The determining factor influencing the success of web-based academic information systems to combat the covid-19 pandemic

Muhamad Nicky[1], Ilham Nurjabar[2] , Dybio Dompu Hot Asih[3], Adnan Purwanto[4]

Jurusan Ilmu Komputer, Universitas Nusa Mandiri[1,2,3,4]

Jl. Kramat Raya, Senen, Jakarta, 10450

E-mail : 14002453@nusamandiri.ac.id[1], 14002451@nusamandiri.ac.id[2],
14002438@nusamandiri.ac.id[3,] 14002474@nusamandiri.ac.id[4]

Abstract -- **Educational institutions around the world are making every effort to keep learning during the covid-19 pandemic, one of which is by building a web-based academic information system so that all students can continue to follow learning even though there are no face-to-face lectures. All applications that are built are expensive and require a certain amount of time and effort to build and maintain such information systems, furthermore there are a number of challenges to identify the factors that influence the adoption, utilization and success of information systems. This study aims to overcome this problem by identifying the parameters that influence the success of the Elnusa academic information system, an academic information system built by the University of Nusa Mandiri in combating the Covid-19 pandemic, using the Delone and Clean Model and combined with the Technology Acceptance Model (TAM). As a result, system quality positively affected the use and user satisfaction. Furthermore, service quality positively influenced use but not user satisfaction. Meanwhile, information quality had no significant effect either on use or satisfaction. Both use and user satisfaction had a significant effect on net benefits.**

Keywords: **information system, covid-19, academic information system, delone and mclean.**

I. INTRODUCTION

After one year of the COVID-19 pandemic, Nusa Mandiri University launched an academic information system website called Elnusa (Elearning Nusa Mandiri). This application allows Lecturers and Students to conduct lectures online to overcome the Enforcement of Restrictions on Community Activities imposed in Indonesia. In previous studies, several academic information systems at several universities have been investigated using various methods, such as the Technology Acceptance Model (TAM), Delone and Mclean, Information System Success Model.

Several universities have developed academic information systems with various approaches to overcome learning barriers during the COVID-19 pandemic. The information system takes a lot of time, effort, and cost. Therefore, it is necessary to investigate what factors influence the success of the information system.

This research is more emphasized on how academic information systems are able to overcome learning limitations during the covid-19 pandemic, this study uses the Delone Mclean model combined with TAM.

II. LITERATURE REVIEW

A. *Information system*

Advances in ICT such as the growth of the internet provide great benefits and opportunities for everyone to receive or provide up-to-date information. Information systems often refer to the relationship between humans, algorithmic processes, data, and technology[2]. Science and Technology are two things that are closely related. Technology has a very big role in changing human civilization. With technology, it will change the way people work. People's problems often rely on technology to be solved effectively and efficiently[3]. However, in my opinion, this information system is not intended to replace offline media but to complement the choice of information media for the wider community.

B. *Validity test*

Validity comes from the word validity which means the extent to which the accuracy and accuracy of a measuring instrument in carrying out its size function (Azwar 1986). In addition, validity is a measure that shows that the variable being measured is really the variable that the researcher wants to study (Cooper and Schindler, in Zulganef, 2006). Meanwhile, according to Sugiharto and Sitinjak (2006), validity relates to a

variable measuring what should be measured. Validity in research states the degree of accuracy of research measuring instruments to the actual content being measured. Validity test is a test used to show the extent to which the measuring instrument used in a measure is what is being measured. Ghozali (2009) states that the validity test is used to measure the validity or validity of a questionnaire. A questionnaire is said to be valid if the questions on the questionnaire are able to reveal something that will be measured by the questionnaire.

C. Reliability test

Walizer (1987) mentions the notion of Reliability (Reliability) is a measurement constancy.According to John M. Echols and Hasan Shadily (2003: 475) reliability is something that can be trusted. Popham(1995: 21) states that reliability is "...the degree of which test scores are free from error measurement". Thus, the reliability of a measuring instrument can be seen from two indicators, namely the standard error of measurement and the reliability coefficient. Both of these statistics each have advantages and limitations (Feldt & Brennan, 1989: 105)Reliability, or reliability, is the consistency of a series of measurements or a series of measuring instruments. This can be a measurement of the same measuring instrument (test with retest) will give the same result, or for a more subjective measurement, whether two raters give similar scores (inter-rater reliability). Reliability is not the same as validity. This means that a reliable measurement will measure consistently, but not necessarily measure what it is supposed to measure.

