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Understanding E-Learning Satisfaction Through Technology Acceptance Model: A Case Study of Edlink Implementation at Sahid University

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Abstract: Good electronic resources and student-lecturer interaction are essential to improve student satisfaction during online learning; e-learning satisfaction is a multifaceted construction that significantly affects student engagement and retention in online learning environments. This study aims to examine and evaluate a four-variable model, including E-learning, Perceived Ease of Use, E-learning Satisfaction, and Perceived Usefulness. Quantitative methods are used to test scales, research models, and hypotheses. These include testing scale reliability, testing the validity and consistency of the scale, and Structural Equation Modeling (SEM) for hypothesis testing. The sample used was an active student of the Faculty of Economics and Business in the odd semester of 2023/2024 who had used Edlink at Sahid University. The object was chosen because Sahid University has an e-learning site, namely Edlink, that supports teaching and learning activities and is already running. One hundred thirty-eight questionnaires were distributed directly through Google Forms to students who had used Edlink. The data analysis technique in this study uses SEM with SmartPLS version 4. Through the evaluation of the measurement model with a loading factor of >0.70 , Composite Reliability > 0.70 , Cronbuc's Alpha >0.70 and Average variances Extracted >0.50 . Then, we use the hypothesis test with Bootstrapping to determine the direct and indirect influences. The results of the study showed that there was an Effect of Perceived Ease of Use on E-learning satisfaction, No Effect of Perceived Usefulness on E-learning satisfaction, Effect of E-Learning on Perceived Ease of Use, Effect of E-Learning on Perceived Usefulness, Perceived Ease of Use did not mediate the Effect of E-Learning on E-learning satisfaction, Perceived Usefulness mediated the Effect of E-Learning on E-learning satisfaction.

Keywords: E-Learning, Perceived Ease of Use, E-learning satisfaction, Perceived Usefulness

INTRODUCTION

E-learning has emerged as a transformative educational paradigm, leveraging information and communication technology advances to facilitate learning anytime and anywhere. This mode of education has gained traction due to its ability to overcome traditional barriers of space and time, allowing for a more flexible learning environment (Bibi et al., 2024; Lau, 2023). The COVID-19 pandemic has further accelerated the adoption of e-learning technologies, requiring a robust approach to ensure adequate education delivery (Qiao et al., 2021; Shokouhifar & Pilevari, 2022). Research shows that the effectiveness of e-learning is influenced by various factors, including technological competence, social influence, and the quality of the e-learning system (Abbad, 2021; Oyetade et al., 2023; Siregar, 2022). In addition, integrating multimedia and interactive tools improves student engagement and learning outcomes, making e-learning a necessity and a preferred teaching method in many contexts (Ahmad & Seandy, 2024; Alwendi et al., 2023). As educational institutions continue to adapt, a focus on developing robust e-learning frameworks remains essential to maximize the benefits of this innovative approach (Dehbi et al., 2023).

Perceived ease of use (PEOU) is an important construct in the Technology Acceptance Model (TAM), which argues that users are more likely to adopt technology if they believe it is easy to use. This belief significantly influences their intention to use various technologies, including online services and e-learning platforms (Ajibade & Zaïdi, 2023; Park et al., 2023). Research shows that PEOU influences user behavioral intentions and mediates the relationship between perceived usability and actual use (Nature et al., 2023; Mailizar, Burg et al., 2021). For example, studies have shown that higher perceived ease of use positively correlates with user satisfaction and loyalty in online environments, such as e-commerce and online learning (Kurniawan & Tankoma, 2023; Wilson et al., 2021). In addition, ease of use increases the perceived effectiveness of educational technology, thereby increasing student engagement and learning outcomes (He et al., 2023; Iriani & Nugraheni, 2023). These findings underscore the importance of designing user-friendly systems to facilitate adoption and maximize the benefits of technological innovation across multiple domains (Drueke et al., 2021; Liu, 2023).

