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Adoption of Information Technology and Acceptance of Learning Management Systems During Pandemic Covid-19 in Indonesia

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Abstract

The COVID-19 pandemic that emerged in 2019, in wuhan, Hubei province, China has spread almost all over the world, including Indonesia. From the virus, the government has issued public policies, which include social distancing, social isolation, and independent impacts. Various sectors must implement the policy. Several companies in Indonesia must implement work from home for all their employees, including educational institutions in Indonesia, starting from the Playgroup level, PAUD, Kindergarten, Elementary, Junior High, State Senior High School or private high school. Vocational High Schools and Colleges also implement an online learning process from home. Information Technology provides solutions for the education system in Indonesia in these difficult times, so that the learning process can continue. In previous studies, an exploration of the Unified Theory of Acceptance and Use of Technology (UTAUT) model has been carried out with social isolation variables, and the moderating variable of corona fear towards Behavioral Intentions of Learning Management System and Behavior of Use of Learning Management Systems among high school students or Vocational and state university students. Researchers try to apply this model in developing countries such as Indonesia. Bootstrap method with 100 subsamples to determine the significance value for each path coefficient. The responses received by the researchers were 101 respondents. Data analysis using Smart Partial Least Square (PLS) and Structural Equation Modeling (SEM). The findings show a positive relationship between Performance Expectations (PE), Effort Expectations (EE), Social Influence (SI), and Social Isolation on LMS Behavioral Intentions and, also between LMS Behavioral Intentions and Behavior. In addition, the results of the moderating analysis show that the fear of Corona only moderates the relationship between Performance Expectations and Social Influences with LMS Behavioral Intentions. The findings imply the need to increase the behavioral intentions of LMS users among college students or university students.

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Keywords: COVID-19; UTAUT; Smart Pls; LMS; Higher education; Senior High School; Vocational School

Introduction

COVID-19 emerged in 2019, in Wuhan, Hubei Province, China. This epidemic spread very quickly throughout China and even the whole world. According to a report by the World Health Organization (2020), more than 130 countries and territories have confirmed the presence of the Corona virus as an emerging case in mid-March 2020. As a highly contagious disease has a relatively high mortality rate, this has caused increasing fear among the public (Ahorsu, et al., 2020), because fears about COVID-19 are based on contact with individuals who may be infected with the disease (Lin, 2020).

In response to the COVID-19 crisis, governments around the world are issuing public policies that include social distancing, isolation and quarantine (Anderson, et al., 2020), This of course has social and economic consequences and applies worldwide. While millions of people around the world are staying in their homes to prevent the spread of the Corona virus, their livelihoods have been hindered, and, in the case of students, their access to educational establishments has been blocked. However, when countries are isolated, advances in Information Technology shed light on the possibility of alternative learning. The quite dramatic change caused by the evolution of Information Technology in all aspects of life, especially considering its involvement, is very important to discuss higher education during the COVID-19 pandemic. Technology always helps improve the simplest tasks, such as the advancement of traditional learning processes.

A Technology that lies under the e-learning umbrella has allowed him to continue the learning process during the lockdown (Zwain, 2019). This technology is referred to as a Learning Management System (LMS). LMS is a web-based technology developed to improve the learning process through proper planning, implementation, and evaluation in educational institutions (Alias & Zainuddin, 2005). The use of LMS in the learning process helps facilitate e-learning because it provides educational materials without time or place constraints (Ain, Kaur, & Waheed, 2015), allows students and teachers to interact via the internet and facilitates the sharing of information related to courses and resources (Al-Busaidi & Al-Shihi, 2010; Lonn, et al., 2011). This indicates that the use of this technology during the COVID-19 pandemic is a necessity of the era to keep the learning process running. Some examples of LMS used in institutional education include Moodle, WebCT, Blackboard, and Desire2Learn (Iqbal, 2011; Waheed, et al., 2016). Hassanzadeh et al. (2012) revealed in his study that with the advent of information technology, the definition of higher education has changed. Therefore, the area of technology acceptance is seen by scholars as a mature area in the role of information systems in science (Venkatesh, et al., 2003). According to Teo (2011) technology acceptance is a person's willingness to adopt the use of technology to facilitate task execution based on the support it is designed to provide. Recently, the acceptance of e-learning systems and technologies is being investigated by researchers in different educational environments around the world, using different models based on different criteria (Decman, 2015; Raza, et al., 2020). Considering the context of the higher education sector, it is important to investigate the factors that lead to the acceptance of e-learning technology among students, as investing in an e-learning system requires a large investment in resources and infrastructure (Ma & Yuen, 2011).