D. R Studio

Acceptance of RStudio, that is, acceptance of the use of R lan- guage through RStudio software, was assessed by means of the TAM developed by Davis (1986, 1989), with three dimensions (attitude toward RStudio, perceived usefulness, perceived ease of use), each with five items, measured through a seven-point Likert scale [4].

E. DeLone and McLean Information Systems Success Model .

The D&M ISS model was proposed in 1992 first [4]. The initial DeLone and McLean Information System Success Model, hereinafter referred to as the IS D&M Success Model, is a theory that tries to determine information success by identifying six critical variables, namely system quality, information quality, usage, and user satisfaction, individual impact and organizational impact. Regarding the implementation of IS, the e-learning system is expensive and requires a large amount of time and effort to deploy. Therefore, researchers and practitioners continue to struggle to identify the key factors that influence the adoption, utilization, and success of information systems. One of the most frequently used models to investigate IS success is the DeLone and McLean (D&M) success model. Much research on the application of the IS D&M success model in the context of e-learning has been carried out in recent years, and this area of research has received increasing levels of attention [5].

Furthermore, it is argued that if information systems research is to contribute to the world of practice, well-defined outcome measures (measures) are essential. Also, evaluation of I/S practices, policies, and procedures requires measures of I/S success against which various strategies can be tested. In the updated D&M IS Model they modified six dimensions to be: system quality, information quality and service quality as independent variables, user usage and satisfaction as intermediate variables and net benefit as dependent variable. In this model, the net benefit variable is the most important.

So that the solutions provided by information systems (IS) have become a central theme in IS success research. The solutions and their organizational context have also been the focus of extensive study in both educational and managerial fields. There are at least 5 stages in the DeLone and McLean model that are applied as a reference for the success of a system [6], namely: system quality, information quality, service quality, user satisfaction and system usability.Systems Quality. System Quality is manifested in the system's overall performance. DeLone and McLean explain system quality as the desired characteristics of the information system itself which produces the information. System quality was measured in term of ease-of-use, functionality, reliability, flexibility, data quality, portability, integration, and importance. According to Petter et al, system quality as the desirable of an information system has several components such as ease of use, system flexibility, system reliability, and ease of learning.

1. System Quality. System Quality is manifested in the overall system performance. The quality of the system is used to measure the quality of system information itself, both software and hardware [7]. DeLone and McLean describe system quality as a desirable characteristic of the information system itself that produces information. System quality is measured in terms of ease of use, functionality, reliability, flexibility, data quality, portability, integration, and importance. According to Petter et al. The desired system quality of an information system has several components such as ease of use, system flexibility, system reliability, and ease of learning. The analysis found no attributes other than the attributes of the IS performance model. Therefore, this study paves the way for organizations to recognize whether information systems offer benefits or not [8].

2. *Information Quality.* Information quality refers to the desired characteristics of information produced by IS DeLone and McLean [9]. describes information quality as a desirable characteristic of system outputs, namely management reports and web pages. Information quality refers to the quality of information that a system can store, transmit, or produce, and is one of the most common dimensions used to evaluate information systems. Information quality is measured in terms of accuracy, timeliness, completeness, relevance, and consistency. The quality of information will determine user satisfaction. that in measuring the quality of information consisting of relevance, understandability, accuracy, conciseness, completeness, understanding, fairness, timeliness, and usefulness. Information quality is often seen as a key dimension of user satisfaction.

3. *Quality of Service.* Quality of Service can be described as the overall support provided by the service provider, applicable regardless of whether this support is provided by the IS department, a new organizational unit, or outsourced to an Internet service provider, there are four main components of service quality, namely responsiveness.

4. *Use & Intent to Use.* Usage measures everything from app usage, in-app navigation, information retrieval, to health status updates. The use of the application is one of the important constructs to measure the benefits of the application of Elnusa which is also the purpose of use.