Perceived Usefulness (PU) is a fundamental Technology Acceptance Model (TAM) component. It states that users are more likely to embrace technology if they believe it improves their performance or learning outcomes. In education, many studies have established a strong correlation between perceived Usefulness and intention to use e-learning platforms (Alyoussef, 2021; Ibrahim & Shiring, 2022; Zheng et al., 2023). Research shows that when educators find helpful technology, they are more likely to adopt it for instructional purposes, thereby increasing teaching effectiveness (Ibrahim & Shiring, 2022; Zheng et al., 2023). In addition, perceived usability is influenced by various factors, including the quality of the e-learning system and the relevance of the content provided (Mailizar, Burg et al., 2021; Mensah et al., 2022). Studies have shown that higher-quality e-learning leads to increased perceived usability, positively influencing user attitudes and intentions to continue using these platforms (Mailizar, Burg, et al., 2021). In addition, the role of control and scaffolding of learners in improving perceived usability has been highlighted, showing that when learners feel in control of their learning process, they perceive technology as more beneficial (Al-Dokhny et al., 2021). Thus, understanding and improving the perceived Usefulness is essential to promote adopting and sustainable use of e-learning technology in higher education (Nayanajith & Damunupola, 2021).

E-learning satisfaction is a multifaceted construct significantly affecting student engagement and retention in an online learning environment. Research shows that various factors contribute to e-learning satisfaction, including system quality, perceived usability, student interaction, and overall quality of educational content (Auliana et al., 2023; Merrydian et al., 2023; Sari et al., 2024). Good electronic resources and student-lecturer interaction are

essential to increase student satisfaction during online learning (Auliana et al., 2023). Similarly, the quality of e-learning systems is directly related to student satisfaction, as highlighted by Merrydian, who noted that improving the quality of e-learning leads to increased satisfaction levels (Merrydian et al., 2023). Additionally, instructors' responsive role and feedback are crucial in shaping student satisfaction with online teaching, especially during the COVID-19 pandemic (Keržič et al., 2021). Studies have also shown that facilitating conditions, such as technology and infrastructure support, significantly impact student satisfaction and their intention to continue using e-learning platforms (Ejdys, 2022; Gilavand et al., 2024). Overall, understanding these factors is essential for educational institutions aiming to improve their e-learning offerings' effectiveness and student outcomes (Chang et al., 2023; Spring et al., 2022).

The rapid development of information and communication technology has changed many aspects of life, including education. During these changes, education policies integrating online learning methods have become a relevant and strategic topic. This policy is driven by the need to provide broader access to education, flexibility in learning, and efficiency in delivering educational materials. The change in the educational paradigm is increasingly evident with the development of information technology. In various countries, *online learning* has been implemented as a complement or replacement for conventional methods. Online learning is emerging as an innovative solution to address conventional educational challenges like geographic, time, and resource limitations.

The COVID-19 pandemic has further accelerated the adoption of this method worldwide, including in Indonesia. Social restrictions and school closures have forced educational institutions worldwide to shift the teaching and learning process from face-to-face to online. Applications such as Zoom, Google Meet, and Learning Management Systems (LMS) are integral in supporting the sustainability of education during times of crisis (Alenezi, 2020). Today, although face-to-face learning is being implemented again, online learning systems remain relevant due to their high flexibility and accessibility. In addition, online learning also supports lifelong learning, which is one of the primary needs in the era of globalization. Implementing online learning is inseparable from challenges, such as technological access gaps, student motivation, and curriculum adaptation. Therefore, a deep understanding of this system's characteristics, benefits, and challenges is essential to optimize its future implementation.

The online learning system or e-learning is an educational approach that utilizes digital technology to deliver teaching materials via the Internet. This method allows students and teachers to interact without space and time limitations, allowing students and educators to utilize devices such as laptops, tablets, and smartphones to access learning resources anytime and anywhere (Hussein, 2016). Multimedia capabilities connected to the Internet make it easier to get information in teaching and learning activities (Al-Azawei et al., 2017). In this digital era, online learning is an effective alternative to improve educational accessibility. The quality of education must adapt to technological developments, where IT and communication have played many roles (Turnbull et al., 2021). Online learning answers the needs of the modern generation, which wants flexibility in learning. This method allows students to adjust their study schedules to other activities, including work or family responsibilities. However, despite its various benefits, *online learning* faces significant challenges (Gunawardena & Dhanapala, 2023). The digital divide is one of the main problems where not all students and educators can access adequate technological devices or stable internet connections. This creates a gap between those who can follow *online learning* well and those who have difficulty accessing it (Kaymak & Horzum, 2022).

