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Evaluating User Interfaces in E-Learning Satisfaction Using EUCS Method

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ABSTRACT

This study investigates how User Interface elements affect student satisfaction with E-Learning platforms among junior high school, senior high school, and vocational high school students in Medan by adopting the End User Computing Satisfaction model augmented with a dedicated User Interface quality construct. It examines Content, Accuracy, Format, Ease of Use, Timeliness, and overall Interface Perception as predictors of End User Computing Satisfaction. Data were gathered via questionnaires administered to students actively using E-Learning applications across these three school levels in Medan and Structural Equation Modeling was employed to explore the complex interrelationships among these constructs. Results reveal that Accuracy, Format, Ease of Use, and Timeliness each exert positive and significant influences on perceived Interface quality, with Ease of Use contributing most strongly, while Content presentation alone does not significantly affect perceptions. Furthermore, perceived Interface quality demonstrates a very strong and significant impact on End User Computing Satisfaction. These findings indicate that in the context of Medan's junior high school, senior high school, and vocational high school digital learning environments, intuitive usability, clear visual formatting, information accuracy, and prompt delivery are critical drivers of student satisfaction. This study underscores the need for E-Learning developers and educational policymakers to prioritize intuitive, reliable, and responsive interface designs and recommends that future research broaden sample coverage to additional regions, compare multiple E-Learning platforms, and adopt longitudinal designs to capture how Interface element effects on student satisfaction evolve over time.

INTRODUCTION

The role of Information Technology (IT) is crucial in supporting the learning process and enhancing its effectiveness, whether conducted digitally, online, or offline (Purwanto & Deden Hedin, 2020). Online learning (E-Learning) has become commonplace(Syafi'ah, Nambo, & Tahyudin, 2021). E-Learning has transformed traditional face-to-face learning into a more flexible approach (Wijaya, Solikhatin, & Tahyudin, 2021), providing access to various resources such as E-Books, assignment submission platforms, and interactive communication between teachers and students through collaborative and real-time digital platforms (Syafi'ah et al., 2021). Along with the increasing use of technology in education, research conducted by Maheshwari (Maheshwari, 2021) emphasizes that technology plays a significant role in online learning. One of the key components of educational technology is the User Interface. An intuitive and responsive User Interface can facilitate system use, enhance motivation, engagement, and efficiency for both students and teachers. Conversely, a poorly designed User Interface can hinder user acceptance and decrease engagement. However, there are two main challenges in ensuring that the User Interface supports user satisfaction. The first challenge is the subjective nature of user perceptions, which are influenced by individual backgrounds, visual preferences, and personal ways of interacting with the system (Kala, Shanker Chaubey, Kumar Meet, & Samed Al-Adwan, 2024). The second challenge lies in the complexity of the interaction between various User Interface elements such as visualization, navigation, and responsiveness which makes it difficult to determine the exact contribution of each element to overall user satisfaction (Gunawan, Anthony, Vendly, & Anggreainy, 2021). Secondary school is a critical phase marked by increasingly complex challenges as students mature (Jie, 2021). According to research by Zuo et al. (Zuo, Liu, Hu, Zhang, & Luo, 2021), secondary school students exhibit a high level of engagement in E-Learning. A study conducted by Agustang et al. (har, Agustang, Adam, & Upe, 2021) found that students' ability to use E-Learning varies according to their level of education. Among high school students, the ability level is 71.21%, vocational high school students 69.41%, junior high school students 62.90%, and elementary school students 54.03%.

Several previous studies serve as references for this research. The first study, conducted by Kala et al. (Kala et al., 2024), analyzed E-Government websites using the TAM method and the ISSM framework to evaluate the quality of the User Interface in terms of design, ease of use, accessibility, reliability, and responsiveness. The findings indicated that a good User Interface can enhance user satisfaction, although there were limitations in the visual design aspects

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such as icons, layout, and typography. The study also highlighted a gap in understanding Perceived Ease of Use and barriers to access caused by the digital divide and internet connectivity issues. The second study, conducted by Gunawan et al. (Gunawan et al., 2021), explored the development of User Interfaces in supporting IT transformation in E-Commerce, focusing on page layout, system flow, and color selection that is comfortable for users. However, the study did not compare the display on smartphones and computers, nor did it address accessibility issues such as text and button sizes. Further research is recommended to assess the speed and ease of the shopping process as well as the impact of User Interface design on purchasing decisions. According to research by Felix et al. (Felix & Rembulan, 2023), which analyzed factors influencing customer experience, engagement, and loyalty in e-commerce through interviews, the results showed that content personalization, ease of navigation, and loyalty programs are crucial to user satisfaction. Users expect a User Interface that aligns with their preferences.