5. *User Satisfaction.* User satisfaction refers to the level of user satisfaction with review reports, applications, and support services. DeLone and McLean suggest that user satisfaction is the most widely used SI success measure and one reason is that the attractiveness of satisfaction as a measure of success is that most of the other measures are very poor; they are conceptually weak or empirically difficult to obtain. User satisfaction can be described as a summary of a person's attitudes or feelings towards several factors that affect a particular situation. In our research, User Satisfaction is seen as a user's opinion about the use of Elnusa application and its environment.

6. *Net profit.* Net benefit refers to the extent to which IS contributes to the success of individuals, groups, organizations, industries, and countries. For example: increased successful detection of Covid-19, decreased number of people exposed to Covid-19, and successful dissemination of correct information about Covid-19. Net benefits are the most important measure of success because they include a balance of positive and negative impacts on users, communities and countries. Moreover, although net benefits are the most important variables, they cannot be analyzed and understood without measuring system quality, information quality, and service quality. In this study, the net benefit refers to the benefits of e-learning, because in measuring the net benefits, we can use the same measure on the content of the benefits of Elnusa applications.

7. *Technology Acceptance Model (TAM)*
Technology Acceptance Model (TAM) is one of the well- known research models used mostly in the area of information technology which originally proposed by Davis in 1985. Basically, TAM was developed intentionally to find out the factors that lead the users either accept or reject information technology. TAM posits that two particular beliefs, Perceived Usefulness and Perceived Ease of Use, are of primary relevance for computer acceptance behavior. For this reason, in this study, researchers adopted part of TAM variables, that is: Perceived Ease-of-Use and Perceived Usefulness, and then combined them with the D & M IS Model becomes research model.

8. *Perceived Usefulness (PU).* One of two importance variables in TAM that may influence systems use is PU. PU is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" [9]. Also, PU is also defined as the prospective user's subjective probability that using a specific application system will increase his or her job performance within an organizational context.

9. Perceived Ease-of-Use (PEU). Number two of two importance variables in TAM that may influence system use is PEU. PEO, refers to "the degree to which a person believes that using a particular system would be free of effort". This follows from the definition of "ease": "freedom from difficulty or great effort".

10. Theoretical Framework and Hypotheses According to Now the theoretical framework is a conceptual model of how a person theorizes or makes a

logical sense of the relationship between several factors that have been identified as important to the problem. Furthermore, now said that the theoretical framework discusses the relationship between variables which are considered integral to the dynamics of the situation under study. So theoretically it explains the relationship between the dependent variable and the independent variable. A theoretical framework is used when we have more than two variables in our research. So the research model in this study is as illustrated in Figure 1.

Based on the research model, this study tested the following hypotheses:

H1: System Quality has a significant effect on the Usage & Intention to Use.

H2: System Quality has a significant effect on the User Satisfaction.

H3: Information Quality has a significant effect on the Usage & Intention to Use.

H4: Information Quality has a significant effect on the User Satisfaction.

H5: Service Quality has a significant effect on the Usage & Intention to Use.

H6: Service Quality has a significant effect on the User Satisfaction.

H7: Perceived Ease-of-Use has a significant effect on the Perceived Usefulness.

H8: Perceived Ease-of-Use has a significant effect on the Usage & Intention to Use.

H9: Perceived Usefulness has a significant effect on the Usage & Intention to Use.

H10: Usage & Intention to Use has a significant effect on the User Satisfaction.