In today's digital era, Sahid University students are individuals who can master computers or have good computer literacy. Sahid University has implemented an online learning system, using Edlink as a forum for teaching and learning. Although the University

has provided a forum through the Edlink portal, not all lecturers use this media in teaching and learning activities. In this case, the existence of lecturers is one of the biggest motivations for students to use Edlink because almost all courses can be accessed through Edlink. Edlink can be used to access learning materials, discussion or question-and-answer forums, quizzes, exams, and communication using Zoom or Google Meet through Edlink. The existence of tools or systems that are easier to use will encourage individual self-confidence to use them (De Smet et al., 2012). This can happen if students see e-learning products as having great uses in lectures run by students. The confidence level in improving learning outcomes can affect the intensity of e-learning use (Harris, 2017).

Online learning, especially at the Faculty of Economics and Business, Sahid University, has its characteristics and challenges. In conventional learning, some courses are made as practical courses. During the Covid-19 pandemic, all theoretical and practical courses must be delivered online or virtually. Therefore, online learning carried out by the Faculty of Economics and Business at Sahid University needs to be further studied after the COVID-19 pandemic regarding the expectations of online learning felt from the student's point of view. Therefore, the formulation of the problem in this study is whether e-learning at the Faculty of Economics and Business, Sahid University, has met students' expectations regarding benefits and ease of use. From the formulation of the problem described above, the purpose of this study is to analyze the implementation of e-learning at the Faculty of Economics and Business, Sahid University, and whether it has met the expectations of students in terms of benefits and ease of use.

This study aims to examine and evaluate a four-variable model, including E-Learning, Perceived Ease of Use, E-learning Satisfaction, and Perceived Usefulness.

METHOD

Quantitative methods are used to test scales, research models, and hypotheses, which include testing scale reliability, testing the validity and consistency of the scale, and Structural Equation Modeling (SEM) for hypothesis testing. The sample used was an active student of the Faculty of Economics and Business in the odd semester of 2023/2024 who had used Edlink at Sahid University. The object was chosen because Sahid University has an e-learning site, namely Edlink, that supports teaching and learning activities and is already running. One hundred thirty-eight questionnaires were distributed directly through Google Forms to students who had used Edlink.

The exogenous variable used is the application of e-learning (Edlink) with 3 (three) dimensions, namely: 1) System Quality (F. D. Davis, 1989; DeLone & McLean, 2003); 2) Quality of Learning (Garrison et al., 1999; Merrill, 2009); 3) Interaction and Support (Moore, 2001; Zaharias & Poylymenakou, 2009). The endogenous variables used were perceived Usefulness, ease of use, and student satisfaction. In education, the technology acceptance model (TAM) for investigating the technology adoption process continues to increase (Huang et al., 2019).

The Technology Acceptance Model (TAM) is a framework developed to understand and explain how users accept and use new technologies. This model is an adaptation of the Theory of Reasoned Action (TRA) introduced by Fishbein and Ajzen in 1975, where there are two primary constructs, namely Perceived Usefulness (PU) and Perceived Ease of Use (PEU) (Prieto et al., 2017). Perceived Usefulness is a state in which a person believes that using a system can improve their performance, which consists of 4 (four) dimensions, namely 1) Increased productivity, 2) Work effectiveness, 3) Perceived benefits, and 4) Overall performance. Meanwhile, Perceived Ease of Use is a state when individuals believe that no hard work is required in using the system, which consists of 4 (four) dimensions, namely 1) Ease of learning the system, 2) Clarity of interaction, 3) Flexibility of use; 4) Ease of attaining

membership (F. Davis, 1987). TAM can determine the readiness of the group to implement basic computer technology in its activities (Alomary & Woollard, 2015). All variables were measured using a questionnaire with a 5-point Likert scale, which was included in the category of strongly disagreeing (1) to strongly agreeing (5).

