Analysis of the Use of Thesis Guidance Information System Using the Technology Acceptance Model

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Abstract. This study analyzes the implementation of thesis guidance information system named SIBIMTA for students of Faculty of Engineering, Universitas Negeri Yogyakarta. This study was classified as correlational research with a quantitative approach. Data were collected from 161 respondents in Faculty of Engineering who were working on their theses. Data collection techniques used a questionnaire with 32 questions. Data were taken using the Likert scale with 4 alternative options. The results of the study were: (1) the system quality had a positive effect on perceived usefulness; (2) the system quality had a positive effect on perceived ease-of-use; (3) the information quality had a positive effect on perceived usefulness; (4) information quality had a positive effect on perceived ease of use; (5) service quality had a positive effect on perceived usefulness; (6) service quality had a positive effect on perceived ease of use; (7) the perceived ease of use had a positive effect on perceived usefulness; (8) perceived ease of use had a positive effect on attitudes toward using a new technology; (9) perceived usefulness had a positive effect on attitudes toward using a new technology; (10) the perceived usefulness did not have a positive effect on the intention to use the new technology; (11) the attitude of using technology had a positive effect on the intention to use the new technology; (12) intention to use the new technology had a positive effect on actual use.

1. Introduction
The development of technology impacts all aspects of humans lives and it has made daily activities easier and better. Technology changes and improves economy, culture, social, and educational aspects. Since the internet was discovered, activities performed manually has become more simple and practical. In the education field, technology accommodates communication between teachers and students, problems with materials, tests, homework, guidance and grading which previously had to be discussed face to face, now it can be done online through internet networking. Technology improves all aspect of daily activities and assists people to work faster and easier.

The observation data from the students in Faculty of Engineering, Universitas Negeri Yogyakarta, showed that before the end of 2017, students completed their thesis using a manual system. The students should meet face to face with the thesis supervisors. They should contact the lecturers first and make an appointment. All of required documents and letters were also processed manually by the academic staff. Manual academic service is not longer effective. It takes more efforts and time. Thesis guidance process will be interrupted if the guidance schedule is delayed or canceled due to certain reasons. The amount of time wasted because the manual system is considered a significant problem.

Based on these problems, the academic service system at Universitas Negeri Yogyakarta was replaced by an online-based service system particularly in the activities of thesis guidance management,
which originally used a manual system and then now was swifter to an online based system. In 2016, Universitas Negeri Yogyakarta created an information system to support the thesis guidance management named SIBIMTA. The purpose of SIBIMTA is to assist the students who are working on the thesis to receive guidance from their supervisors. The students who need thesis guidance do not need to meet the lectures directly, they are only required to upload the thesis files to the information system. The existence of SIBIMTA is expected to improve the thesis guidance management to be easier, faster and effective.

A new technology in an organization usually has positive or negative impact. A positive impact is indicated by the role of the new implemented technology which improve the organization's activities. Conversely, if the new technology bring poor organization's activities, it means it has negative impact. Negative impact can occur due to several factors, for example if the users are not ready to implement the new technology. To better predict, explain, and increase user acceptance, Davis, F.D. [4] states that It is important to examine the factors influence end users in adopting a new technology, to better understand why people accept or reject computers. The theory that supports this statement is the theory of reasoned action (TRA) by Fishbein and Ajzen [8]. The theory states that users who get the benefits (positive outcomes) will continue to utilize the technology. One model that can be used to measure users’ acceptance of new technology implementation is Technology Acceptance Model (TAM).

TAM is one of the theoretical models of technology acceptance approaches. TAM was introduced by Davis. It is a derivative of TRA. According to Davis [4] the purpose of TAM is to describe the factors that determine the process of receiving information-based technology in general, explaining the behavior of end users of information technology with a wide enough variation along with the user population. TAM suggests two factors that have influence on the acceptance of a new technology, namely perceived usefulness and perceived ease-of-use. Both of the factors affect users’ attitude towards using the new technology, which is directly proportional to the behavioral intention to use the technology which ultimately determines the actual usage.

Technology acceptance is also influenced by several other factors besides the impact of the technology namely the ability of the technology to run or assist the process of activities. These factors in the theory of TAM are categorized into four groups. One of the factors is system characteristics, which consist of various sub categories, including: (1) system quality, (2) information quality, and (3) service quality.

According to Afiani and Priyanto [1], Perceived usefulness (PU) is the degree to which a person believes that using a particular technology would enhance his or her job performance. In this case, it is related to how the students are working on their thesis. Perceived ease-of-use (PEOU) is defined the degree to which a person believes that using a particular technology would be free from effort. Attitudes towards the use (ATU) of technology can be interpreted as individual feelings both positive or negative about the behavior of using the technology. The behavioral intention to use (BIUS) technology here is the student's intention to use SIBIMTA.

