THE ANALYSIS OF E-LEARNING SUCCESS BY USING
DELONE AND MCLEAN SUCCESS MODEL (CASE
STUDY: PERTAMINA UNIVERSITY)

Burhan Mafazi
Magister Sistem Informasi Universitas Gunadarma
burhanmafazi@gmail.com

Abstract--Education is a crucial thing and highly
concerned all over the world. As one of the educational
institutions, the university has currently applied many
information systems because of several obstacles and
problems. With the fast development of information and
communication technology, the learning process also has
improved, known as e-learning. Pertamina University is a
private university located in Jakarta, which has six faculties
and 15 study programs. Since its inception in 2016,
Pertamina University has applied e-learning to its students.
Based on the conceptual models developed by DeLone &
McLean, this research aims to examine the success of the
implementation of the e-learning system in Pertamina
University with six variables, which are information
quality, system quality, service quality, use, user
satisfaction, and net benefit. The results of the study using
610 samples showed that the information quality variable
did not affect the user satisfaction variable, which means
that the quality of information on e-learning needed to be
improved again to get a better response to user satisfaction.

Keywords: DeLone and McLean model; E-learning;
Information system success model.

I. INTRODUCTION

Education is a crucial thing and highly concerned
all over the world. In the education arrangement,
good management of education information is
urgently needed to provide services for parties
involved and produce better performances.
Preciseness, accuracy, and the speed of information
presentation are vital factors to manage and support
students' academic performances. The
implementation of information technology becomes
a significant model to win the competition and
improve the service qualities in the field of
education.

As one of the educational institutions, the
university has currently applied many information
systems because of several obstacles and problems
that often have to face. With the fast development of
information and communication technology, the
learning process has also improved, known as
electronic learning (e-learning). With e-learning,
college students can study through the internet, so it
will help them to find many study sources related to
the issues faced in the learning process [1]. Some
research concerning the success model of using the
information system [2], [3] and e-learning system
[1], [4], [5] has been conducted.

There are some differences between traditional
learning and e-learning. In traditional learning,
lecturers are considered omniscient and charged to
give knowledge to their students. College students
are independent in some particular times and
responsible for their learning. E-learning
environments will force college students to play an
active role in their learning. College Students do the
planning and look for the materials by their effort as
well as initiative. Many universities have used e-
learning, and one of them is Pertamina University.

II. METHOD

The success model of the information technology
system developed by DeLone and McLean [2] gets
responses quickly. One of its reasons is because their
model is a parsimony model yet considered quite
valid. Another reason is that it currently needs a
model that can become the reference to make an
information technology system that can be
implemented successfully in institutions.
This model was used because DeLone and McLean's model had been frequently applied to measure the system's success. Based on that model, it would be developed as the base of the research early hypothesis, which became the reference in developing a questionnaire to measure e-learning implementation success.

III. RESULT AND DISCUSSION

There were three independent variables and three dependent variables gained through the proposal of the early hypothesis. Independent variables are influential variables or variables that cause transformations or dependent variables [6]. On the other side, dependent variables are influenced variables or variables that exist because of independent variables. There was some early hypothesis proposed by the researcher:

**H1**: The Effect of System Quality on the Use
**H2**: The Effect of System Quality on User Satisfaction

**H3**: The Effect of Information Quality on the Use
**H4**: The Effect of Information Quality on User Satisfaction

**H5**: The Effects of Service Quality on the Use
**H6**: The Effects of Service Quality on User satisfaction

After the system quality, information quality, and service quality had been determined, then it was followed by the hypothesis that determined the relationship between the use, user satisfaction, and net benefit.

**H7**: The Effect of Use on User satisfaction
**H8**: The Effect of Use on Net Benefit
**H9**: The Effect of User Satisfaction on Net Benefit

A. Variables and Indicators

DeLone and McLean's Model was developed based on the theory and result of information system empirical research in the 1970s and 1980s. For ten years until 2002, nearly 300 articles in various journals cited and used this model. This model, which has been largely known, signifies strong evidence for integrating the research findings in information systems comprehensively. Things renewed to include the following:

1. Add the dimension of Service Quality as the addition of the existing dimensions of qualities, which are System Quality and Information Quality.
2. Combine the individual impact and organizational impact into one variable, which is Net Benefit. This combination aims to keep the model remaining parsimony.
3. Add the dimension of Intention using Intention to Use as the alternative dimension of Use. DeLone and McLean [7] propose an alternative measure, which is the Intention of Use. The intention of use is the attitude, while Use is the Behavior.
4. Use and User Satisfaction are strongly connected. Use must precede User satisfaction as the process.
5. If the Net Benefit is positive, the Intention of Use, Use, and User Satisfaction will increase. This feedback is still valid, even when the Net Benefit is negative.
6. Model renewed has purposed to demonstrate the relation proposed by the success dimensions in the process. However, it does not signifies either a positive or negative relation is causal.