RESULT AND DISCUSSION

The evaluation of the outer model is based on reliability, convergent validity, and discrimination validity. The reliability of the indicators is the square of the loading of each indicator, which should be above 0.7, but for exploratory research, a value of 0.4 or more is still acceptable (Hulland, 1999). Reliability is checked using a composite reliability (CR) value of 0.7 or higher. If it is exploratory research, 0.6 or higher is acceptable. (Bagozzi and Yi, 1988). The validity of the convergence is verified using the average of the extracted variance (AVE) by each construct, and the value must exceed the variance due to a measurement error for that construct. AVE should be 0.5 or higher (Bagozzi & Yi, 1988). Table 1 summarizes the results of the outer model test where all criteria have been met.

Table 1. Summary of Reflective Outer Models Results

	Loading Factor	t statistic	P values	CA	CR	AVE
EL01	0,82	16,06	0,000	0,94	0,95	0,64
EL02	0,80	20,62	0,000			
EL03	0,81	21,58	0,000			
EL04	0,71	8,96	0,000			
EL05	0,82	15,48	0,000			
EL06	0,81	13,76	0,000			
EL07	0,84	17,52	0,000			
EL08	0,86	19,17	0,000			
EL09	0,87	20,15	0,000			
EL10	0,67	9,56	0,000			
EL11	0,75	11,78	0,000			
ES01	0,72	10,75	0,000	0,87	0,90	0,61
ES02	0,80	12,46	0,000			
ES03	0,72	11,17	0,000			
ES04	0,85	15,93	0,000			
ES05	0,75	8,11	0,000			
ES06	0,84	12,26	0,000			
PE01	0,81	17,37	0,000	0,69	0,81	0,52
PE02	0,63	5,31	0,000			
PE03	0,62	4,94	0,000			
PE04	0,79	14,21	0,000			
PU01	0,84	22,01	0,000	0,85	0,90	0,69
PU02	0,73	10,52	0,000			
PU03	0,85	18,77	0,000			
PU04	0,90	37,02	0,000			

There are several indicators with a load of less than 0.7. However, the researcher decided not to remove it from the model because, according to Bagozzi and Yi (1988), a loading value of 0.6 is acceptable if it meets the criteria of Composite Reliability and Discriminant Validity (Fornell-Larcker criterion). The table shows that all variables meet the Composite Reliability (CR) criteria, whose value is above 0.7, and meet the Average Variance Extract (AVE) criteria above 0.5.

For Cronbach's Alpha (CA), which is a measure of internal reliability or consistency to measure how closely related a group of items/indicators are in a construct, in this model, it is a good criterion (0.8-0.9), except for PE variables that are slightly below the minimum limit of 0.7.

Tabel 2. Fornell-Larcker Criterion

	PE	PU	EL	ES
PE	0,718			
PU	0,657	0,831		
EL	0,588	0,707	0,798	
ES	0,632	0,636	0,676	0,782

The analysis of the discrimination validity using the Fornell-Larcker criterion shows that this research model has a good measurement

Overall, the correlation patterns between constructs ranging from 0.588 to 0.707 show that although the constructs in the model are interconnected, they retain their respective conceptual uniqueness. This reinforces the belief that this research instrument can measure different aspects of the digital learning experience well.