TAM suggests two factors that have an influence on the acceptance of a new technology, namely PU and PEOU. These two factors will influence the desire to use the technology. While the external variables that will be used in TAM based on the study consisted of three variables including system quality, information quality and service quality. This study will analyze the acceptance and the use of the online thesis guidance information system based on aspects that exist in TAM.

2. Research Method
This study is classified as an exploratory descriptive study using a correlational approach which is part of the expose facto research, because it has the aim of describing the circumstances of events that occur in the field. Explorative research is expected to explore the relationship between variables, test hypotheses, develop generalizations, and develop theories that have universal validity without controlling and manipulating variables. The setting of the study was Faculty of Engineering, Universitas Negeri Yogyakarta in September-October 2018. The samples were determined by using a purposive sampling technique. This technique determines the sample based on certain considerations according to
the research objectives. Based on the research objectives, the selected sample consisted of students who were writing theses. The reason was the respondents of the study should be the students who were writing theses and were already used SIBIMTA.

The method used in data collection was a survey method by distributing questions in the form of a closed questionnaire. The questionnaire consisted of the respondent's identity, instructions for filling the questionnaire and statements in accordance with the research construct. The objects of this study were influential constructs for the acceptance of the use of SIBIMTA in the academic activities of engineering students at Universitas Negeri Yogyakarta. These constructs were the constructs mentioned in the TAM theory and the DeLone and McLean information system success model (2003). The data analysis technique used was Partial Least Square (PLS).

3. Results
3.1. Inner Model Design
The design of the inner model between constructs in this study was based on the research hypothesis. The design of the inner model used smartPLS software 3. Figure 1 presents the results of the inner model design.

![Figure 1. Inner Model Design](image)

The design of the first inner model from Figure 1 is H1 system quality (SysQual) influencing PU followed by the second H2 system quality (SysQual) influencing the PEOU variable. H3 information quality (InfQual) affects PU followed by H4 information quality (InfQual) influences PEOU. Then H5 service quality (ServQual) influences PU continued by H6 service quality (ServQual) that influences PEOU. Then H7 PEOU influences PU, followed by H8 PEOU influencing ATU. Then H9 PU influences ATU followed by H10 PU influences BIUS. Then H11 ATU influences BIUS. Finally H12 BIUS influences AU.

3.2. Outer Model Design
The indicators in each construct of this study were reflective, so the arrows in each construct were headed towards the indicators. The design of the outer model used the help of smartPLS 3 software which can be seen in Figure 2.
From Figure 2, it can be seen SysQual or system quality has indicators of KS1, KS2, KS3, KS4 and KS5. The quality of the system has an influence on PU and PEOU. InfQual or information quality has indicators of KI1, KI2, KI3, KI4 and KI5. Information quality has an influence on PU and PEOU. ServQual or service quality has indicators of KL1, KL2 and KL3. Service quality has an influence on PU and PEOU. PU or perceived usefulness has indicators of PU1, PU2, PU3, PU4, PU5 and PU6. Perceived usefulness has an influence on ATU and BIUS. PEOU or perceived ease of use has indicators of PEOU1, PEOU2, PEOU3, PEOU4 and PEOU5. Perceived ease of use has an influence on PU and ATU. ATU has indicators of ATU1, ATU2, ATU3 and ATU4. The attitude of using new technology has an influence on BIUS. BIUS or intention to use technology has the indicators of BIUS1, BIUS2, and BIUS3. The intention to use technology has an influence on the AU. AU or actual use had AU indicators.

3.3. Model Estimation
The method used in assessing parameters (estimation) in this study was an algorithm from smartPLS v3.0. To measure the inidimensionalitas of each construct in terms of the convergent validity of each construct indicator. The category for indicating individual reflexive correlation is high if it has a score higher than 0.70 with the construct being measured. For scores that have a loading factor of 0.50 to 0.60, they can still be used for models that are still under development [3]. The results of testing the model using the PLS algorithm can be seen in Figure 3.
The results of loading factors of the model testing, including: H1. SysQual or system quality had an influence on PU by 0.119; H2. SysQual or system quality had an influence on PEOU of 0.134; H3. InfQual or quality of information had an influence on the PU of 0.194; H4. InfQual or information quality had an influence on PEOU of 0.286; H5. ServQual or service quality had an influence on PU by 0.170; H6. ServQual or service quality had an influence on PEOU of 0.395; H7. PEOU or perceived ease of use has an influence on PU of 0.444; H8. PEOU had an influence on ATU of 0.263; H9. PU has an influence on ATU of 0.539; H10. PU has an influence on BIUS of 0.116; H11. ATU has an influence on BIUS of 0.439; H12. BIUS has an influence on AU of 0.481.