Existing literature reveals that LMS acceptance among university students varies from country to country (Zwain, 2019), such as Arab universities in the Middle East region registered e-learning acceptance rates are still low (Matar et al., 2011). Meanwhile, the acceptance rate of e-learning systems is high registered in western countries (Decman, 2015).

This paper investigates the factors that influence LMS admissions from the perspective of students and/or students during the COVID-19 pandemic in Indonesia. To this end, UTAUT theory is considered a well-developed, updated, and relevant theory of technological acceptance by researchers, as it has been incorporated from existing recognized technology acceptance theories (Decman, 2015). The

reason for the development of the UTAUT model is to explore the unity of the information technology view (Venkatesh, et al., 2003). The model was later validated by Venkatesh et al. (2003) in a longitudinal study study, in which it was found that models accounted for 70 percent of variances in BI for using the technology and 50 percent about actual use. Therefore, this theory was chosen among other theories because it is more comprehensive, allowing for a higher explanatory power than the early theory used to learn the acceptance of technology.

Over the years, researchers have explored models through combining several factors to understand reception technologies relevant to the situational factors of the regions studied. Lin and Anol (2008) added online social support to understand its effect on the use of network information technology in Taiwan. Furthermore, Raza et al. (2019) studied the factors affecting the acceptance of mobile banking (M-banking) at the Islamic Bank of Pakistan using a modified integrated acceptance theory and technology usage model (UTAUT). In addition, Chao, (2019) aims to empirically test the factors that influence student and/or student BI against mobile learning through the addition of different factors such as perceived comfort, trust satisfaction, risk, and mobile self-efficacy. Taiwo and Downe (2013) and Dwivedi, et al. (2011) revealed, in their latest meta-analysis of the results of the UTAUT Study, that the construction is positively and significantly related to the existing literature but emphasized the lack of moderator investigation in some studies. Therefore, the expansion of this model through the incorporation of Social Factors and Corona Fears will help understand the user's behavior of technology acceptance intentions in light of the recent pandemic and its sub-use of sequential behavior.

The acceptance of e-learning systems using the UTAUT Model is adequate because it is the acceptance of the latest and most advanced technology. The theory of admission is widely recognized by scholars (Decman, 2015). The findings of the expanded model will prove useful for understanding LMS admissions among students, in this way, educational institutions will focus on Effective system implementation and investing in e-learning technology for good purposes. This research paper follows the introduction with a literature review, an ornate explanation of the theoretical background and hypothesis development that is to be tested. Later, the paper emphasizes the research methodologies used to measure variable impact, and the sampling and data collection methods used. Then, data analysis techniques and findings will be discussed. Finally, the paper concludes with the implications of the findings and the future direction of the study that follows the limitations of the study.

Theoretical Framework

Theoretical Background

This paper develops an integrated model through the expansion of the Unified Theory of Acceptance and Use of Technology (UTAUT) by adding the independent variable Social Isolation caused by the recent COVID-19 pandemic, and a moderating variable, Corona Fear, for the construction of a pre-existing model. Which includes Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI) and Facilitating Conditions (FC). The original UTAUT was introduced by Venkatesh et al. (2003). He reviewed eight existing theories to develop a unified model. These theories include Theory of Reasoned Action (TRA), Innovation Diffusion Theory (IDT), Social Cognitive Theory (SCT), Technology Acceptance Model (TAM), Theory of Planned Behavior (TPB), Model of PC Utilization (MPCU), motivational. Model (MM), and Combined TAM and TPB (C-TAM-TPB).

The integrated model allows academics to view and demonstrate the full picture of predictors of technology acceptance (Al-Imarah, Zwain, & Al-Hakim, 2013). Venkatesh et al. (2003) revealed that the integrated model predicts a 69 percent variance in the use of Behavioral Intention, which is higher than the previous model which only predicted 17 to 53 percent. Therefore, this model is a useful tool to investigate student acceptance of LMS during the COVID-19 pandemic. Raza et al. (2020) have applied the UTAUT model and extended it to assess the role of Social Isolation on LMS Behavioral Intentions and the moderating effect of pandemic-induced Corona Fear. Further research needs to be done to develop the UTAUT model by adding moderating and mediating variables in other developed and developing countries during the pandemic, to analyze what factors influence LMS acceptance and use of e-learning systems, to provide better learning materials. to students, or students in pursuit of

education. Thus, the authors use the model developed by Raza et al. (2020) to analyze what factors influence Information Technology Adoption and LMS Acceptance during the CVID-19 Pandemic in Indonesia.