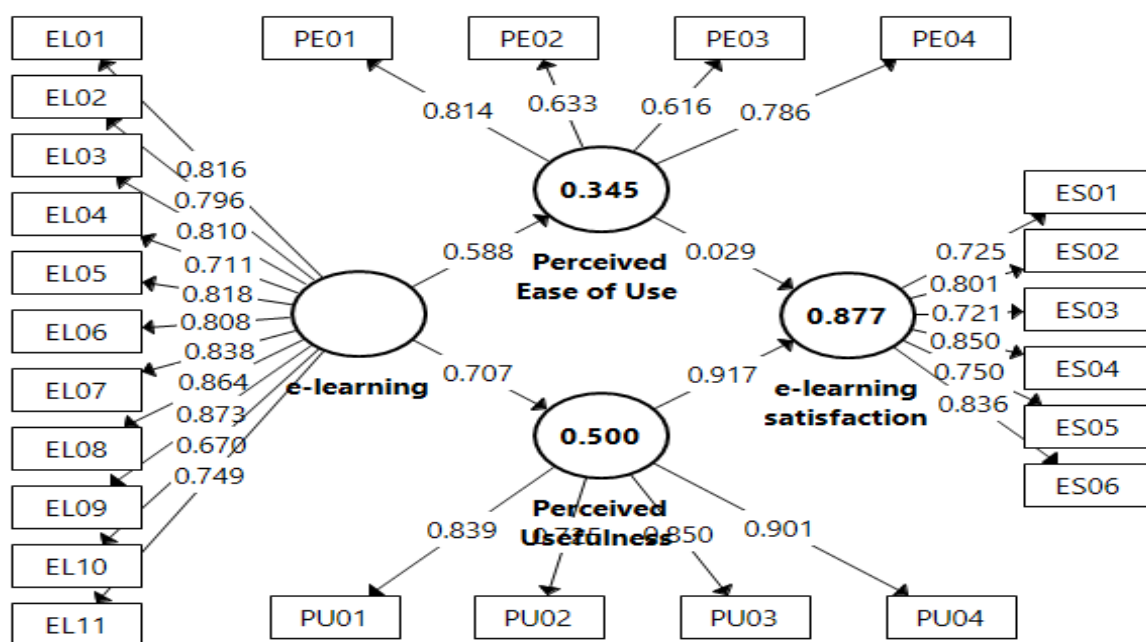


Figure 1. Research Model

Direct Effect

The coefficients of direct paths of influence between variables are summarized in the following table :

Table 3. Coefficient of Direct Path of Influence Between Variables

	Original Sample (O)	Sample Mean (M)	STDEV	t Statistics	P Values
Perceived Ease of Use -> e-learning satisfaction	0,029	0,030	0,039	0,757	0,450
Perceived Usefulness -> e-learning satisfaction	0,917	0,918	0,027	33,574	0,000
e-learning -> Perceived Ease of Use	0,588	0,605	0,070	8,362	0,000
e-learning -> Perceived Usefulness	0,707	0,717	0,053	13,380	0,000

The results of the path analysis in this research model show the relationship between variables in the e-learning *context*.

1. The relationship between Perceived Ease of Use and e-learning satisfaction showed very small ($\beta = 0.029$) and insignificant ($t = 0.757, p = 0.450$) path coefficients. This indicates that the ease of use of the system does not have a significant direct influence on e-learning user satisfaction.
2. Perceived Usefulness strongly and significantly influences e-learning satisfaction ($\beta = 0.917, t = 33.574, p < 0.001$). These findings show that the perception of the system's usability is the dominant factor affecting user satisfaction in e-learning. The R Square value = 0.500 indicates that the e-learning variable can explain 50% of the variation in the perception of usability. In comparison, the other 50% is influenced by variables not included in the model.
3. Furthermore, e-learning showed a positive and significant influence on both perception variables. The effect on Perceived Ease of Use was quite strong ($\beta = 0.588, t = 8.362, p < 0.001$), and the effect on Perceived Usefulness was even more potent ($\beta = 0.707, t = 13.380, p < 0.001$). The R Square value = 0.877 indicates excellent predictive ability, where Perceived Ease of Use and Perceived Usefulness can explain 87.7% of the variation in e-learning usage satisfaction, with only 12.3% explained by other factors.

These findings imply that the success of e-learning implementation is more determined by users' benefits than the ease of use. An e-learning system perceived as applicable will be more likely to result in user satisfaction, regardless of ease of use.