3.4 Model Evaluation
3.4.1 Testing the Outer Model
There were 3 categories in evaluating the outer model in this study. Using reflective indicators namely convergent validity (convergent validity score is the loading factor score for latent variables with the indicators. Expected score > 0.70). Discriminant validity (the score of discriminant validity is the score of cross loading factor which has the order to know whether the construct has sufficient discrimination by comparing the loading factor score on the intended construct that must be greater than the loading score with other constructs). Composite reliability (Data that has composite reliability > 0.8 has high reliability). Convergent validity from model calculations with reflective indicators can be viewed from the relationship between item / indicator scores and the construct (loading factor) that can be assessed from the output outer loadings.

![](image1.png)

Figure 4. Outer Loading Results of ATU, AU, BIUS, and Information Quality.

![](image2.png)

Figure 5. Outer Loading Results of PEOU, PU, System Quality, and Service Quality.

An alternative way to measure discriminant validity is to equalize the square root score of the Average Variance Extracted (AVE) of each construct with the correlation score between constructs and other constructs (latent variable correlation). The score of discriminant validity is considered adequate if the model has a square root score of AVE for each construct higher than the score of the latent variable
correlation. The results of AVE and latent variable correlations of PLS Algorithms can be reviewed in Table 1 and Figure 6.

Table 1. Results of AVE and AVE Square Root

|   | AVE   | Akar AVE |
|---|-------|----------|
| KS| 0.615 | 0.784219 |
| KI| 0.558 | 0.746994 |
| KL| 0.666 | 0.816088 |
| PU| 0.608 | 0.779744 |
| PEOU| 0.623 | 0.789303 |
| ATU| 0.688 | 0.829458 |
| BIUS| 0.703 | 0.838451 |
| AU| 1     | 1        |

Figure 6. Output of Latent Variable Correlation

Based on the equation of the Table and Figure above, it can be concluded that the square root score of each construct was greater for the relationship between constructs and other constructs. For example, the AVE square root of the PU construct of 0.779 is greater than the correlation score of PU with ATU of 0.719, greater than the correlation score of PU with BIUS of 0.432, greater than the correlation score of PU with PEOU of 0.685, greater than the correlation score of PU with KS equal to 0.418, greater than the correlation between PU and KL by 0.527, and greater than the correlation between PU and KI of 0.571. Therefore it can be concluded that all constructs of the estimated model have discriminant validity criteria.

Besides testing the construct validity, a construct reliability test was assessed using two categories, namely composite reliability and Cronbach alpha of the indicator block assessing the construct. The construct is considered to be reliable when the composite reliability or Cronbach alpha scores are above 0.70 [9]. The composite reliability and Cronbach alpha output can be viewed in Table 2 and Table 3. It can be concluded that each construct had good reliability.

Table 2. Output of Composite Reliability

|   | Composite Reliability |
|---|----------------------|
| KS| 0.847                |
| KI| 0.748                |
| KL| 0.856                |
| PU| 0.870                |
| PEOU| 0.848             |
| ATU| 0.847               |
| BIUS| 0.798               |
| AU| 1                    |

Table 3. Output of Cronbachs alpha

|   | Cronbachs Alpa |
|---|----------------|
| KS| 0.889          |
| KI| 0.863          |
| KL| 0.856          |
| PU| 0.902          |
| PEOU| 0.892          |
| ATU| 0.898          |
| BIUS| 0.876          |
| AU| 1              |

3.4.2 Testing the Inner Model

After evaluating the measurement (outer) model, the structural and inner model tests were then carried out by reviewing the R-Square score in the endogenous construct. Structural models that indicate that
good, moderate and weak models has an R-square result of 0.67, 0.33, and 0.19 respectively [9]. The R-square score of each endogenous construct from the estimated model is presented in Table 4.

The results of the R-square output in Table 4 indicated that there were two constructs that fall into the “moderate” criteria and one construct that falls into the “weak” criteria. The interpretation of the R-square output can be interpreted as follows: (1) The R-square score of the PU endogenous construct for this research model was 0.54. This meant that the KS, KI and KL constructs could only explain the PU construct of 54% and the rest was explained by other variables outside the model, (2) R-square score of PEOU’s endogenous construct for this research model was 0.40. This meant that the KS, KI and KL constructs could only explain the ATU construct of 40% and the rest was explained by other variables outside the model, (3) The R-square score of the endogenous ATU construct for this research model is 0.55. This meant that the PU and PEOU constructs could only explain the ATU construct of 55% and the rest was explained by other variables outside the model, (4) R-square score of BIUS endogenous construct for this research model was 0.27. This means that the PU and ATU constructs could only explain the BIUS construct by 27% and the rest is explained by other variables outside the model, (5) R-square score of the AU endogenous construct for this research model was 0.23. It meant that the BIUS construct only described the AU construct of 23% and the rest was explained by other variables from outside the model.