Based on the studies by Kala et al.(Kala et al., 2024), Gunawan et al. (Gunawan et al., 2021), and Felix et al. (Felix & Rembulan, 2023), the importance of User Interface has been evaluated in the contexts of E-Government and E-Commerce. These studies found a positive relationship between User Interface quality and user satisfaction. However, they have not specifically isolated the individual elements of the User Interface within the context of digital education, particularly E-Learning. Therefore, although the general relationship between User Interface and user satisfaction is well established, there remains a research gap in analyzing the specific contributions of individual UI elements to user satisfaction in the context of online learning.

To address these challenges, this research will employ the End User Computing Satisfaction (EUCS) method developed by Doll and Torkzadeh. The End User Computing Satisfaction (EUCS) is specifically designed to assess end-user satisfaction with information systems through five primary dimensions: Content, Accuracy, Format, Ease of Use, and Timeliness (Fadli Robby & Mauritsius, 2023) Research conducted by Syafi'ah et al. (Syafi'ah et al., 2021) indicates that EUCS is more appropriate than other methods such as HOT-FIT, TAM, and UTAUT for evaluating user satisfaction in digital learning systems, as it is specifically oriented towards the direct satisfaction aspects of end users. Although EUCS has been utilized in studies (Syafi'ah et al., 2021), there has yet to be research examining the impact of User Interface elements on user satisfaction within e-learning platforms.

Therefore, this study aims to thoroughly evaluate the influence of User Interface elements on user satisfaction in the context of e-learning platforms, particularly among high school students, using the EUCS method. This research is expected to contribute theoretically by filling the research gap regarding specific User Interface analysis in the context of digital education, as well as providing practical guidance for the development of more effective User Interfaces in e-learning platforms. Based on the aforementioned, this research is conducted under the title " Evaluating User Interfaces in E-Learning Satisfaction Using EUCS Method"

LITERATURE REVIEW

E-Learning

E-Learning is an educational system that utilizes information and communication technology to support the teaching and learning process (Syafi'ah et al., 2021). This innovation has become one of the most significant breakthroughs in modern education. E-Learning can be defined as an educational method that leverages technology for the purpose of delivering knowledge, facilitating the learning process, and enhancing performance. One of the key advantages of E-Learning is the flexibility it offers, allowing students to engage in learning either with a teacher or independently. Additionally, E-Learning provides students with the freedom to determine their own learning schedules and methods according to their preferences (de Souza Rodrigues, Chimenti, & Nogueira, 2021). There are two types of learning in E-Learning: synchronous and asynchronous learning. Synchronous learning takes place in real time, where instructors and learners can interact directly even from a distance. Asynchronous learning, on the other hand, allows learners to access materials, complete assignments, and participate in discussions at their own convenience without needing to be online at the same time as the instructor.

There are several E-Learning methods that can be used to enhance the quality of learning. First, Online Collaborative Learning is a method that facilitates interaction and collaboration between students and teachers by utilizing digital technology and social media. Second, Blended Learning integrates face-to-face and online learning to create a more effective learning experience. Third, the Flipped Classroom approach uses digital materials before class begins, allowing face-to-face time to be focused on deeper discussions. Fourth, Gamification incorporates game elements into digital learning to boost student motivation. Fifth, Digital Storytelling is a learning method that uses digital technology to craft engaging and interactive narratives or stories, helping to deliver content more effectively and meaningfully. With these various methods, E-Learning can become more effective, flexible, and enjoyable for learners (Al-Hail, Zguir, & Koç, 2023).

EUCS (End User Computing Satisfaction)

EUCS (End-User Computing Satisfaction) is a method developed by Doll and Torkzadeh in 1988, used to measure user satisfaction with information systems (Purwanto & Deden Hedin, 2020). EUCS focuses on the perception of end users regarding the quality of the system they use, including how they feel and emotionally respond during

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interactions with the system (Deng, Liu, Yang, & Duan, 2022) User satisfaction measured through EUCS serves as one of the key indicators in evaluating the success of an information system implementation (Purwanto & Deden Hedin, 2020). In its development, Doll and Torkzadeh identified five main factors that contribute to measuring user satisfaction: Content, Accuracy, Format, Ease of Use, and Timeliness. These factors reflect various critical aspects of an information system that directly influence users' perceptions and experiences when using the system(Fadli Robby & Mauritsius, 2023). The dimensions of the EUCS model are illustrated in Figure 1 (Arifin et al., 2021).

