Analysis of factors that influence satisfaction and usefulness for attendance system with the Delone & McLean model (case study: attendance system at Diponegoro University)

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Abstract. The attendance system is an educational management tool at Diponegoro University used for attendance activities using technology. The attendance system is implemented in the "Sistem Informasi Akademik, Penelitian dan Pengabdian" (SIAP) application and can be accessed by students through Single Sign On (SSO). Students can do it using the smartphone they have. This research is analyzed through the factors that affect students' satisfaction and usefulness after using the attendance system. The analysis will be performed using the Delone & McLean model and additional usefulness variables from the Technology Acceptance Model (TAM) model. A total of 506 respondents participated in this research. Respondent data is then processed using smartPLS 3.0 software. Based on the research, some indicators do not meet the measurement criteria. The attendance information on the attendance system can be accessed using various types of smartphones, so the indicators must be removed from the model. The research results have found that system quality affects usefulness, service quality effect on user satisfaction, information quality affect on usefulness, and usefulness effect on user satisfaction.

1. Introduction
The progress of the current information system has quickly into various fields of life, including education. Information systems supported by information technology can provide added value to an institution is designed to be an effective information system and a system that indicates that the system provides satisfaction and usefulness for those who use it.

This research is essential due to that the attendance system is to replace the students' attendance system, which used paper into an information system. The model produced in this research is useful to the stakeholder to investigate user satisfaction and usefulness for using the attendance system.

The model that will be used in this research employs the Delone & McLean model because it is considered quite valid, and many previous studies have used the Delone & McLean model as a reference to test whether the information system is mandatory [1][2][6][7][11].

This research will also add a usefulness variable from the Technology Acceptance Model (TAM) to explain the factors in measuring the usefulness felt by users of the attendance system [3].
Knowing the factors of satisfaction and usefulness felt by students of 2019 level in the use of attendance system will be a recommendation for Diponegoro University to improve the attendance system.

2. Basic theory

2.1. The Delone & McLean success model

The Delone & McLean success model was first introduced in 1992 by William H. Delone and Ephraim R. McLean to identify the success factors’ information system with the variables in figure 1 [4].

\[\text{Figure 1. The Delone & McLean success model (1992)}\]

In 2003, Delone & McLean improved the model with a change from the previous model of adding service quality variables, adding dimensions of intention to use as an alternative to the dimensions of use, and combining individual impact and organizational impact into net benefits [9].

\[\text{Figure 2. The Delone & McLean Success Model (2003)}\]

2.2. Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) is a model compiled by Davis in 1989 [3]. This model places the attitude factor of each user's behavior using two variables, namely:

1. Perception of Ease of Use: is the ease felt by users after using information systems.
2. Usefulness Perceived: is the level where someone believes that using the system will improve user performance.

This research will use the usefulness variable to find out the usefulness felt directly by the user towards the use of the attendance system.
2.3. Delone & McLean's success model with attendance system
In this research, system quality focuses on the characteristics of system performance. It refers to the ease of use in using attendance systems, with indicators ease of use, ease of understanding, user-friendly, response time, and language [3,5,7,9].

The service quality variable refers to the attendance system's services with indicators assurance, infrastructure, responsiveness, and help desk [5,9].

Information quality is stated to measure the quality of output produced in the attendance system expected by the user when using the system, with indicators format of output (smartphones), the format of output (browser), up-to-date, informative, completeness, and relevance [7,9,10].

The user satisfaction variable is the user response that is raised after using the attendance system, with indicators of repeat visits, repeat purchases, performance satisfaction, enjoyment, and user surveys [4,8,9].

This research does not use intention to use and net benefits variables. The intention to use variable is the user's intention to use the information system so that the user is not required to use the information system depending on whether the user wants to use an information system or not. Whereas the attendance system is a mandatory system used by 2019 level students in conducting attendance activities, this causes the intention to use's variable to be eliminated because it does not fit the system's users' behavior.

This research does not use the net benefits variable because it only uses an individual impact that is the perception or point of view of the 2019 level students at Diponegoro University who use the attendance system and do not use the organizational impact, while the variable net benefit is a combination of individual impact and organizational impact [9].

2.4. Usefulness
The usefulness variable in this research aims to determine the usefulness felt directly by the user towards the use of the attendance system, with indicators timely, mobility, performance, usefulness, and cost-saving [3,9,12].

3. Method

3.1. Research hypothesis
The following is the proposed model used in this research:

![Figure 3. Proposed model](image-url)
H1: System Quality has a positive and significant effect on Usefulness
H2: Service Quality has a positive and significant effect on Usefulness
H3: Information Quality has a positive and significant effect on Usefulness
H4: System Quality has a positive and significant effect on User Satisfaction
H5: Service Quality has a positive and significant effect on User Satisfaction
H6: Information Quality has a positive and significant effect on User Satisfaction
H7: Usefulness has a positive and significant effect on User Satisfaction

3.2. Population and sample
The population in this research were 2019 level students using the attendance system. The data collected were 516 respondents data and obtained 506 respondents data that met the criteria and ten respondents data that did not fit the criteria, so that it could not be used in research.

