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The Influence of System Use and User Satisfaction as a Mediator of System Quality, Information Quality and E-Learning Service Quality on Benefits

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***Abstract*: This study aims to collect the information needed to form a conceptual model that will be used to measure the success of e-learning that has been applied to universities. The methodology used in this study is a literature study conducted by comparing several literacies sourced from scientific journals, books and expert opinions used as a reinforcement in supporting findings in research. Understanding the comparison between variables and the relationship between variables is a more in-depth study to find the variables that will later be used in this study. The conclusion of this study is a conceptual model that implements the use of systems and user satisfaction as mediating variables of the relationship between system quality, information quality and service quality to benefits in the use of e-learning. Furthermore, further research related to it may refer to this conceptual model in its implementation.**

***Keywords*: system quality, quality of information, service quality, system use, user satisfaction, benefit, e-learning, higher education.**

1. Introduction

The development of technology in the digital era as it is today that is growing faster over time has an immediate impact on the increase in the utilization of increasingly high technology. Information technology is expected to be very useful to shape activities and support decision making so that it can bring success to the activities carried out [1].

Indonesia as an archipelago country with a population of ±250 million people also felt the impact of the development of the technology. Including in terms of internet technology utilization, it is recorded that in 2021 as many as 73.7% of the total population in Indonesia have enjoyed and felt the benefits of using the internet (https://datareportal.com/reports/digital-2021-indonesia, February 11, 2021).

This makes investment in the field of information technology or information systems in almost all sectors very important, because information systems can play an important role in providing better services and competitive advantage [2]. This phenomenon is a challenge for organizations to increase success and monitor as well as evaluate the information system so that system users feel satisfied [3].

Currently, the use of information systems increase very rapid, the speed of information is indispensable to support activities, especially in the conditions of the Covid-19 pandemic [4]. Every day the number of citizens confirmed Covid-19 are increased, so the government implements a *physical distancing* policy. Including in terms of learning, the government needs to implement a distance learning model. Definitely, in order to support this policy, educational institutions must have a good *e-learning* system.

E-learning is a technology that can support online-based learning [5]. With this technology, it is possible for students and teachers to carry out the learning process without face to face. In this case, it is possible for students to obtain material through electronic media [6]. In addition, using *e-learning* learning model can save costs, time and travel [7]. It can also improve basic skills, hone creativity and increase students' insights [8].

Based on previous phenomena and research that have been conducted, researchers are interested in examining the effect of system quality variables, information quality, service quality on benefits through the use of systems and user satisfaction. This study aims to propose a conceptual model to evaluate the benefits of using *e-learning*.

2. Methodology

This research is a literature study. For a literature study, the researcher draws from the results of research that has been done in the past related to the success of the information system and the variables used to measure it. Literature study used for comparison of relationships between variables conducted by Yusof, M. M., & Yusuff, A. Y. A. (2013) [9]-[11], Utomo, L. T., Ardianto, Y. T., & Sisharini, N. (2017) [12], Sopalatu, H., Hidayatullah, S., & Respati, H. (2021) [13], Perwira, R. I. (2016) [14], Kutlu, B., & Alkaya, A. (2015) [15], Krisbiantoro, D., Suyanto, M., & Taufiqluthfi, E. (2015) [16], Hidayatullah,

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S., Khouroh, U., Windhyastiti, I., Patalo, R. G., & Waris, A. (2020) [4]. Other references both from journals and books are also used to support research. The comparative analysis method is used to compare articles to find suitable variables for use in designing conceptual models.

In this study, a questionnaire will be distributed which is a tool to collect data that aims to find out the opinions of respondents, the data is obtained from a sample of research with a predetermined amount.

3. Literature Study

In 1992 Delone and McLean proposed that measuring system output could be done by evaluating the quality of the system and the quality of information which was then associated with the use of actual and user satisfaction which would subsequently affect individual impacts and collectively the individual impacts would affect organizational impacts [17]. Then in 2006 Yusof introduced a new framework for evaluating information systems, the proposed hot-fit framework (Human, Organization and Technology-Fit), was developed to critically assess the findings. HOT-FIT combines the concepts of fit between people, organization and technology [10]. Initially hot-Fit WAS used to evaluate the health system, but in 2013 it began to be used to evaluate the *e-Government* system [9].

