M = 4.122$, $SD = 0.705$), while Information Quality had the lowest mean ($M = 3.865$, $SD = 0.629$).

The Pearson correlation analysis revealed that all three dimensions of mobile learning quality were positively and significantly correlated with user satisfaction ($p < 0.001$). Information Quality exhibited the strongest relationship with user satisfaction ($r = 0.754$), followed by Service Quality ($r = 0.712$) and System Quality ($r = 0.664$). These findings indicate that higher perceptions of system quality, information quality, and service quality are associated with higher levels of user satisfaction among Malaysian research students. The significant positive correlations provide preliminary support for the proposed hypotheses and justify the use of multiple regression analysis to further examine these relationships.

Table 3. Descriptive Statistics and Pearson Correlation Matrix

Variable	Mean	SD	1	2	3	4
1. System Quality	4.087	0.574	1			
2. Information Quality	3.865	0.629	.717**	1		
3. Service Quality	3.898	0.605	.708**	.792**	1	
4. User Satisfaction	4.122	0.705	.664**	.754**	.712**	1

Regression Analysis

Multiple regression analysis was conducted to examine the effects of system quality, information quality, and service quality on user satisfaction among Malaysian research students. The regression model was statistically significant ($F = 132.678$, $p < .001$) and explained 61.9% of the variance in user satisfaction ($R^2 = 0.619$; Adjusted $R^2 = 0.614$). The Durbin–Watson statistic (1.967) indicated that the assumption of independent errors was satisfied. Information Quality emerged as the strongest predictor of user satisfaction ($\beta = 0.434$, $p < .001$), followed by Service Quality ($\beta = 0.237$, $p < .001$) and System Quality ($\beta = 0.185$, $p = .002$). All three predictors were statistically significant, supporting the proposed hypotheses.

Table 4. Regression Analysis

Predictor	β	t	p-value	VIF
System Quality	0.185	3.094	.002	2.309
Information Quality	0.434	6.261	< .001	3.084
Service Quality	0.237	3.470	< .001	3.004

Model Statistics: $R = 0.787$, $R^2 = 0.619$, Adjusted $R^2 = 0.614$, $F = 132.678$, $p < .001$, Durbin–Watson = 1.967.

DISCUSSION

The present study examined the effect of mobile learning quality on user satisfaction among Malaysian research students based on the Information Systems Success Model (DeLone & McLean, 2003). The findings indicate that system quality, information quality, and service quality all have significant positive effects on user satisfaction. These results support the Information Systems Success Model, which proposes that users' satisfaction with an information system is influenced by the quality of the system, the information it provides, and the services that support its use. The regression model further demonstrated that the three dimensions of mobile learning quality collectively explained 61.9% of the variance in user satisfaction, indicating that mobile learning quality is an important determinant of students' satisfaction within higher education.

Among the three dimensions, information quality emerged as the strongest predictor of user satisfaction. This finding suggests that research students place greater importance on receiving accurate, relevant, reliable, and up-to-date information when using mobile learning platforms. Unlike undergraduate students, research students frequently engage in literature reviews, academic writing, information retrieval, and knowledge synthesis. Consequently, the quality of information provided through mobile learning systems plays a crucial role in supporting their academic and research activities. This finding is consistent with Almaiah and Alismaiel (2019), who reported that information quality significantly enhances students' satisfaction with mobile learning systems. Similarly, Al-Fraihat et al. (2020) found that high-quality learning content contributes substantially to user satisfaction and the overall success of digital learning environments.

The findings also revealed that service quality positively influenced user satisfaction. This indicates that responsive technical support, reliable services, and timely assistance contribute to positive learning experiences among research students. As mobile learning increasingly incorporates cloud-based platforms and AI-enabled technologies, users expect efficient support services to ensure uninterrupted access to learning resources. This result is consistent with previous studies that identified service quality as an important factor influencing satisfaction with e-learning and mobile learning systems (Al-Fraihat et al., 2020; DeLone & McLean, 2003).

Furthermore, system quality was found to have a significant positive effect on user satisfaction, although its influence was smaller than information quality and service quality. This suggests that research students consider system stability, accessibility, usability, and ease of navigation to be essential prerequisites for effective mobile learning. However, once acceptable system performance has been achieved, the quality of academic information appears to become the primary factor shaping overall satisfaction. This finding supports the Information Systems Success Model and reinforces previous empirical evidence reported by Almaiah and Alismaiel (2019), who concluded that high-quality mobile learning systems improve students' learning experiences and satisfaction.

Overall, the findings demonstrate that enhancing mobile learning quality requires higher education institutions to focus not only on developing technically reliable systems but also on ensuring the availability of high-quality learning content and responsive support services. These improvements are particularly important for research students, whose academic activities depend heavily on continuous access to reliable digital information and mobile learning technologies.

CONCLUSION AND FUTURE RESEARCH

This study examined the effect of mobile learning quality on user satisfaction among Malaysian research students based on the Information Systems Success Model (ISSM). The findings revealed that system quality, information quality, and service quality all have significant positive effects on user satisfaction, with information quality emerging as the strongest predictor. These findings reinforce the proposition of the ISSM that the quality of digital learning systems is a fundamental determinant of user satisfaction and highlight the importance of providing reliable mobile learning platforms, accurate academic information, and responsive support services to enhance students' learning experiences.

The study contributes to the growing body of knowledge on mobile learning by extending the application of the ISSM to the context of Malaysian research students, a population that has received relatively limited empirical attention. The findings also provide practical implications for higher education institutions, educators, system developers, and policymakers by emphasizing the need to continuously improve the quality of mobile learning environments as universities increasingly integrate artificial intelligence (AI)-enabled technologies into teaching, learning, and research. Enhancing the quality of mobile learning systems is expected to support not only students' satisfaction but also their research productivity, knowledge acquisition, and lifelong learning.

Although the present study provides valuable empirical evidence, several opportunities remain for future research. Future studies may incorporate additional variables, such as AI readiness, digital literacy, trust in AI-

enabled technologies, self-directed learning, or perceived usefulness, to develop a more comprehensive understanding of user satisfaction in mobile learning environments. In addition, comparative studies involving different student populations, higher education institutions, or cross-country settings would improve the generalisability of the findings. Future researchers are also encouraged to employ longitudinal designs or structural equation modelling to further examine the complex relationships among mobile learning quality dimensions and user satisfaction over time.

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