3.3. Research variable
The endogenous latent variables in this research are as follows:

Table 1. Usefulness statements

| Code | Statements                                                                 | Indicator | Reference               |
|------|-----------------------------------------------------------------------------|-----------|-------------------------|
| U1   | The attendance system allows me to do attendance activities faster than manual attendance | Timely    | Wu & Chen, 2016         |
| U2   | Using the attendance system is very effective because it can be done anywhere. | Mobility  |                        |
| U3   | In my opinion, using an attendance system increases system performance.       | Performance | Davis, 1989            |
| U4   | I feel that using the attendance system is more useful than using manually attendance | Usefulness |                        |
| U5   | In my opinion, attendance using the attendance system saving money because it is accessed digitally and academically does not need to provide paper. | Cost Savings | DeLone & McLean, 2003  |

Table 2. User satisfaction statements

| Code | Statements                                                                 | Indicator            | Reference                  |
|------|-----------------------------------------------------------------------------|----------------------|----------------------------|
| US1  | I am satisfied using the attendance system.                                 | Repeat visits        | DeLone & McLean, 2003      |
| US2  | I am satisfied with the attendance data information that I got.             | Repeat purchases     |                           |
| US3  | Performance in the attendance system is satisfied                           | Performance satisfaction | DeLone & McLean, 1992      |
| US4  | I like to use the attendance system.                                        | Enjoyment            | DeLone & McLean, 2003      |
| US5  | the attendance system is under its purpose as a system for conducting attendance | User surveys         | DeLone & McLean, 2003; Palvia, 1996 |
### Table 3. Information quality statements

| Code | Statements                                                                 | Indicator                  | Reference                      |
|------|-----------------------------------------------------------------------------|----------------------------|--------------------------------|
| IQ1  | Information attendance data on the attendance system can be accessed using various types of smartphones | Format of output (smartphones) | J. livari, 2005                |
| IQ2  | Information attendance data on the attendance system can be accessed using various types of browsers | Format of output (browser)  |                                 |
| IQ3  | In my opinion, the attendance information on the attendance system is presented up to date | Update                     |                                 |
| IQ4  | I can find out information that I have done attendance in the attendance system. | Informative                | Yi-Shun Wang & Yi-Wen Liao, 2007; DeLone & McLean, 2003 |
| IQ5  | Information attendance data on the attendance system is presented in a good and easy to understand | Completeness               |                                 |
| IQ6  | Information attendance data on the attendance system is relevant and following user needs. | Relevance                  |                                 |

### Table 4. System quality statements

| Code | Statements                                                                 | Indicator                  | Reference                      |
|------|-----------------------------------------------------------------------------|----------------------------|--------------------------------|
| SyQ1 | In my opinion, the attendance system is easy to use                          | Ease of use                | Davis, 1989                    |
| SyQ2 | Doing absence on attendance system is straightforward and can be understood | Ease of understanding      |                                 |
| SyQ3 | In my opinion, the features on the attendance system is user friendly        | User-friendly              | Mtebe & Raphael, 2018; DeLone & McLean, 2003 |
| SyQ4 | I do not need a long time to access the attendance system.                   | Response time              | J. livari, 2005; DeLone & McLean, 2003 |
| SyQ5 | I can easily understand the language on the attendance system                | Language                   | McLean, 2003                   |

### Table 5. Service quality statements

| Code | Statements                                                                 | Indicator                  | Reference                      |
|------|-----------------------------------------------------------------------------|----------------------------|--------------------------------|
| SeQ1 | I feel safe using the attendance system because attendance data is directly stored on the system. | Assurance                  |                                 |
| SeQ2 | Overall, infrastructure such as wifi and smartphone is available to support the attendance system. | Infrastructure             | Mtebe & Raphael, 2018; Delone & McLean, 2003 |
| SeQ3 | Attendance system response to users is fast.                                | Responsiveness             |                                 |
| SeQ4 | The attendance system has the facility to contact a technician               | Help desk                  |                                 |
4. Result and Discussion