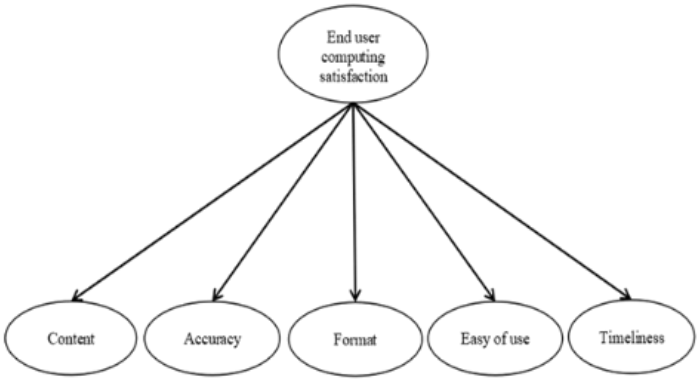

Figure 1. End User Computing Satisfaction (1991)

User Interface

The User Interface serves as the bridge between users and software. It consists of three main components such as, visualization, navigation, and responsiveness. Each component plays a different role visualization aims to present aesthetics and attract attention, navigation organizes the flow of interaction, and responsiveness ensures a smooth user experience. The complexity of interactions among these components arises due to two-way feedback. Complex visual elements can increase cognitive load and reduce responsiveness, while smooth and fast animations can enhance the perceived quality of the interface. Adjustments to the navigation structure, such as adding menu layers, can affect both the visual layout and system performance. This interdependency creates a challenge in research, as any change to one UI component almost always impacts the others, making it difficult to isolate and measure the individual contribution of each component to overall user satisfaction (har et al., 2021).

User perception of a system's interface is intrinsic and strongly influenced by individual characteristics. A user's background including education level, digital literacy, and geographic context such as urban, semi-urban, or rural areas shapes how they interpret and utilize system functions. Additionally, visual preferences related to color schemes, font size and type, layout, and iconography affect comfort and ease of navigation. Users with higher technological experience tend to appreciate efficient minimalist designs, while novice users often require clearer visual guidance. Furthermore, the way individuals access and use the system whether through websites, mobile applications, or based on their purpose such as seeking information, performing tasks, or submitting complaints also contributes to their level of satisfaction and trust in the service. Therefore, interface design must be tailored to the diverse profiles and needs of users to ensure an inclusive, efficient, and satisfying user experience (Zuo et al., 2021).

METHOD

This study employs a quantitative approach using the survey method to collect data. In the initial stage, a literature review was conducted, followed by the development of a questionnaire aligned with the research objectives. The questionnaire was then distributed to respondents to gather the necessary data. Once the data was collected, a thorough testing and analysis process was carried out to draw the final conclusions of the study. The stages of this research process are illustrated in Figure 2.

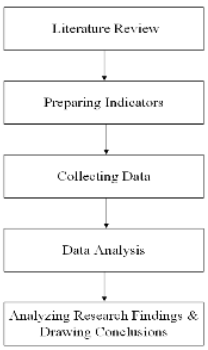

Figure 2. Research Methodology

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Conceptual Model and Research Hypotheses

The researcher conducted a literature review to develop an appropriate conceptual model. After reviewing various previous studies, the EUCS method was selected because it evaluates user satisfaction in digital learning systems, with a specific focus on direct end-user satisfaction. An additional variable, namely the User Interface, was included to thoroughly assess the influence of User Interface elements on user satisfaction in the context of e-learning platforms, particularly among secondary school students in the city of Medan.

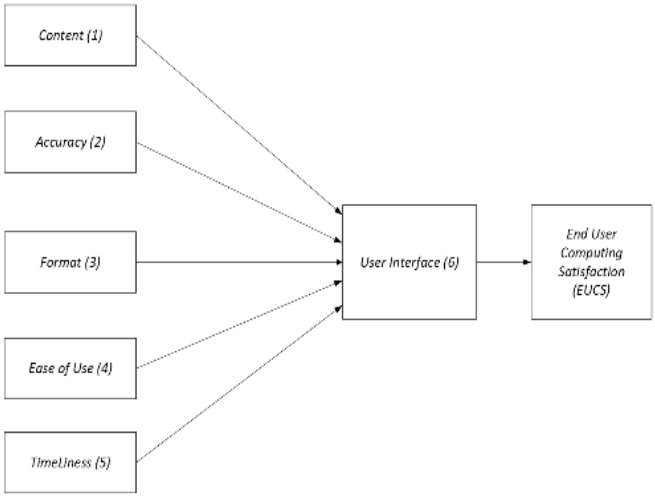

Figure 3. Conceptual Model

Based on the conceptual model presented in Figure 2, the following hypotheses are proposed: Content has a positive influence on the User Interface (H1), Accuracy has a positive influence on the User Interface (H2), Format has a positive influence on the User Interface (H3), Ease of Use has a positive influence on the User Interface (H4), Timeliness has a positive influence on the User Interface (H5), and the User Interface has a positive influence on user satisfaction (H6).