H11: Usage & Intention to Use has a significant effect on the Elnusa Benefit

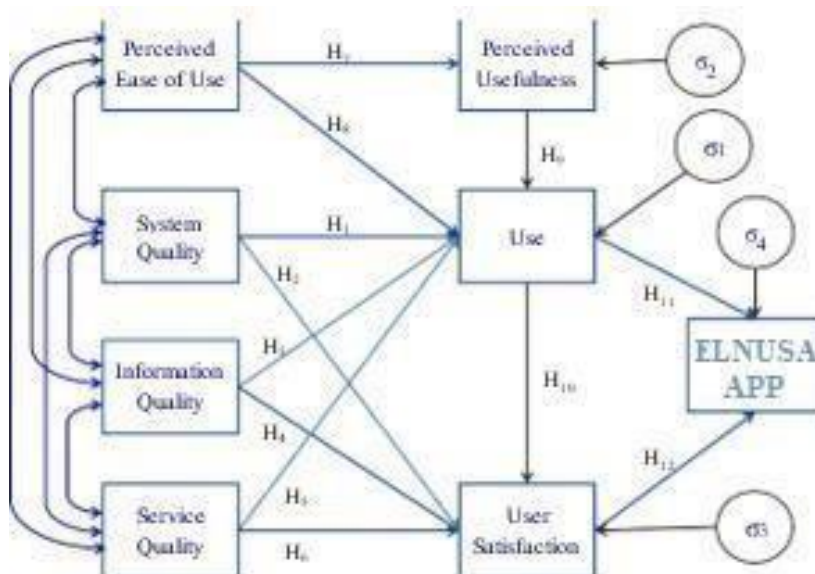H12: User Satisfaction has a significant effect on the Elnusa Benefit.

Figure 1. Research Model

III. FINDING AND DATA ANALYSIS

The questionnaire consists of personal data and question data about the Elnusa application.
Personal data includes:
- Name
- Gender
- Age
- Profession
- Education

Questions about the Elnusa app include :
- Information Quality 5 questions.
- Service Quality 4 questions.
- User Satisfaction 3 questions.
- Elnusa Benefit 5 questions.
- Use 4 questions.
- System Quality 5 questions.
- Perceived Usefulness 3 questions.
- Perceived Ease of Use 3 questions.

Questionnaire data was collected using a google form with a link :
https://forms.gle/cQFMqLYgAKCa6KgE6

IV. RESEARCH METHODOLOGY

The research method employed in this study is survey research with causative approach. The results of the research will be analyzed using path analysis and structural equation modelling (SEM) software, which is R Studio. Path analysis (SEM models without latent variables) is employed in this study to analyse the relationship among variables, specifically to measure the direct and indirect effect from exogenous variables to endogenous variables . Maximum Likelihood estimation method is implemented using R Studio and the chosen outputs are minimization history, standardized estimates, squared multiple correlations and indirect, direct & total effects. This research was done without any special treatment to the data obtained by the researcher.

The survey was conducted at Universitas Nusa Mandiri campus in November 2021. Thirty nine (39) Students were selected randomly as respondents from the Universitas Nusa Mandiri. Those respondents provide enough representation of the Students of the Universitas Nusa Mandiri.

V. RESULT

1. Validity Testing

Validity testing is conducted using the correlation value with the level of significance of 0.5. So, as the basis of calculation is if the value of correlation ≥0.5 then question in questionervalid.As the basis for the calculation is the result of the output produced by R Studio shown on the Table 4.1 Validity test below

Table 4.1 *Validity test: (Group number 1 - Default model)*

No	Question	Correlation
1	IQ1	0.9500186
2	IQ2	0.9428090
3	IQ3	0.9394811
4	IQ4	0.9428388
5	IQ5	0.9262219
6	SQ1	0.9395400

7	SQ2	0.9489576
8	SQ3	0.9484992
9	SQ4	0.9303032
10	US1	0.9395400
11	US2	0.9455654
12	US3	0.9435493
13	B1	0.9426681
14	B2	0.9472853
15	B3	0.9456857
16	B4	0.9334695
17	B5	0.9417800
18	U1	0.9502717
19	U2	0.9431390
20	U3	0.9459242
21	U4	0.9303226
22	SYSQ1	0.9463017
23	SYSQ2	0.9415924
24	SYSQ3	0.9470713
25	SYSQ4	0.9237802
26	SYSQ5	0.9238354
27	PU1	0.9527109
28	PU2	0.9590635
29	PU3	0.9340588
30	PEU1	0.9597100
31	PEU2	0.9637886
32	PEU3	0.9517749

• From the validity test, it was found that all questions had a correlation above 0.5 so that they were declared valid and positive for the variables, so that all questions could be used.