4.1. Respondent profile data

Table 6. Respondents profile data

| Respondent Profile               | Total | Percentage |
|----------------------------------|-------|------------|
| Year of Entry                    |       |            |
| 2019                             | 506   | 100%       |
| Faculty                          |       |            |
| Faculty of Law                   | 13    | 2.57%      |
| Fakultas of Economics            | 15    | 2.96%      |
| Faculty of Engineering           | 36    | 7.11%      |
| Faculty of Medicine              | 33    | 6.52%      |
| Faculty of Animal and Agricultural Sciences | 19 | 3.75%  |
| Faculty of Humanities            | 61    | 12.06%     |
| Faculty of Political and Social  | 14    | 2.77%      |
| Faculty of Public Health         | 62    | 12.25%     |
| Faculty of Sains and Mathematics | 162   | 32.02%     |
| Faculty of Fisheries and Marine  | 65    | 12.85%     |
| Faculty of Psychology            | 1     | 0.20%      |
| Faculty of Vocational            | 25    | 4.94%      |
| Gender                           |       |            |
| Female                           | 323   | 63.83%     |
| Male                             | 183   | 36.17%     |
| Smartphone used                  |       |            |
| Android                          | 447   | 88.34%     |
| IOS                              | 59    | 11.66%     |

Respondent profile data in this research will be used to create and describe respondents' characteristics and criteria, and the aims are to validate the respondents are a student who uses the attendance system.

4.2. Outer model

4.2.1. Data validity testing. Validity testing using convergent validity is done by looking at the outer loading value and AVE.

Table 7. Convergent validity testing with outer loading result

| Indicator | Outer Loading |
|-----------|---------------|
| IQ1       | 0.496         |
| IQ2       | 0.672         |
| IQ3       | 0.769         |
| IQ4       | 0.737         |
| IQ5       | 0.764         |
| IQ6       | 0.826         |
| SeQ1      | 0.764         |
| SeQ2      | 0.754         |
Based on Table 7, an IQ1 indicator states about the attendance data information on the attendance system can be accessed using various types of smartphones and has an outer loading value < 0.5, which is 0.496. So, the IQ1 indicator is not suitable as a measure of each latent variable. For this reason, in this research IQ1 indicators will be removed from the measurement model. The remaining 24 indicators form a measurement model, as shown in Table 8.

**Table 8.** Convergent validity testing with outer loading after IQ1 was deleted

| Indicator | Outer Loading |
|-----------|---------------|
| IQ2       | 0.655         |
| IQ3       | 0.773         |
| IQ4       | 0.744         |
| IQ5       | 0.780         |
| IQ6       | 0.840         |
| SeQ1      | 0.764         |
| SeQ2      | 0.754         |
| SeQ3      | 0.844         |
| SeQ4      | 0.647         |
| SyQ1      | 0.864         |
| SyQ2      | 0.894         |
| SyQ3      | 0.842         |
| SyQ4      | 0.739         |
| SyQ5      | 0.821         |
| U1        | 0.795         |
| U2        | 0.626         |
| U3        | 0.850         |
| U4        | 0.785         |
| U5        | 0.760         |
| US1       | 0.910         |
| US2       | 0.872         |
| US3       | 0.906         |
| US4       | 0.887         |
| US5       | 0.867         |

*Outer Loading < 0.5
The outer loading test table in Table 8 shows that the 24 indicators have an outer loading value > 0.5, so it can be said that all indicators are valid and underlie the latent variables. Table 9 is the result of validity testing with AVE.

| Variable | AVE   | Description |
|----------|-------|-------------|
| IQ       | 0.579 | Valid       |
| Q        | 0.571 | Valid       |
| Q        | 0.695 | Valid       |
| U        | 0.588 | Valid       |
| US       | 0.790 | Valid       |

Table 9 shows that all variables were having a value > 0.5, states that the latent variable used in the proposed model can explain the variance on the indicator. The next step is to test the validity testing with discriminant validity. There are two tests on discriminant validity: assessing using cross-loading factors or looking at the value of the square root AVE.