B. Sample Measurement

The process of taking representative samples was conducted using a particular measurement. There are many formulas to measure the minimum number of samples in the research. One of the formulas used in this research was Slovin. Slovin Formula was applied to determine the minimum number of samples (n), if the number of population (N) in the significance level (α), it showed that:

\[
 n = \frac{N}{1 + Ne^2} \quad (1)
\]
Note:
\( n = \) The number of the samples
\( N = \) The number of all population members
\( e = \) Significance Level (fault tolerance; 0.05)

In this research, the research population was 5000 students of Pertamina University that would be represented as \( N \), while the level of fault samples chosen was 5%, so the measurement as follow:

\[
\begin{align*}
n &= \frac{5000}{1 + 5000(0.05)^2} \\
n &= 370.3703
\end{align*}
\]

The result of the measurement using the Slovin formula above was 370 (roundup) students involved as the minimum sample needed in this research to represent the student population's characteristics in Pertamina University.

C. Analysis of Structural Equation Modelling (SEM)

Analysis of Structural Equation Modelling (SEM) in this research used the help of SmartPLS 3 software. The following was the SEM model of the indicators in every variable that used SmartPLS 3 from the questionnaire data gained.

\[\text{Fig 2. Structural Equation Modelling Model}\]

In Table 1 above, it showed nine results of hypothesis testing that had been conducted as follow:

1. The relation between Information Quality toward The Use

\( H_0: \) There were no relations between Information Quality toward The Use
\( H_1: \) There were relations between Information Quality toward The Use

The relationship between Information Quality and Usage has a T Statistics value of 4.676 which means \( \geq 1.96 \). And the Original Sample value is a positive value of 0.276 which indicates the relationship between the two is positive, while the P Values is \( 0.00 \leq 0.05 \).

2. The relation between Information Quality toward User Satisfaction

\( H_0: \) There were no relations between Information Quality toward User Satisfaction
\( H_1: \) There were relations between Information Quality toward User Satisfaction

The relationship between Information Quality and User Satisfaction has a T Statistics value of 1.662, which means \( \leq 1.96 \). And the Original Sample value is a positive value of 0.076 which shows the relationship between the two is positive, while the P Values is \( 0.097 \geq 0.05 \).

3. The relation between System Quality toward the Use

\[\text{D. Research Hypothesis Testing}\]

The bootstrapping test aimed to conduct hypothesis testing in the research. Here was the table of the testing result by using the Bootstrapping method.

\[\text{TABLE I}
Hypothesis Testing (Path Coefficient)\]

| | Original Sample | Sample Mean | Standard Deviation | T Statistics | P Values |
|---|---|---|---|---|---|
| I1 \( \rightarrow \) P | 0.276 | 0.277 | 0.059 | 4.676 | 0.000 |
| I1 \( \rightarrow \) KP | 0.076 | 0.074 | 0.046 | 1.662 | 0.097 |
| KS \( \rightarrow \) P | 0.127 | 0.129 | 0.039 | 2.168 | 0.031 |
| KS \( \rightarrow \) KP | 0.445 | 0.446 | 0.049 | 9.098 | 0.000 |
| KL \( \rightarrow \) P | 0.171 | 0.168 | 0.063 | 2.707 | 0.007 |
| KL \( \rightarrow \) KP | 0.194 | 0.195 | 0.051 | 3.779 | 0.000 |
| P \( \rightarrow \) MB | 0.190 | 0.189 | 0.052 | 2.890 | 0.000 |
| P \( \rightarrow \) MB | 0.587 | 0.590 | 0.038 | 15.543 | 0.000 |

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The relationship between Information Quality and Usage has a T Statistics value of 4.676 which means \( \geq 1.96 \). And the Original Sample value is a positive value of 0.276 which indicates the relationship between the two is positive, while the P Values is \( 0.00 \leq 0.05 \).

2. The relation between Information Quality toward User Satisfaction

\( H_0: \) There were no relations between Information Quality toward User Satisfaction
\( H_1: \) There were relations between Information Quality toward User Satisfaction

The relationship between Information Quality and User Satisfaction has a T Statistics value of 1.662, which means \( \leq 1.96 \). And the Original Sample value is a positive value of 0.076 which shows the relationship between the two is positive, while the P Values is \( 0.097 \geq 0.05 \).

3. The relation between System Quality toward the Use

\[\text{Fig 2. Structural Equation Modelling Model}\]
The relationship between System Quality and Usage has a T Statistics value of 2.168, which means $\geq 1.96$. And the Original Sample value is a positive value of 0.127 which indicates the relationship between the two is positive, while the P Values is $0.031 \geq 0.05$.

4. The relation between System Quality toward User Satisfaction
   H0: The were no relations between System Quality toward the Use
   H1: The were relations between System Quality toward the Use
   The relationship between System Quality and User Satisfaction has a T Statistics value of 9.098, which means $\geq 1.96$. And the Original Sample value is a positive value of 0.445 which shows the relationship between the two is positive, while the P Values is $0.000 \leq 0.05$.