2. Reliability Testing
Table 4.2. Reliability table: (Group number 1 - Default model)

No	Variable Name	Alpha Value
1	Information Quality	0.83
2	Service Quality	0.85
3	User Satisfaction	0.88
4	Elnusa Benefit	0.83
5	Use	0.85
6	System Quality	0.83
7	Perceived Usefulness	0.88
8	Perceived Ease of Use	0.88

• From the reliability test, it was found that all variables had an alpha value above 0.7 so that the instrument was declared reliable and could be used.

3. Hypothesis testing and Structural Equation Modeling (SEM)

Hypothesis testing is conducted using the t-value with the level of significance of 0.05. The t-value in R Studio is denoted as Critical Ratio (CR) which will be compared to the value of t-table which is 1.96. So, as the basis of calculation is if the value of CR $\geq$ 1.96 or value the probability (P) $\leq$ 0.05 then H0 is rejected, meaning that it has a significant effect. As the basis for the calculation is the result of the output produced by R Studio.

The magnitude of the contribution can be calculated from the output in Table 4.3 below.

Table 4.3. SEM table: (Group number 1 - Default model)

	Estimate	S.E.	C.R.	P
PU <-- PEU	0.950	0.037	25.975	0.000
Use <--- SysQ	0.309	0.121	2.549	0.011
Use <--- PU	0.142	0.089	1.599	0.110
Use <--- PEU	0.177	0.130	1.364	0.173
Use <--- SerQ	0.577	0.157	3.666	0.000
Use <--- InfQ	-0.200	0.126	-1.585	0.113
UseS <--- SerQ	0.439	0.135	3.255	0.001
UseS <--- Use	0.125	0.077	1.615	0.106
UseS <--- SysQ	0.319	0.072	4.434	0.000
UseS <--- InfQ	0.144	0.103	1.398	0.162
RAB <--- Use	0.317	0.068	4.626	0.000
RAB <--- UseS	0.673	0.068	9.838	0.000

Based on the table 4.3, the hypothesis is accepted if P 0.05, then the proven hypothesis is :

H1: Application quality has a significant effect on Usage & Intention to Use.

H2: Application quality has a significant effect on User Satisfaction.

H5: Service quality has a significant effect on Usage & Intention to Use.

H6: Service Quality has a significant effect on User Satisfaction.

H7: Perceived Ease of Use has a significant effect on Perceived Usefulness.

H11: Usage & Intention to Use have a significant effect on the benefits of Elnusa.

H12: User satisfaction has a significant effect on the benefits of the Elnusa.
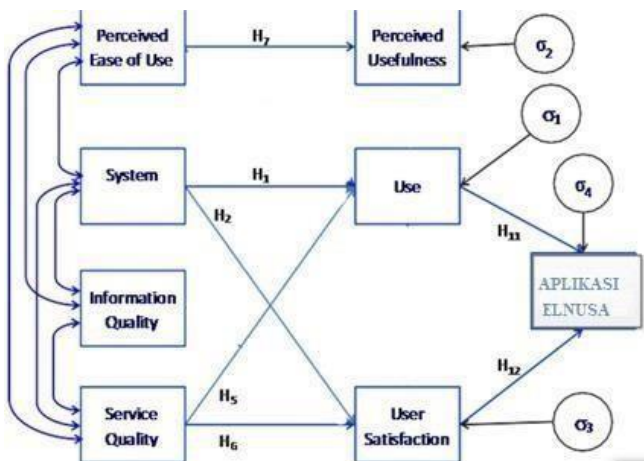
Regression

- Perceived Usefulness = 0.95 Perceived Ease of Use + 0.115

- Use = 0.309 System Quality + 0.577 Service Quality + 0.078

- User Satisfaction = 0.439 Service Quality + 0.319 System Quality + 0.026

- Elnusa Benefit = 0.317 Use + 0.673 User Satisfaction + 0.038

VI. CONCLUSIONS

The research carried out to analyze the IS success of "Elnusa", as one of System Information Academic in fighting Covid-19 pandemic, using combination D&M and TAM model has been conducted. The results show that out of twelve hypotheses, seven had positive effects. It turned out that information quality was not a determinant of use and user satisfaction. Instead, system quality was the essential factor since it positively influenced use and user satisfaction, following by service quality that affected user satisfaction. Both use and user satisfaction had a significant effect on net benefits.