In previous studies, Anthony explained in his research results that service quality and system quality have a positive impact on user satisfaction and user intention. However, the quality of information does not have a positive effect on user satisfaction, while user satisfaction and intention to use have a positive effect [18]. In contrast to Krisbiantoro, Yusof and Utomo, explaining that system quality, information quality and service quality have a positive effect on user satisfaction and system use [9], [12], [16]. Perwira's research in 2016 and Abda 'u in 2018 sought to explain the different results that the quality of information and the quality of services did not have a positive effect on the use of the system and user satisfaction [14], [19]. Sopalatu's research explains that the quality of the system has a positive effect on user satisfaction [13]. Meanwhile, user satisfaction in Hidayatullah research in 2020 has a positive effect on benefits [4]. Wahyudi and Sopalatu use user satisfaction as a meditator to examine the relationship between the quality of the system and the quality of information on benefits [13], [20].

Finally, Kutlu & Alkaya test the relationship between system quality and service quality against benefits [15]. The result is that the quality of the system and the quality of the information have no positive effect on the benefits. Table 1 below shows some variables from previous studies used to measure the success of information systems.

Based on the literature study described above, the conceptual model that will be proposed in this study includes six variables, namely: system quality, information quality, service quality, system use, user satisfaction and benefits.

A. System Quality

System quality means that the system is easily accessible, able to answer problems and serve the timely needs of users, meet user expectations [15]. System quality is a measure of the extent to which system users feel that certain systems are comfortable to use, easy to understand, learn and connect and fun [21]. Measuring the quality of a system is usually related to measuring the reliability of features inherent to the system itself, including system performance and system interfaces and user interfaces.

In this study, the quality of the system is closely related to the student's experience while using *e-learning*. As the example: ease of use, ease of learning, ease of access and have a fast response time. In addition, the quality of the system will also affect user satisfaction and system usage [16]. Ease of use is referred to as the performance characteristic of the system [22]. These characteristics also relate to systems that are easy to use, easy to understand and easy to learn. Furthermore, it is related to flexibility, which is the ability of the system to respond effectively to changes in situations [23]. Some important things in the use of the system are that it can save time, reduce redundancy and can increase productivity [24]. Therefore, timeliness can also be used as one of the aspects that affect the quality of the system.

B. Information Quality

The quality of the information measures the quality of the output from the information system [25], [26]. Information quality is a function that concerns the value of the information output produced by the system [27]. It can be concluded that the quality of information is a measurement that focuses on the output produced by the system, as well as the output value for the user.

Measurement of information quality can be done in three ways, namely: Information must have certain accuracy, information must not arrive late and information must have appropriate usefulness [28]. Measurement of information quality relates to information that can be generated by the system, including transactions and reporting.

Table 1
Variabel yang digunakan dalam mengukur keberhasilan sistem informasi

Kutlu & Alkaya (2015)	**Perwira (2016)**	**Krisbiantoro (2015)**	**Utomo (2017)**	**Hidayatullah (2020)**	**Abda'u (2018)**
Quality System	Quality System	Quality System	Quality System	Quality System	Quality System
Information Quality	Information Quality	Information Quality	Information Quality	Information Quality	Information Quality
Service Quality	Service Quality	Service Quality	Service Quality	Service Quality	Service Quality
User Satisfaction	System Use	System Use	User Satisfaction	User Satisfaction	System Use
	User Satisfaction	User Satisfaction		Net Benefits	User Satisfaction
	Structure	Structure			Organization Structure
	Environment	Environment			Condition of Facilities
	Net Benefits	Net Benefits			Top Management Support
					Net Benefits

C. Quality Service

The quality of services in the field of higher education can be interpreted as the difference between expectations and experiences of students in higher education [29]. Service quality relates to the overall support provided by information system service providers, both services provided by internal and external parties of the organization. In terms of achieving educational goals, service quality can improve learning services through online media [30]. This becomes in strengthening the competitive advantage by providing additional something unique to increase user satisfaction [31].

Some of the key factors that can represent service quality in *e-learning* are: administration and support, instructor quality, accuracy, specialized materials and security [31]. Good quality of service can have a good impact on user satisfaction and system usage [14]. For the achievement of good information system services in education, one of them is by improving the quality of *e-learning* services. Improvement efforts can be made by evaluating based on students' experiences and perceptions.

D. System Use

The success of a system depends very much on the acceptance and use of individuals, from the measurement of acceptance and use can explain the level of satisfaction from the use of the system and have a direct impact on increasing the productivity of an organization [32]. The use of the system has a close relationship with who is using it, the level of its use, including in terms of training, knowledge, expectations and attitudes of the recipient [16].