### Table 4. Output R-Square (R²)

| Construct | R-Square (R²) |
|-----------|--------------|
| PU        | 0.554        |
| PEOU      | 0.419        |
| ATU       | 0.554        |
| BIUS      | 0.280        |
| AU        | 0.232        |

Hypothesis testing results showed that: (1) the first hypothesis concluded that the proposed H1 was rejected. The output path coefficients display the results of the statistical t score on the construct of the system quality to the construct of PU under 1.960 which was 1.754 so that the impact produced by the system quality on the construct of PU was not identified as significant. (2) Based on the second hypothesis testing, it was concluded that the proposed H2 was accepted. The output path coefficients displayed the results of the t statistic score on the system quality construct toward the PEOU construct above 1.960 which was 2.015 thus the impact of the system quality on the PEOU construct was significant. (3) Based on the third hypothesis testing, it was concluded that the proposed H3 was accepted. Output path coefficients display the results of the t score of statistics on the construct of information quality to the construct of PU above 1.960 which was 2.828 thus the impact produced by the quality of information on the construct of PU was identified as significant. (4) Based on the fourth hypothesis testing, it was concluded that the proposed H4 was accepted. The output path coefficients display the results of the t score of statistics on the construct of information quality on the PEOU construct above 1.960 which is 3.535 thus the impact produced by the quality of information on the PU construct is significant, (5) Based on the fifth hypothesis testing, it was concluded that the proposed H5 was accepted. The output path coefficients display the results of the t score of statistics on the construct of service quality to the construct of PU above 1.960 which was 2.204 so that the impact produced by the quality of service on the construct of PU was identified as significant. (6) Based on the sixth hypothesis testing, it was concluded that the proposed H6 was accepted. The output path coefficients displayed the results of the statistical t score on the service quality construct of the PEOU construct above 1.960, which was 6.543 so that the impact produced by the quality of the service on the PEOU construct was significant, (7) Based on the seventh hypothesis testing, it was concluded that the proposed H7 was acceptable. The output path coefficients displayed the results of the statistical t score of the PEOU construct on the PU construct above 1.960 which was 5.843 thus the impact produced by the PEOU on the PU construct was significant. Based on the eighth hypothesis testing, it was concluded...
that the proposed H8 was accepted. The output path coefficients displayed the results of the statistical t score of the PEOU construct on the ATU construct above 1.960, which is 3.004 thus the impact produced by the PEOU on the ATU construct. (9) Based on the ninth hypothesis testing, it was concluded that the proposed H9 was acceptable. The output path coefficients displayed the results of the statistical t score of the PU construct to the ATU construct above 1.960 which was 7.647 thus the impact produced by PU on the ATU construct is identified as significant. PU has the biggest influence on ATU, this is in accordance with other researchs [10][1][7][2]. (10) Based on the tenth hypothesis testing, it was concluded that the proposed H10 was rejected. The output path coefficients displayed the results of the statistical t score of the PU construct to the BIUS construct below 1.960 which is equal to 0.914 such that the impact produced by PU on the BIUS construct was not significant. (11) Based on the eleventh hypothesis testing, it was concluded that the proposed H11 could be accepted. The output path coefficients displayed the results of the statistical t score of the ATU construct on the BIUS construct above 1.960 which is 4.031 so that the impact produced by the ATU on the BIUS construct was identified as significant. (12) Based on the twelfth hypothesis testing, it was concluded that the proposed H12 was accepted. The output path coefficients displayed the results of the statistical t score of the BIUS construct against the AU construct above 1.960 which was 8.619 thus the impact produced by BIUS on the AU construct was identified as significant.

4. Conclusion
Based on the data obtained from this study, there were several tests that have t arithmetic scores below the t table, thus they do not have a significant impact on the dependent construct. This was because some students have not used SIBIMTA completely to do their theses because it was not recommended by their supervisors or the supervisors do not want to use it at the initial stage of implementing the system. The following details the results of testing the model, including: (1) system quality had a positive influence on perceived usefulness; (2) system quality had a positive influence on perceived ease-of-use; (3) information quality had a positive influence on perceived usefulness; (4) information quality had a positive influence on perceived ease-of-use; (5) service quality had a positive influence on perceived usefulness; (6) service quality had a positive influence on perceived ease-of-use; (7) perceived ease-of-use had a positive effect on perceived usefulness; (8) perceived ease-of-use has positive effect on the attitude to use technology; (9) perceived usefulness had a positive influence on attitudes using technology; (10) perceived usefulness did not have a positive influence on intention to use the technology; (11) attitude to use the technology had a positive influence on intention to use the technology; (12) intention to use the technology had a positive effect on actual use.

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