Other research methods and more primary data than questionnaires are expected to be used in future studies. For example, direct interviews could be conducted to improve the respondents' objectivity. In addition, future research is projected to be able to expand the size of respondent samples in order to obtain better results that are closer to general conclusions.

VII. REFERENCES

[1] M. Magdalena, K. Kunci, and I. Pendahuluan, "Analisis Sistem informasi Manajemen dalam Penanganan Gangguan Keamanan Bandara," vol. 4, no. 2, pp. 1034–1043, 2021.

[2] W. H. DeLone and E. R. McLean, "The DeLone and McLean model of information systems success: A ten-year update," *J. Manag. Inf. Syst.*, vol. 19, no. 4, pp. 9–30, 2003, doi: 10.1080/07421222.2003.11045748.

[3] M. Muafani, "Pemanfaatan Teknologi Informasi Di Tengah Pandemi Covid-19 Dalam Pemberdayaan Masyarakat," *J. Penelit. dan Pengabdi. Kpd. Masy. UNSIQ*, vol. 8, no. 2, pp. 134–139, 2021, doi: 10.32699/ppkm.v8i2.1587.

[4] A. Al-Azawei and R. Al-Azawi, "Evaluating Facebook success in Iraq: An extension of the DeLone and McLean's model of information systems success (ISS)," *J. Phys. Conf. Ser.*, vol. 1804, no. 1, 2021, doi: 10.1088/1742-6596/1804/1/012114.

[5] H. N. Sabeh, M. H. Husin, D. M. H. Kee, A. S. Baharudin, and R. Abdullah, "A Systematic Review of the DeLone and McLean Model of Information Systems Success in an E-Learning Context (2010–2020)," *IEEE Access*, vol. 9, 2021, doi: 10.1109/ACCESS.2021.3084815.

[6] R. Rachman, "Analisa Kesuksesan E - Government LAPOR dengan Model Delone - Mclean pada Pengembangan Smart City," *J. Sist. Inf.*, vol. 10, no. 2, pp. 357–368, 2021.

[7] A. Tahu, G. P., & Yuesti, "Academic Information System In Higher Education: Applicating Delone and Mclean Model," *J. Contemp. Issues Bus. Gov.*, vol. 27, no. 1, pp. 2844–2853, 2021.

[8] O. A. R and D. K. Mahalik, "Evaluation of ERP System: A Psychological Impact on End-Users Satisfaction using DeLone and McLean model," vol. 58, pp. 1774–1781, 2021.

[9] N. Sandjojo and T. Wahyuningrum, "Measuring e-learning systems success: Implementing D and M is success model," *Proc. 2015 4th Int. Conf. Interact. Digit. Media, ICIDM 2015*, no. Icidm, pp. 4–9, 2016, doi: 10.1109/IDM.2015.7516343.

[10] Fred D. Davis, "A Technology Acceptance Model for Empirically Testing New End-User Information Systems: Theory and Results," *Science (80-.).*, vol. 146, pp. 1–291, 1985, doi: 10.1126/science.146.3652.1648.

[11] F. D. Davis, R. P. Bagozzi, and P. R. Warshaw, "User Acceptance of Computer Technology: A Comparison of Two Theoretical Models," *Manage. Sci.*, vol. 35, no. 8, pp. 982–1003, 1989, doi: 10.1287/mnsc.35.8.982.

[12] U. Sekaran, *Research Methods For Business: A Skill Building Approach, 4Th Ed*. Wiley India Pvt. Limited, 2006.

[13] N. Sandjojo, "Metode Analisis Jalur dan Aplikasinya Edisi Revisi," *Jakarta Fak. Ilmu Komput. Univ. Pembang. Nas. "Veteran" Jakarta*, 2014.

[14] M. Prof. Dr. H. Siswoyo Haryono, MM, M.Pd. Parwoto Wardoyo, ST, "STRUCTURAL EQUATION MODELING Untuk Penelitian Manajemen Menggunakan AMOS 18.00," *PT. Intermedia Personalia Utama*. 2016.

[15] B. M. Byrne, *Structural Equation Modeling With AMOS: Basic Concepts, Applications, and Programming, Third Edition*. Taylor \& Francis,