Population and Sample

The population in this study consists of educators and secondary school students in the city of Medan who utilize E-Learning applications. The sampling method applied is purposive sampling, with the criteria being respondents who are E-Learning users in Medan, including both students and secondary-level educators. Since the population size cannot be determined, the Lemeshow formula is used to calculate the minimum sample size, with the calculation as follows (Durach, Kembro, & Wieland, 2021).

$$n = \frac{Z^2 x\, P(1-P)}{d^2}$$

Description:
n = required sample size
Z = confidence level of 95% (1.96)
P = expected population proportion of 0.5
d = alpha (0.5) sampling error (5%)

By applying the Lemeshow formula, this study can determine the minimum required sample size through the following calculation (Durach et al., 2021).

$$n = \frac{(1{,}96)^2 x\ 0{,}5(1-0{,}5)}{(0{,}05)^2} = 384.16 \text{ rounded to } 385$$

Data Collections Methods

Data were collected through a standardized questionnaire survey distributed to the sample population to obtain responses (Tiong & Palmqvist, 2023). The questionnaire serves as a tool to measure the research sample by using the Likert scale to assign weights to respondents' answers. This scale is used to measure satisfaction, perceptions, or individual attitudes toward an object. The scores and answer categories on the Likert scale can be found in the table (Ponsiglione et al., 2022).

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Table 1. Questionnaire Answer Score

Answer Type	Score
Strongly Agree	5
Agree	4
Undecided	3
Disagree	2
Strongly Disagree	1

Analysis Technique

This study employs two statistical methods, namely multiple regression and structural equation modeling (SEM) using the SmartPLS 3.2.9 software. This approach aims to assess the influence of several factors, including content, accuracy, format, ease of use, timeliness, and user interface on user satisfaction related to the use of e-learning platforms in the context of students and teachers at the secondary school level.

RESULT

Respondent Overview

Based on the questionnaires received, it can be concluded that the largest number of respondents came from Telkom 1 Vocational High School Medan, with 43 individuals or approximately 10% of the total sample. State Senior High School 12 Medan accounted for 41 respondents (9.65%), followed by State Senior High School 13 Medan with 36 respondents (8.47%). State Senior High School 10 Medan and State Senior High School 4 Medan each had 35 respondents (8.24%), while Pertiwi Medan Junior High School contributed 33 respondents (7.76%). Additionally, State Senior High School 2 Medan and State Senior High School 5 Medan contributed 31 respondents (7.29%) and 30 respondents (7.06%), respectively. Other schools, such as State Vocational High School 9 Medan, had 22 respondents (5.18%), while both State Vocational High School 8 Medan and State Vocational High School 7 Medan each had 16 respondents (3.76%). There were also contributions from Unggul Bina Kasih Nusantara Senior High School with 16 respondents (3.76%) and Multi Karya Vocational High School Medan with 14 respondents (3.29%). The remaining schools contributed between 1 and 10 respondents each, indicating a fairly even participation from various senior high schools (SMA), vocational high schools (SMK), and junior high schools (SMP) across Medan. Thus, Telkom 1 Vocational High School Medan exhibited the highest participation rate, followed by State Senior High School 12 Medan, State Senior High School 13 Medan, State Senior High School 10 Medan, State Senior High School 4 Medan, and Pertiwi Medan Junior High School, as presented in Table 2.

Table 2. Respondent Characteristics

Level	School of Origin	Amount	Percentage	Overall Percentage
Junior High School	Pertiwi Medan Junior High School	33	7.76%	9.88%
	Sultan Iskandar Muda Junior High School	3	0.71%	
	Taman Siswa Junior High School Medan	2	0.47%	
	Muhammadiyah 19 Medan Junior High School	1	0.24%	
	State Junior High School 2 Medan	1	0.24%	
	State Junior High School 30 Medan	1	0.24%	
	State Junior High School 34 Medan	1	0.24%	
Senior High School	State Senior High School 12 Medan	41	9.65%	60.71%
	State Senior High School 13 Medan	36	8.47%	
	State Senior High School 10 Medan	35	8.24%	
	State Senior High School 4 Medan	35	8.24%	
	State Senior High School 2 Medan	31	7.29%	
	State Senior High School 5 Medan	30	7.06%	
	Harapan Mandiri Senior High School Medan	27	6.35%	
	Unggul Bina Kasih Nusantara Senior High School	16	3.76%	
	Sultan Iskandar Muda Senior High School	2	0.47%	
	Primbana Senior High School Medan	1	0.24%	
	Santo Thomas 2 Medan Senior High School	1	0.24%	
	Santo Thomas 3 Medan Senior High School	1	0.24%	
	Al-Ulum Senior High School Medan	1	0.24%	
	State Senior High School 15 Medan	1	0.24%	
Vocational High School	Telkom 1 Vocational High School Medan	43	10.12%	29.18%
	State Vocational High School 9 Medan	22	5.18%	
	State Vocational High School 8 Medan	16	3.76%	
	State Vocational High School 7 Medan	16	3.76%	
	Multi Karya Vocational High School Medan	14	3.29%	