Indirect Effect

The coefficients of indirect influence paths between variables are summarized in the following table:

Tabel 4. Coefficients of Indirect Influence Paths Between Variables

	Original Sample (O)	Sample Mean (M)	STDEV	t Statistics	P Values
e-learning -> Perceived Ease of Use -> e-learning satisfaction	0,017	0,018	0,024	0,725	0,469
e-learning -> Perceived Usefulness -> e-learning satisfaction	0,649	0,659	0,054	12,074	0,000

The results of the mediation effect analysis in this research model show the following patterns:

1. The mediation pathway through the perceived ease of use was insignificant ($p > 0.05$). This means that the perception of ease of use does not effectively mediate the influence of e-learning on user satisfaction.
2. There was a substantial mediation effect ($p < 0.05$) through the perception of Usefulness. That is, the influence of e-learning on user satisfaction is substantially mediated by the perception of the system's usability. This has implications for the success of e-learning in increasing user satisfaction, which depends mainly on how the system is perceived as valuable by its users.

Discussion

The first hypothesis that perceived ease of use positively affects e-learning satisfaction is well supported. Studies show that perceived ease of use significantly affects user satisfaction and behavioral intent towards e-learning platforms. The perceived ease of use is important in student acceptance and satisfaction with online education classes during the COVID-19 pandemic (Han & Sa, 2022). Similarly, perceived usability and ease of use correlate positively with user satisfaction in e-learning (Han & Sa, 2022). Further supporting this, Zheng et al. assert that perceived ease of use increases perceived usability, affecting the intention to continue using the e-learning platform (Zheng et al., 2023). In addition, Iriani and Nugraheni highlighted that ease of use directly affects students' perception of the effectiveness of online learning technology, reinforcing the relationship between ease of use and satisfaction (Iriani & Nugraheni, 2023). Overall, evidence suggests that increasing perceived ease of use of e-learning systems can increase user satisfaction.

The second hypothesis that perceived Usefulness positively affects e-learning satisfaction is well supported by empirical evidence. The perceived Usefulness mediates the relationship between the compatibility of online methods and overall satisfaction with e-learning platforms, which shows an important role in improving student satisfaction (Rucsanda et al., 2021). Similarly, Kholifah et al. showed that perceived usability significantly moderated the impact of e-learning readiness on student satisfaction, suggesting that a higher perception of usability led to greater satisfaction among users of learning management systems (Kholifah et al., 2022). In addition, Auliana's study highlights that perceived usability is one of the key factors influencing student satisfaction during online learning, in addition to other elements such as content and learning interaction (Auliana et al., 2023). Thus, the study of Xuân et al. also confirmed a positive relationship between perceived usability and user satisfaction, reinforcing the idea that when students find e-learning useful, their satisfaction levels increase (Xuân et al., 2022). These findings underscore the importance of perceived Usefulness in increasing e-learning satisfaction, suggesting that educational institutions should focus on improving the perceived utility of their online offerings.

Various studies support the third hypothesis that e-learning positively affects ease of use. For example, Mailizar et al. found that perceived ease of use is influenced by user experience with e-learning systems, suggesting that as users become more familiar with these platforms, their perception of ease of use increases (Mailizar, Almanthari et al., 2021). Similarly, Mensah et al. showed that perceived ease of use significantly predicted perceived usability, suggesting that when students found e-learning systems easy to navigate, they were more likely to find them useful (Mensah et al., 2022). Additionally, Ismiyati et al. highlighted that the ease of use of mobile learning apps during the COVID-19 pandemic had a positive impact on students' intentions to use these technologies, reinforcing the idea that perceived ease of use is essential for user engagement (Ismiyati et al., 2021). In addition, Zheng et al. emphasized that perceived ease of use affects perceived usability and increases the intention to continue using e-learning platforms (Zheng et al., 2023). These findings suggest that increasing the perceived ease of use of e-learning systems can lead to greater user satisfaction and engagement.