After understanding the definition of the use of the system, according to experts, it can be concluded that the use of the system is a component that performs an assessment of the system by performing an overall evaluation based on the user's experience in using the information system.

E. User Satisfaction

In several studies on the evaluation of information systems, user satisfaction is widely used as a key indicator in measuring the success of information systems, especially in the world of education [24]. This can be measured in terms of user experience, functionality and usability [33]. E-Learning as a support tool is expected to improve and meet student learning objectives [34]. A good information system must be able to provide all information, functions and facilities that can support student learning. In other words, user satisfaction can be associated with the effectiveness of *e-learning* in carrying out functions to meet the needs of students [35], [36].

With a high level of user satisfaction will be able to benefit users and service providers [4]. In addition, the supporting factors of system quality satisfaction and service quality were used in previous studies to measure and evaluate *e-learning* affectivity [37]-[39].

F. Benefit

Benefit is the balance between positive and negative impacts seen from the user side, the greater the positive impact felt, the implementation of the system can be said to be successful [40]. Benefits can support increased decision making, increased productivity, increased sales, reduced costs, increased profits, increased efficiency, consumer welfare, job creation and economic development [41].

Benefits can be used to demonstrate the positive or negative impact of information system performance [21]. In the information system success model proposed by DeLone & McLean, benefits are grouped into two dimensions, namely individual impact and organizational impact [42]. With the benefits arising from the use of information systems, it can directly support productivity, effectiveness and decision making.

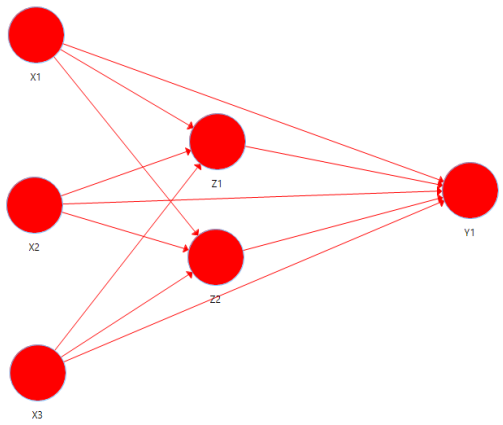

Fig. 1. Conceptual research model

4. Result

A total of 275 respondents have filled out this research unit which has been circulated online. The results of the analysis based on the research hypothesis were obtained from the results of the Structural Equation Model (SEM) analysis using SmartPLS software as follows:

A. Outer Model or Measurement Model

Outer model or measurement model is to assess the validity and reliability of the model through the algorithm iteration process. There are two validity test in PLS, namely convergent validity (convergent validity) and discriminant validity (discriminant validity). The reliability test in PLS also has two assessments, alpha cronbach and composite reliability. The following will be further explained about the measurement of the outer model (measurement model) in the results of this study.

B. Convergent Validity

Convergent validity of the measurement model with reflexive indicators is assessed based on the correlation between item score or component score with construct score calculated with PLS. Convergent validity consists of 3 parameters, namely Loading factor, Average Variance Extracted (AVE) and Communality. For research, the initial stage of the development of the measurement scale of the loading factor value is between 0.50 and 0.60[43]. The loading factor value is said to be high if it correlates more than 0.70 with the construct to be measured. It is known that all indicators in

this study have a loading factor greater than 0.50 so that no indicators are discarded and declared valid. The results of loading factors of each indicator can be seen in Table 2 in the Original Sample column.

The Average Variance Extraced (AVE) on Partial Least Square (PLS) determined the value must be above 0.50 to state that the variables used in this study are valid.

C. Discriminant Validity

Discriminant validity of the measurement model with reflective indicators is assessed based on cross loading measurements with constructs. Cross loading is useful to assess whether the construct has adequate discriminant validity by comparing the correlation of an indicator with the correlation of the indicator with other constructs. If the correlation of the indicator has a higher value compared to the correlation of the indicator to other constructs, this indicates that the construct has a high discriminant validity [44]. Discriminant validity can also be determined with a cross loading value in one variable of more than 0.7.

D. Reliability Test

The PLS model reliability test consists of two assessments, namely the cronbach alpha assessment and composite reliability. The reliability of a construct or variable can be done by looking at the alpha cronbach value and the composite reliability value between 0.60 to 0.70 while more than 0.70 is considered better [45]. Based on the results of calculations with SmartPLS software, it is found that all research variables have alpha cronbach and composite reliability values that are more than 0.60 so that it can be concluded that each research variable is reliable.