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	Sultan Iskandar Muda Vocational High School	10	2.35%	
	Pencawan Vocational High School Medan	1	0.24%	
	State Vocational High School 2 Medan	1	0.24%	
	Panca Budi Vocational High School Medan	1	0.24%	
Total		425	100%	100%

Descriptive Statistics Results

Descriptive statistical data is used to provide an overview of the research variables included in this study. These variables comprise Content, Accuracy, Format, Timeliness, Ease of Use, User Interface, and End User Computing Satisfaction. The descriptive statistical results are documented in Table 3 below:

Table 3. Descriptive Statistics Results

Variable	Indicator	Answer (%)					Mean
		1	2	3	4	5	
Content	CON1.1	0	3	20	60	342	4,74
		0,00%	0,71%	4,71%	14,12%	80,47%	
	CON1.2	0	1	19	114	291	4,64
		0,00%	0,24%	4,47%	26,82%	68,47%	
	CON1.3	1	1	21	88	314	4,68
		0,24%	0,24%	4,94%	20,71%	73,88%	
	CON1.4	1	3	21	90	310	4,66
		0,24%	0,71%	4,94%	21,18%	72,94%	
Accuracy	ACC2.1	0	3	23	94	305	4,65
		0,00%	0,71%	5,41%	22,12%	71,76%	
	ACC2.2	0	1	23	76	325	4,71
		0,00%	0,24%	5,41%	17,88%	76,47%	
	ACC2.3	1	10	33	68	313	4,60
		0,24%	2,35%	7,76%	16,00%	73,65%	
	ACC2.4	0	1	32	73	319	4,67
		0,00%	0,24%	7,53%	17,18%	75,06%	
	ACC2.5	0	2	25	77	321	4,69
		0,00%	0,47%	5,88%	18,12%	75,53%	
	ACC2.6	0	0	20	82	323	4,71
		0,00%	0,00%	4,71%	19,29%	76,00%	
	ACC2.7	0	0	23	103	299	4,65
		0,00%	0,00%	5,41%	24,24%	70,35%	
	ACC2.8	0	2	23	76	324	4,70
		0,00%	0,47%	5,41%	17,88%	76,24%	
Format	FOR3.1	0	1	23	78	323	4,70
		0,00%	0,24%	5,41%	18,35%	76,00%	
	FOR3.2	1	2	24	75	323	4,69
		0,24%	0,47%	5,65%	17,65%	76,00%	
	FOR3.3	0	0	24	72	329	4,72
		0,00%	0,00%	5,65%	16,94%	77,41%	
	FOR3.4	0	3	20	84	318	4,69
		0,00%	0,71%	4,71%	19,76%	74,82%	
Easy Of Use	EOU4.1	0	1	20	66	338	4,74
		0,00%	0,24%	4,71%	15,53%	79,53%	
	EOU4.2	0	3	25	77	320	4,68
		0,00%	0,71%	5,88%	18,12%	75,29%	
	EOU4.3	0	1	24	67	333	4,72
		0,00%	0,24%	5,65%	15,76%	78,35%	
	EOU4.4	0	1	24	77	323	4,70
		0,00%	0,24%	5,65%	18,12%	76,00%	
	EOU4.5	0	2	27	67	329	4,70
		0,00%	0,47%	6,35%	15,76%	77,41%	
Timeliness	TIM5.1	0	2	28	89	306	4,64
		0,00%	0,47%	6,59%	20,94%	72,00%	
	TIM5.2	1	1	23	97	303	4,65
		0,24%	0,24%	5,41%	22,82%	71,29%	