| Variable | IQ   | Q     | Q     | U     | US   |
|----------|------|-------|-------|-------|------|
| IQ2      | 0.655<sup>a</sup> | 0.458 | 0.435 | 0.437 | 0.445 |
| IQ3      | 0.773<sup>a</sup> | 0.549 | 0.517 | 0.499 | 0.576 |
| IQ4      | 0.744<sup>a</sup> | 0.450 | 0.570 | 0.476 | 0.527 |
| IQ5      | 0.780<sup>a</sup> | 0.505 | 0.524 | 0.435 | 0.516 |
| IQ6      | 0.840<sup>a</sup> | 0.649 | 0.643 | 0.581 | 0.709 |
| SeQ1     | 0.598 | 0.764<sup>a</sup> | 0.607 | 0.533 | 0.603 |
| SeQ2     | 0.446 | 0.754<sup>a</sup> | 0.449 | 0.431 | 0.481 |
| SeQ3     | 0.585 | 0.844<sup>a</sup> | 0.600 | 0.565 | 0.634 |
| SeQ4     | 0.443 | 0.647<sup>a</sup> | 0.349 | 0.348 | 0.439 |
| SyQ1     | 0.596 | 0.577 | 0.864<sup>a</sup> | 0.582 | 0.617 |
| SyQ2     | 0.660 | 0.581 | 0.894<sup>a</sup> | 0.591 | 0.670 |
| SyQ3     | 0.625 | 0.597 | 0.842<sup>a</sup> | 0.557 | 0.641 |
| SyQ4     | 0.499 | 0.555 | 0.739<sup>a</sup> | 0.520 | 0.528 |
| SyQ5     | 0.583 | 0.522 | 0.821<sup>a</sup> | 0.478 | 0.572 |
| U1       | 0.483 | 0.479 | 0.544 | 0.795<sup>a</sup> | 0.557 |
| U2       | 0.413 | 0.360 | 0.374 | 0.626<sup>a</sup> | 0.453 |
| U3       | 0.575 | 0.579 | 0.592 | 0.850<sup>a</sup> | 0.626 |
| U4       | 0.505 | 0.516 | 0.491 | 0.785<sup>a</sup> | 0.604 |
| U5       | 0.480 | 0.468 | 0.494 | 0.760<sup>a</sup> | 0.525 |
| US1      | 0.683 | 0.687 | 0.688 | 0.653 | 0.910<sup>a</sup> |
| US2      | 0.680 | 0.616 | 0.600 | 0.572 | 0.872<sup>a</sup> |
| US3      | 0.653 | 0.672 | 0.694 | 0.636 | 0.906<sup>a</sup> |
| US4      | 0.628 | 0.625 | 0.677 | 0.720 | 0.887<sup>a</sup> |
| US5      | 0.647 | 0.615 | 0.576 | 0.640 | 0.867<sup>a</sup> |

<sup>a</sup>Value of Loading with the Underlying Variable
From the discriminant validity test done by using cross-loading in Table 10, each variable has a higher outer loading value if it is paired with its latent variable than if it is paired with other latent variables. This conclusion is also corroborated by the use of the AVE square root method in Table 11, where the AVE square root value on the latent variable itself is higher than the correlation between the variables. So it was found that the resulting discriminant validity is categorized as useful.

### 4.2.2. Data reliability testing
Reliability testing is done by looking at Cronbach's alpha value and composite reliability value.

#### Table 12. Cronbach’s Alpha & composite reliability results

| Variable | Cronbach’s Alpha | Composite Reliability | Description |
|----------|------------------|------------------------|-------------|
| IQ       | 0.816            | 0.872                  | Reliab     |
| Qe       | 0.748            | 0.841                  | Reliable   |
| Q        | 0.889            | 0.919                  | Reliable   |
| U        | 0.822            | 0.876                  | Reliable   |
| US       | 0.933            | 0.949                  | Reliable   |

From the data reliability testing conducted using Cronbach’s alpha, in Table 12, it appears that all latent variables have values > 0.7, this defines that the level of consistency or stability of respondents’ answers is high and appropriate. Meanwhile, with the composite reliability method shows that all latent variables have values > 0.7, so it can be concluded that the data can be relied on to go to the next stage up to the hypothesis testing stage in the research.

### 4.3. Inner model

In Table 13, which is the result of R-Square testing, it can be seen how the influence of exogenous variables on endogenous variables, such as the usefulness variable (U), which has a value of 0.522 is categorized as moderate. The user satisfaction variable (US), which has a value of 0.702 is categorized as substantial, and in Table 13, it can be seen that all endogenous latent variables have Q-Square values > zero (0), namely U of 0.222 and US of 0.397. So, each endogenous latent variable in the model has predictive relevance.

#### Table 13. R-Square and Q-Square results

| Endogenous Variable | R-Square Value | Q-Square Value |
|---------------------|----------------|---------------|
| U                   | 0.522          | 0.222         |
| US                  | 0.709          | 0.397         |
In Table 14, the results of hypothesis testing, all variables have an Original Sample value > zero (0) and then have a T-statistic value higher than the T-Table value (1.96) and P-Values < 0.05, which indicates that H1, H2, H3, H4, H5, H6, and H7 have a positive and significant effect on the acceptance of attendance system. So, the hypothesis H1, H2, H3, H4, H5, H6, and H7 are accepted.

5. Conclusion
The results of the research have found that system quality variable effect on usefulness variable, service quality variable effect on usefulness variable, information quality variable effect on usefulness variable, system quality variable effect on user satisfaction variable, service quality variable effect on user satisfaction variable, information quality variable effect on user satisfaction variable and usefulness variable effect on user satisfaction variable.

6. Suggestion
Suggestions that can be given in this research are advisable to emphasize or focus on technology, such as smartphones used for students who use the attendance system. It is suggested by adding the net benefits variable for further research. In addition, the variable organizational impact can be used for further research.

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