Table 2
Outer loading (Mean, STDEV, T-Statistic)

	Original Sample (O)	**Sample Mean (M)**	**Standard Deviation (STDEV)**	**T Statistics (|O/STDEV|)**	**P Values**
X1.2 <- X1	0.734	0.733	0.055	13.404	**0.000**
X1.3 <- X1	0.716	0.713	0.043	16.607	**0.000**
X1.4 <- X1	0.757	0.750	0.045	16.791	**0.000**
X2.1 <- X2	0.749	0.751	0.040	18.959	**0.000**
X2.2 <- X2	0.735	0.735	0.040	18.324	**0.000**
X2.3 <- X2	0.848	0.850	0.031	27.062	**0.000**
X2.4 <- X2	0.861	0.861	0.026	32.629	**0.000**
X3.1 <- X3	0.780	0.779	0.029	26.991	**0.000**
X3.2 <- X3	0.790	0.789	0.033	24.036	**0.000**
X3.3 <- X3	0.817	0.816	0.024	33.975	**0.000**
X3.4 <- X3	0.731	0.728	0.040	18.239	**0.000**
Y1.1 <- Y1	0.703	0.705	0.050	14.006	**0.000**
Y1.2 <- Y1	0.800	0.800	0.036	22.493	**0.000**
Y1.3 <- Y1	0.737	0.735	0.034	21.543	**0.000**
Y1.4 <- Y1	0.791	0.790	0.034	23.530	**0.000**
Y1.5 <- Y1	0.799	0.798	0.032	25.106	**0.000**
Z1.1 <- Z1	0.852	0.852	0.023	36.813	**0.000**
Z1.2 <- Z1	0.778	0.776	0.040	19.533	**0.000**
Z1.3 <- Z1	0.864	0.864	0.024	35.308	**0.000**
Z1.4 <- Z1	0.818	0.816	0.028	28.689	**0.000**
Z2.1 <- Z2	0.710	0.706	0.051	13.993	**0.000**
Z2.2 <- Z2	0.723	0.725	0.043	16.614	**0.000**
Z2.3 <- Z2	0.720	0.722	0.044	16.295	**0.000**
Z2.4 <- Z2	0.726	0.721	0.046	15.916	**0.000**
Z2.5 <- Z2	0.742	0.745	0.039	19.179	**0.000**
X1.1 <- X1	0.810	0.811	0.019	41.971	**0.000**

Table 3
Hypothesis testing result

No.	**Inter-variable relationship**			**Path Coefisient**	***p-value***	***t-count***	**Notes**
1	Quality System (X1)	System Use (Z1)		0,205	0,004	2,871	Significant
2	Information Quality (X2)	System Use (Z1)		0,268	0,000	3,521	Significant
3	Service Quality (X3)	System Use (Z1)		0,403	0,000	5,601	Significant
4	Quality System (X1)	Benefits (Y)		0,243	0,000	7,171	Significant
5	Information Quality (X2)	Benefits (Y)		0,139	0,006	2,777	Significant
6	Service Quality (X3)	Benefits (Y)		0,112	0,024	2,269	Significant
7	System Use (Z1)	Benefits (Y)		0,467	0,000	9,532	Significant
8	Quality System (X1)	System Use (Z1)	Benefits (Y)	0,096	0,005	2,808	Significant
9	Information Quality (X2)	System Use (Z1)	Benefits (Y)	0,125	0,001	3,419	Significant
10	Service Quality (X3)	System Use (Z1)	Benefits (Y)	0,188	0,000	4,550	Significant
11	**Quality System (X1)**	**User Satisfaction (Z2)**		**0,102**	**0,090**	**1,697**	**Not Significant**
12	Information Quality (X2)	User Satisfaction (Z2)		0,517	0,000	7,931	Significant
13	Service Quality (X3)	User Satisfaction (Z2)		0,232	0,000	3,706	Significant
14	User Satisfaction (Z2)	Benefits (Y)		0,141	0,003	3,007	Significant
15	**Quality System (X1)**	**User Satisfaction (Z2)**	**Benefits (Y)**	**0,014**	**0,108**	**1,612**	**Not Significant**
16	Information Quality (X2)	User Satisfaction (Z2)	Benefits (Y)	0,073	0,007	2,697	Significant
17	Service Quality (X3)	User Satisfaction (Z2)	Benefits (Y)	0,033	0,029	2,184	Significant

E. Hypothesis Testing

Based on the test results in table 3, it is known that the coefficient of direct effect of system quality, service quality, information quality, system use has a significant effect on benefits. While in the indirect effect, there are service quality variables, information quality, the use of systems that have a significant influence on benefits.