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	TIM5.3	2 0,47%	3 0,71%	22 5,18%	103 24,24%	295 69,41%	4,61
	TIM5.4	0 0,00%	2 0,47%	24 5,65%	101 23,76%	298 70,12%	4,64
	UI6.1	0 0,00%	3 0,71%	27 6,35%	70 16,47%	325 76,47%	4,69
	UI6.2	0 0,00%	0 0,00%	23 5,41%	77 18,12%	325 76,47%	4,71
User Interface	UI6.3	0 0,00%	0 0,00%	18 4,24%	63 14,82%	344 80,94%	4,77
	UI6.4	1 0,24%	11 2,59%	36 8,47%	78 18,35%	299 70,35%	4,56
	UI6.5	1 0,24%	2 0,47%	28 6,59%	75 17,65%	319 75,06%	4,67
	EUCS7.1	1 0,24%	1 0,24%	25 5,88%	89 20,94%	309 72,71%	4,66
	EUCS7.2	0 0,00%	3 0,71%	25 5,88%	82 19,29%	315 74,12%	4,67
End User Computing Satisfaction	EUCS7.3	0 0,00%	1 0,24%	21 4,94%	70 16,47%	333 78,35%	4,73
	EUCS7.4	0 0,00%	0 0,00%	18 4,24%	73 17,18%	334 78,59%	4,74
	EUCS7.5	0 0,00%	0 0,00%	24 5,65%	89 20,94%	312 73,41%	4,68

Evaluation of Measurement Model

Within the context of the measurement model, an analysis was conducted to assess whether the collected data met the criteria for validity and reliability.

1. Convergent Validity Test

The factor loading values for each indicator, which are utilized to evaluate convergent validity, are presented in the Convergent Validity Test Path Diagram, as shown in Figure 4.

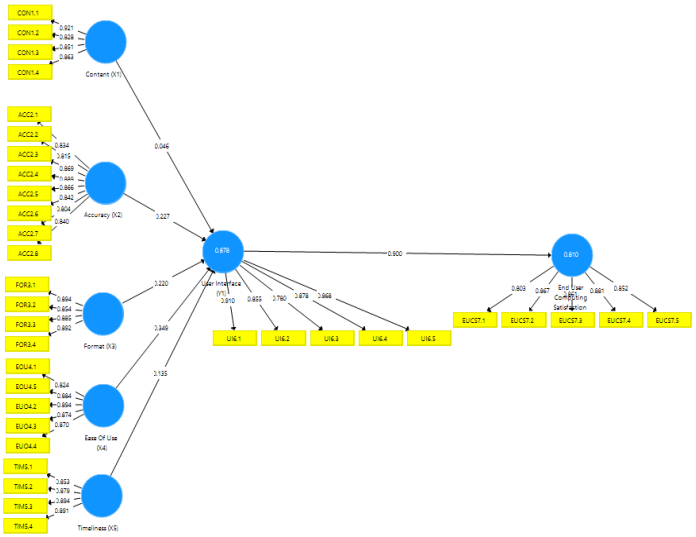

Figure 4 Convergent Validity Test Path Diagram

Referring to Figure 4, it can be seen that each indicator has a Loading Factor value exceeding 0.70. This indicates that all indicators meet the criteria for convergent validity. Therefore, it can be concluded that all indicators are valid in representing the measured constructs.

2. Discriminant Validity Test

The outcomes of the discriminant validity assessment, reflected through the cross-loading values for each variable, are presented in Table 4.

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Table 4. Cross Loading Value

Indicator	X1	X2	X3	X4	X5	Y1	Y2
CON1.1	0.921	0.837	0.795	0.796	0.754	0.789	0.821
CON1.2	0.828	0.698	0.669	0.672	0.632	0.667	0.707
CON1.3	0.851	0.767	0.737	0.734	0.686	0.734	0.745
CON1.4	0.863	0.769	0.769	0.733	0.702	0.717	0.764
ACC2.1	0.754	0.834	0.752	0.734	0.682	0.751	0.762
ACC2.2	0.734	0.815	0.760	0.771	0.688	0.722	0.753
ACC2.3	0.793	0.869	0.812	0.801	0.770	0.801	0.803
ACC2.4	0.784	0.889	0.821	0.810	0.762	0.802	0.808
ACC2.5	0.778	0.866	0.824	0.794	0.743	0.796	0.798
ACC2.6	0.739	0.842	0.782	0.785	0.732	0.773	0.771
ACC2.7	0.668	0.804	0.724	0.736	0.705	0.726	0.754
ACC2.8	0.748	0.840	0.787	0.795	0.714	0.769	0.782
FOR3.1	0.736	0.796	0.894	0.778	0.715	0.786	0.758
FOR3.2	0.765	0.809	0.854	0.768	0.733	0.767	0.794
FOR3.3	0.736	0.840	0.885	0.824	0.750	0.808	0.797
FOR3.4	0.791	0.822	0.892	0.809	0.771	0.804	0.798
EOU4.1	0.687	0.752	0.734	0.824	0.738	0.758	0.778
EUO4.2	0.784	0.833	0.821	0.894	0.772	0.806	0.811
EUO4.3	0.769	0.822	0.831	0.874	0.800	0.825	0.814
EUO4.4	0.705	0.799	0.757	0.870	0.766	0.792	0.791
EOU4.5	0.742	0.798	0.777	0.884	0.787	0.798	0.758
TIM5.1	0.726	0.763	0.752	0.793	0.853	0.794	0.773
TIM5.2	0.723	0.764	0.757	0.781	0.879	0.750	0.783
TIM5.3	0.689	0.753	0.727	0.780	0.894	0.750	0.773
TIM5.4	0.679	0.735	0.723	0.769	0.891	0.732	0.742
UI6.1	0.758	0.826	0.831	0.828	0.779	0.910	0.824
UI6.2	0.758	0.789	0.792	0.802	0.772	0.855	0.803
UI6.3	0.669	0.726	0.699	0.712	0.684	0.780	0.676
UI6.4	0.719	0.800	0.772	0.819	0.781	0.878	0.791
UI6.5	0.704	0.761	0.759	0.767	0.681	0.868	0.763
EUCS7.1	0.718	0.715	0.687	0.670	0.657	0.680	0.803
EUCS7.2	0.760	0.819	0.809	0.824	0.763	0.793	0.867
EUCS7.3	0.759	0.801	0.773	0.774	0.705	0.775	0.861
EUCS7.4	0.784	0.813	0.781	0.833	0.769	0.811	0.881
EUCS7.5	0.722	0.778	0.750	0.764	0.827	0.772	0.852