Hipotesis keempat bahwa e-learning secara positif memengaruhi kegunaan yang dirasakan well supported by empirical research. Ngabiyanto et al. showed that the experience of using the e-learning system significantly improves the perceived usability as users become more familiar with the technology (Ngabiyanto et al., 2021). Similarly, Mailizar et al. found that teachers' e-learning experience directly affects perceived ease of use and usability, suggesting that increased exposure to e-learning platforms leads to a higher perception of their utility (Mailizar, Almanthari et al., 2021). Furthermore, Mensah et al. highlighted the role of technical support in improving perceived usability and ease of use, pointing out that an

adequate support system can improve user perception of the benefits of e-learning (Mensah et al., 2022). Ramasamy's study also supports this idea, showing that students' attitudes towards e-learning are positively influenced by their perception of its Usefulness, which is crucial for their intention to use the system (Ramasamy et al., 2023). These findings suggest that improving the e-learning experience significantly improves user perceptions of its Usefulness, thereby driving greater adoption and satisfaction.

The fifth hypothesis that perceived ease of use does not mediate the effect of e-learning on e-learning satisfaction is supported by various studies. Latifa et al. found that while perceived ease of use affects perceived usability, the latter has a much more significant impact on student satisfaction in blended learning environments, suggesting that perceived ease of use may not serve as a significant mediator in this context (Laifa et al., 2023). Similarly, Nuryakin et al. pointed out that while perceived ease of use and perceived usability both affect student satisfaction, the mediating role of perceived usability is not emphasized, implying that perceived usability may be a more direct influence on satisfaction (Nuryakin et al., 2023). In addition, Ismiyati et al. highlighted that perceived ease of use and perceived usability contribute to customer satisfaction but did not establish the mediating effect of perceived ease of use on the relationship between e-learning and satisfaction (Ismiyati et al., 2021). In addition, Khan et al. noted that perceived ease of use and perceived usability are important factors in determining behavioral intent but found no evidence to support the mediation of perceived ease of use in e-learning satisfaction outcomes (Khan et al., 2023). These findings collectively suggest that while perceived ease of use is important, it may not mediate the relationship between e-learning and satisfaction.

The sixth hypothesis, which is that perceived Usefulness mediates the influence of e-learning on e-learning satisfaction, is supported by various studies. Rucsanda et al. found that perceived Usefulness significantly mediated the relationship between e-learning method compatibility and student satisfaction, suggesting that when students perceived e-learning as applicable, their satisfaction increased (Rucsanda et al., 2021). Similarly, Chang's research highlights the statistically significant mediating effect of e-learning quality on student satisfaction, reinforcing that perceived Usefulness is important in improving satisfaction outcomes in e-learning environments (Chang et al., 2023). Furthermore, Zardari et al. noted that satisfaction is a mediator between various factors, including perceived Usefulness and behavioral intent, suggesting that perceived Usefulness is an integral part of the overall satisfaction derived from the e-learning experience (Zardari et al., 2021). In addition, the findings of Widjaja and Widjaja confirm that perceived usability significantly affects perceived satisfaction and that both constructions directly affect the intention to continue using the e-learning system (Widjaja & Widjaja, 2022). These studies underscore the importance of perceived Usefulness as a mediating factor in the relationship between e-learning and e-learning satisfaction.

CONCLUSION

Implementing online learning using the Edlink platform at the Faculty of Economics and Business, Sahid University, supports the teaching and learning process, especially during the COVID-19 pandemic. This study found that perceived Usefulness is the main factor that affects student satisfaction with e-learning, compared to perceived ease of use. This shows that e-learning systems that are considered beneficial can be more effective in increasing user satisfaction, in this case, students. This study uses the TAM (Technology Acceptance Model) model to evaluate the acceptance rate of e-learning technology by students, with the results showing that system quality, learning, and interaction are important elements in creating an adequate learning experience. Thus, the successful implementation of e-learning at Sahid University depends on efforts to improve the perception of usability and ensure equitable

accessibility of technology for all students. Strategic steps to optimize Edlink must also be taken so that more lecturers and students take full advantage of the platform.

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