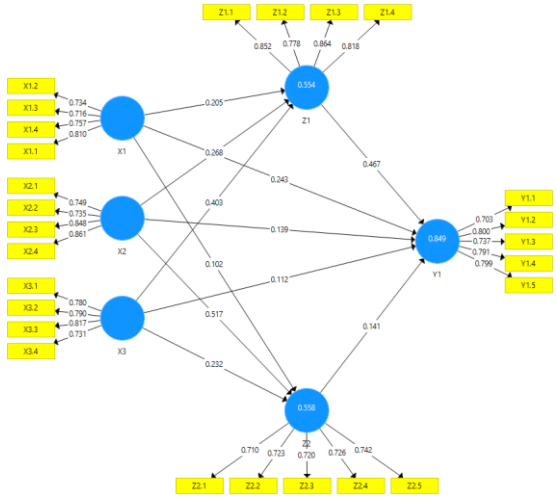

Fig. 2. Hypothesis testing result path diagram

5. Discussions

A. Influence of system quality on system usage

The quality of the system has a positive effect on the use of the system with a path coefficient value of 0.205 and a p-value of 0.004 (p-value < 0.05) and a t-count of 2.871 (t-count > 1.96), then the test can be said to be significant, so that H0 is rejected. This shows that if the quality of the system is improved, it can also improve the use of the system.

B. The effect of information quality on the use of the system

The quality of information has a positive effect on the use of the system with a path coefficient value of 0.286 and a p-value of 0.000 (p-value < 0.05) and a t-count of 3.521 (t-count > 1.96), then the test can be said to be significant, so that H0 is rejected. This shows that if the quality of the system is improved, it can also improve the use of the system.

C. The effect of service quality on system usage

The quality of information has a positive effect on the use of the system with a path coefficient value of 0.286 and a p-value of 0.000 (p-value < 0.05) and a t-count of 3.521 (t-count > 1.96), then the test can be said to be significant, so that H0 is rejected. This shows that if the quality of service is further improved, it also increases the use of the system. This study is in line with research conducted by [46], [47].

D. Influence of system quality on benefits

The quality of the system has a positive effect on the use of the system with a path coefficient value of 0.205 and a p-value of 0.004 (p-value < 0.05) and a t-count of 2.871 (t-count > 1.96), then the test can be said to be significant, so that H0 is rejected. This shows that if the quality of the system is further improved, it also increases the benefits. This study is in line with research conducted by [48], [49].

E. The effect of information quality on benefits

The quality of information has a positive effect on the use of the system with a path coefficient value of 0.286 and a p-value of 0.000 (p-value < 0.05) and a t-count of 3.521 (t-count > 1.96), then the test can be said to be significant, so that H0 is rejected. This shows that if the quality of information is improved, it also increases the benefits. This study is in line with research conducted by [50].

F. Influence of service quality on benefits

The quality of the system has a positive effect on the use of the system with a path coefficient value of 0.205 and a p-value of 0.004 (p-value < 0.05) and a t-count of 2.871 (t-count > 1.96), then the test can be said to be significant, so that H0 is rejected. This shows that if the quality of the system is further improved, it also increases the benefits. This study is in line with research conducted by [51].

G. Influence of system use on benefits

The quality of the system has a positive effect on the use of the system with a path coefficient value of 0.205 and a p-value of 0.004 (p-value < 0.05) and a t-count of 2.871 (t-count > 1.96), then the test can be said to be significant, so that H0 is rejected. This shows that if the use of the system is increasing then the benefits. This study is in line with research conducted by [52].

H. Influence of system quality on system usage

The quality of the system has a positive effect on the use of the system with a path coefficient value of 0.205 and a p-value of 0.004 (p-value < 0.05) and a t-count of 2.871 (t-count > 1.96), then the test can be said to be significant, so that H0 is rejected. This shows that if the quality of the system is improved, the benefits felt by e-learning users are also increased through increasing the use of the system. This study is in line with research conducted by [53].

I. Influence of information quality on system usage

The quality of information has a positive effect on the use of the system with a path coefficient value of 0.286 and a p-value of 0.000 (p-value < 0.05) and a t-count of 3.521 (t-count > 1.96), then the test can be said to be significant, so that H0 is rejected. This shows that if the quality of the system is improved, the benefits felt by e-learning users are also increased through increasing the use of the system. This study is in line with research conducted by [53].