Based on the presented Table 4, the cross-loading values highlighted in gray indicate that the correlation between each indicator and its respective construct is higher than its correlation with other constructs. This demonstrates that each indicator has a stronger association with the variable it represents compared to other variables within the model. Therefore, it can be concluded that all indicators meet the criteria for discriminant validity and can be considered valid. Furthermore, Table 5 presents the AVE (Average Variance Extracted) values for each indicator at the variable level. An AVE value greater than 0.5 indicates that the achieved discriminant validity is adequate.

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Table 5. Average Variance Extracted (AVE) Value

Variabel	Average Variance Extracted (AVE)	Information
X1	0.750	Valid
X2	0.714	Valid
X3	0.777	Valid
X4	0.756	Valid
X5	0.773	Valid
Y1	0.739	Valid
Y2	0.728	Valid

Based on the results presented in Table 5, it is evident that the AVE (Average Variance Extracted) values for all variables examined in this study exceed the threshold of 0.5. This finding indicates that each variable has satisfied the criteria for adequate discriminant validity. Consequently, it can be concluded that all variables utilized in this study are considered valid.

3. Composite Reliability Test

Table 6 presents the Composite Reliability values for each indicator examined in this study.

Table 6. Composite Reliability Value

Variabel	Composite Reliability	Information
X1	0.923	Reliable
X2	0.952	Reliable
X3	0.933	Reliable
X4	0.939	Reliable
X5	0.932	Reliable
Y1	0.934	Reliable
Y2	0.930	Reliable

Structural Model Evaluation (Structural Model/Inner Model)

The results of the hypothesis testing are presented in Figure 5.

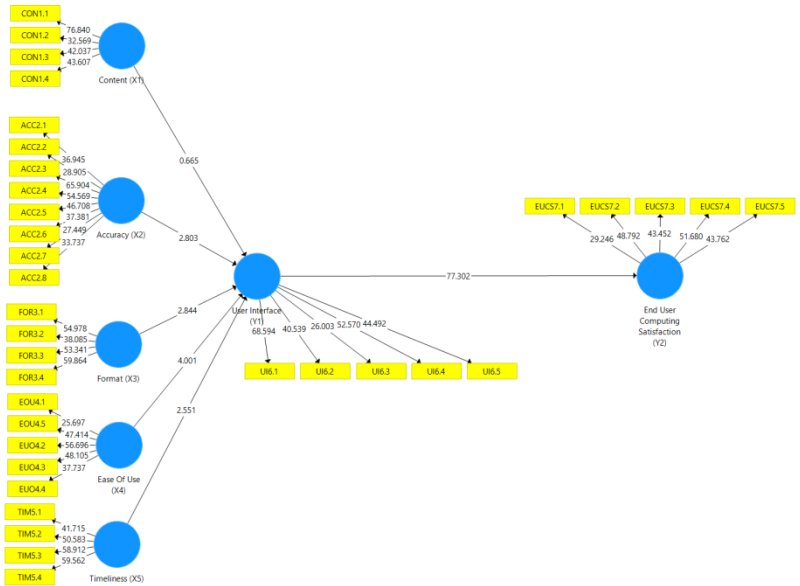

Figure 5. Path Diagram Results (Bootstraping)

Based on Figure 5, structural model testing is conducted using R Square R2 to assess the explanatory power of the dependent variables, the Stone Geisser Q Square test to evaluate predictive relevance, and bootstrapping to analyze the significance of path coefficients. A relationship between variables is considered significant and the hypothesis is accepted when the T statistic is greater than 1.96 and the p value is less than 0.05, while it is rejected when the T statistic is less than 1.96 or the p value is greater than 0.05.