5. The relation between Service Quality toward the Use
   H0: The were no relations between Service Quality toward the Use
   H1: The were relations between Service Quality toward the Use
   The relationship between Information Quality and Usage has a T Statistics value of 2.707 which means $\geq 1.96$. And the Original Sample value is a positive value of 0.171 which indicates the relationship between the two is positive, while the P Values is $0.007 \leq 0.05$.

6. The relation between Service Quality toward User Satisfaction
   H0: The were no relations between Service Quality toward User Satisfaction
   H1: The were relations between Service Quality toward User Satisfaction
   The relationship between Service Quality and User Satisfaction has a T Statistics value of 3.779 which means $\geq 1.96$. And the Original Sample value is a positive value of 0.194 which indicates the relationship between the two is positive, while the P Values is $0.000 \leq 0.05$.

7. The relation between the Use toward User Satisfaction
   H0: The were no relations between the Use toward User Satisfaction
   H1: The were relations between the Use toward User Satisfaction
   The relationship between Usage and User Satisfaction has a T Statistics value of 5.896, which means $\geq 1.96$. And the Original Sample value is a positive value of 0.190 which shows the relationship between the two is positive, while the P Values is $0.000 \leq 0.05$.

8. The relation between the Use toward Net Benefit
   H0: The were no relations between the Use toward Net Benefit
   H1: The were relations between the Use toward Net Benefit
   The relationship between Usage and Net Benefits has a T Statistics value of 4.718, which means $\geq 1.96$. And the Original Sample value is a positive value of 0.177 which indicates the relationship between the two is positive, while the P Values is $0.000 \leq 0.05$.

9. The relation between User Satisfaction toward Net Benefit
   H0: The were no relations between User Satisfaction toward Net Benefit
   H1: The were relations between User Satisfaction toward Net Benefit
   The relationship between User Satisfaction with Net Benefits has a T Statistics value of 15.543, which means $\geq 1.96$. And the Original Sample value is a positive value of 0.587 which shows the relationship between the two is positive, while the P Values is $0.000 \leq 0.05$.

E. R-Square ($R^2$) Testing

R-Square test was applied to know how much the relation of some variables. The higher the value of $R^2$, the better the prediction model of the research model proposed. The classifications of the value of $R^2$ were $\geq 0.67$ (strong), $0.33 – 0.66$ (moderate), and $0.19 – 0.32$ (weak) [8].
TABLE II
The value of R-Square and Adjusted R-Square

| Variables      | R Square | Adjusted |
|----------------|----------|----------|
| User satisfaction | 0.601    | 0.598    |
| Net Benefit     | 0.483    | 0.481    |
| Use             | 0.270    | 0.267    |

Adjusted R-Square was the value of R-Square adjusted, this value was always smaller from the R square, and the number could have negative values.

**F. The goodness of Fit Testing**

After gaining Average Variance Extracted (AVE) and Adjusted R-Square ($R^2$) values, the next step was to measure the Goodness of Fit (GoF). The range values of GoF were 0-1, with the agreement of GoF > 0,1 (bad), GoF > 0,25 (moderate), dan GoF > 0,36 (good) (Haryono, 2017).

TABLE III
The Value of Goodness of Fit

| Variable      | GoF   | Note |
|---------------|-------|------|
| User satisfaction | 0.711 | Good |
| Net Benefit     | 0.586 | Good |
| Use             | 0.456 | Good |

**G. The Result of Research Analysis**

The result gained through this research was the level of DeLone and McLean model success. Here was the DeLone and McLean model success that signified the level of the effect of variable among the variables.

1. Information Quality variables had a positive effect on the Use variables, so if there were value changes in Information Quality variables, it would affect the Use variables.
2. Information Quality variables did not have a positive effect on the User Satisfaction variables, so if there were value changes in Information Quality variables, it would not affect the User Satisfaction variables.
3. System Quality variables had a positive effect on the Use variables, so if there were value changes in System Quality variables, it would affect the Use variables.
4. System Quality variables had a positive effect on the User Satisfaction variables, so if there were value changes in System Quality variables, it would affect the User Satisfaction variables.
5. Service Quality variables had a positive effect on the Use variables, so if there were value changes in Service Quality variables, it would affect the Use variables.
6. Service Quality variables had a positive effect on the User Satisfaction variables, so if there were value changes in Service Quality variables, it would affect the User Satisfaction variables.
7. Use variables had a positive effect on the User Satisfaction variables, so if there were value changes in Use variables, it would affect the User Satisfaction variables.
8. Use variables had a positive effect on the Net Benefit variables, so if there were value changes in Use variables, it would affect the Net benefit variables.
9. User Satisfaction variables had a positive effect on the Net Benefit variables, so if there were value changes in User Satisfaction variables, it would affect the Net benefit variables.

**IV. CONCLUSION**

Based on the analysis and the discussion conducted earlier, the researcher concluded building upon this research's aims, that the DeLone and McLean Success Model factors showed that only the Information Quality did not affect the User Satisfaction variables. It pointed out that Information
Quality in e-learning needed to be improved to gain better user satisfaction responses.

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