J. Influence of service quality on system usage

The quality of information has a positive effect on the use of the system with a path coefficient value of 0.286 and a p-value of 0.000 (p-value < 0.05) and a t-count of 3.521 (t-count > 1.96), then the test can be said to be significant, so that H0 is rejected. This shows that if the quality of the system is improved, the benefits felt by e-learning users are also increased through increasing the use of the system. This study is in line with research conducted by [53].

K. The effect of system quality on user satisfaction

The quality of the system has a positive effect on user satisfaction with a path coefficient value of 0.102 and a p-value of 0.090 (p-value > 0.05) and a t-count of 1.697 (t-count < 1.96), so the test can be said to be insignificant, so that H0 is accepted. This shows that the better the quality of the system, the less it affects user satisfaction. This study is in line with research conducted by [54].

L. The effect of information quality on user satisfaction

The quality of information has a positive effect on the use of the system with a path coefficient value of 0.286 and a p-value of 0.000 (p-value < 0.05) and a t-count of 3.521 (t-count > 1.96), then the test can be said to be significant, so that H0 is rejected. This shows that if the quality of information is further improved, user satisfaction in using e-learning will increase. This study is in line with research conducted by [48], [55].

M. The effect of service quality on user satisfaction

The quality of information has a positive effect on the use of the system with a path coefficient value of 0.286 and a p-value of 0.000 (p-value < 0.05) and a t-count of 3.521 (t-count > 1.96), then the test can be said to be significant, so that H0 is rejected. This shows that if the quality of information is further improved, user satisfaction in using e-learning will increase.

N. Influence of user satisfaction on benefits

The quality of the system has a positive effect on the use of the system with a path coefficient value of 0.205 and a p-value of 0.004 (p-value < 0.05) and a t-count of 2.871 (t-count > 1.96), then the test can be said to be significant, so that H0 is rejected. This shows that if user satisfaction is getting better, the benefits of using e-learning can also be felt by its users. This study is in line with research conducted by [46].

O. The effect of system quality on user satisfaction

The quality of the system has a positive effect on user satisfaction with a path coefficient value of 0.102 and a p-value of 0.090 (p-value > 0.05) and a t-count of 1.697 (t-count < 1.96), so the test can be said to be insignificant, so that H0 is accepted. This shows that there is no relationship between system quality, benefits and user satisfaction in the use of e-learning. This study is in line with research conducted by [55], [56].

P. The effect of information quality on user satisfaction

The quality of information has a positive effect on the use of the system with a path coefficient value of 0.286 and a p-value of 0.000 (p-value < 0.05) and a t-count of 3.521 (t-count > 1.96), then the test can be said to be significant, so that H0 is rejected. This shows that if the quality of information is improved, user satisfaction is also increased so that the benefits obtained by e-learning users can also be felt. This study is in line with research conducted by [57].

Q. The effect of system quality on user satisfaction

The quality of information has a positive effect on the use of the system with a path coefficient value of 0.286 and a p-value of 0.000 (p-value < 0.05) and a t-count of 3.521 (t-count > 1.96), then the test can be said to be significant, so that H0 is rejected. This shows that if the quality of services is improved, user satisfaction is also increased so that the benefits obtained by e-learning users can also be felt. This study is in line with research conducted by [58].

6. Conclusion

From the results of the analysis and discussion, it can be concluded that the system quality variable, information quality and service quality have a significant influence on the use of the system. Likewise, the variables of benefits, system quality, information quality, and service quality have a significant influence. System usage variables have a significant influence on benefits. The same results are also obtained when testing indirect effects, system quality, information quality and service quality have a significant effect on benefits through the use of the system. This study is in line with research conducted by [24].

Slightly different results are shown when the user satisfaction variable is used as a mediation variable. System quality has no significant effect on user satisfaction. Likewise, the quality of the system has no significant effect on benefits through user satisfaction.

In this study, it was found that the quality of the system has no direct effect on user satisfaction, this shows that user satisfaction is not related to the quality of the system, whether the system has improved quality or not. Users feel that they have no impact on satisfaction after running an e-learning system. The same result is also shown when user satisfaction is a mediating variable between system quality and benefit. Thus, it can be concluded that there is no relationship between the quality of the system and the benefits perceived by users through the variable between user satisfaction. This means that even though the quality of the system is improved, it does not affect the satisfaction of its users so that it does not impact the benefits felt by system users.

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