The T statistics and path coefficients p values for both latent variables and moderation variables are summarized

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in Table 7.

Table 7. T-Statistics And Latent Variable Path Coefficient (P-Value)

Relationship between Variables	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values	Description
X1 -> Y1	0.046	0.047	0.069	0.665	0.506	Rejected
X2 -> Y1	0.227	0.227	0.081	2.803	**0.005**	Accepted
X3 -> Y1	0.220	0.214	0.077	2.844	**0.004**	Accepted
X4 -> Y1	0.349	0.351	0.087	4.001	**0.000**	Accepted
X5 -> Y1	0.135	0.138	0.053	2.551	**0.011**	Accepted
Y1 -> Y2	0.900	0.900	0.012	77.302	**0.000**	Accepted

DISCUSSION

Accuracy (X2) has a positive effect on User Interface (Y1)

The hypothesis testing results show that the Accuracy (X2) variable has a T-Statistics value of 2.803, which exceeds the critical value of 1.960, and a P-Value of 0.005, which is less than the significance level of 0.05. This indicates that the proposed hypothesis is accepted. In other words, the Accuracy (X2) variable has a positive effect on the User Interface (Y1), with a coefficient of 0.081, in the use of E-Learning by students at junior high schools, senior high schools, and vocational schools in the city of Medan.

Format (X3) has a positive effect on User Interface (Y1)

The hypothesis testing results show that the Format (X3) variable has a T-Statistics value of 2.844, which exceeds the critical value of 1.960, and a P-Value of 0.004, which is less than the significance level of 0.05. This indicates that the proposed hypothesis is accepted. In other words, the Format (X3) variable has a positive effect on the User Interface (Y1), with a coefficient of 0.077, in the use of E-Learning by students at junior high schools, senior high schools, and vocational schools in the city of Medan.

Ease of Use (X4) has a positive effect on User Interface (Y1)

The hypothesis testing results show that the Ease of Use (X4) variable has a T-Statistics value of 4.001, which exceeds the critical value of 1.960, and a P-Value of 0.000, which is less than the significance level of 0.05. This indicates that the proposed hypothesis is accepted. In other words, the Ease of Use (X4) variable has a positive effect on the User Interface (Y1), with a coefficient of 0.087, in the use of E-Learning by students at junior high schools, senior high schools, and vocational schools in the city of Medan.

Timeliness (X5) has a positive effect on User Interface (Y1)

The hypothesis testing results show that the Timeliness (X5) variable has a T-Statistics value of 2.551, which exceeds the critical value of 1.960, and a P-Value of 0.011, which is less than the significance level of 0.05. This indicates that the proposed hypothesis is accepted. In other words, the Timeliness (X5) variable has a positive effect on the User Interface (Y1), with a coefficient of 0.053, in the use of E-Learning by students at junior high schools, senior high schools, and vocational schools in the city of Medan.

User Interface (Y1) has a positive effect on End User Computing Satisfaction (Y2)

The hypothesis testing results show that the User Interface (Y1) variable has a T-Statistics value of 77.302, which exceeds the critical value of 1.960, and a P-Value of 0.000, which is less than the significance level of 0.05. This indicates that the proposed hypothesis is accepted. In other words, the User Interface (Y1) variable has a positive effect on End User Computing Satisfaction (Y2), with a coefficient of 0.012, in the use of E-Learning by students at junior high schools, senior high schools, and vocational schools in the city of Medan.

CONCLUSION

Research findings indicate that the variables Accuracy, Format, Ease of Use, and Timeliness exert positive and significant effects on the perceived quality of the User Interface in secondary-level E-Learning platforms in Medan, with Ease of Use making the strongest contribution. In contrast, the Content variable does not have a significant effect on User Interface perceptions. Furthermore, User Interface quality is shown to have a very strong and significant impact on End User Computing Satisfaction, underscoring the importance of a well-structured, user-friendly, accurate, and timely interface design for enhancing the satisfaction of junior high school, senior high school, and vocational high school students in E-Learning environments.

Theoretically, these findings fill a research gap by isolating the contributions of specific UI elements within the

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digital education context using the EUCS method. Practically, they offer guidance for E-Learning platform developers and school policymakers in designing more effective interfaces for secondary-level learners. For future research, it is recommended to broaden the sample scope to other regions, compare different E-Learning platforms, and conduct longitudinal studies to observe the dynamics of UI element influences on user satisfaction over time.

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