Hypothesis Development

Performance Expectancy (PE) the level of an individual's perception of the usefulness of technology to perform different tasks is called Performance Expectancy (PE) (**Venkatesh, et al., 2003**; **Ain, et al., 2015**), and in the case of LMS acceptance evaluation among students, it is considered as a student's belief about the effectiveness of the system for learning (**Decman, 2015**). Therefore, based on the literature review, the following hypothesis was proposed by previous researchers (**Raza et al., 2020**):

H1: PE has a positive effect on BI LMS

Effort Expectancy (EE). Yoo et al. (2012), revealed that the most influential factor of the UTAUT model is Effort Expectancy (EE) which is considered an intrinsic element, because it is the amount of effort that individuals perceive to invest in using a technology, which is generally low due to the user-friendly nature of information technology (Decman, 2015). Therefore, based on the literature review, the following hypothesis was proposed by previous researchers (Raza et al., 2020):

H2: EE has a positive effect on BI LMS

Social Influence (SI). Social influence (SI) is a reflection of peer, instructor, and peer perceptions of technology on individual behavioral intentions in social environments (Venkatesh et al., 2003). When evaluating LMS acceptance, SI is the degree to which a student's social circle influences their LMS BI. Along with advances in information technology and the emergence of social networking sites, the focus of this factor has shifted from physical to virtual (Decman, 2015). Therefore, based on the literature review, the following hypothesis was proposed by previous researchers (Raza et al., 2020):

H3: SI has a positive effect on BI LMS

Facilitating Conditions (FC). Venkatesh et al. (2003) refers to Facilitating Conditions (FC) as the availability of adequate support and resources for the proper use of technology. In the context of the E-learning environment, FC focuses on the accessibility of technical and organizational infrastructure for the adoption and use of LMS. This includes training, technical support, and required infrastructure (Decman, 2015). Therefore, based on the literature review, the following hypotheses were proposed by previous researchers (Raza et al., 2020).

H4: FC has a positive effect on BI LMS

Social Isolation (SI). De Jong Gierveld, et al. (2016) define social isolation as an individual's absence or low number of meaningful ties with others, thus making them socially isolated. The COVID-19 pandemic has forced countries to practice social distancing, and drastically reduce social gatherings, through the implementation of social distancing as it is necessary to combat the spread of the Corona Virus. Due to the closure of classrooms, public markets and public places and the cancellation of activities and gatherings, social distancing reduces social contact between people in groups, leading to isolation around the world (Wilder-Smith & Freedman, 2020), Previous researchers (Raza et al., 2020) predict that socially isolated students will be positively stimulated to take online classes through the Learning Management System. Therefore, based on this assumption, the previous researcher (Raza et al., 2020) proposed this hypothesis and based on the literature review, the author also used the following hypothesis:

H5: Social isolation has a positive effect on BI LMS

Behavioral Intention (BI) from LMS. A person's intention to adopt the use of certain technologies to perform various tasks is called Behavioral Intention (BI) (Ain, Kaur, & Waheed, 2015). Ngai et al. (2007) define BI as the level of commitment that a person shows to engage in certain behaviors, which in the context of this paper is the level of commitment of students to accept the use of LMS to meet the objectives of his educational course. Therefore, based on the literature review, the following hypotheses were proposed by previous researchers (Raza et al., 2020).

H6: BI LMS has a positive effect on LMS Use Behavior

Medium Effects of Corona Fear. Mertens et al. (2020) defines fear as an adaptive emotion that mobilizes energy in individuals to deal with potential threats. Pakpour & Griffiths (2020) reveal that unforeseen and extraordinary situations such as a disease outbreak can cause fear among people, and therefore become one of the psychological aspects of the COVID-19 pandemic. This shows the need to know the effect on students, especially regarding the acceptance and use of LMS implemented by educational institutions, to continue the learning process. So, based on the literature review, the following hypotheses were proposed by previous researchers (Raza et al., 2020):

H7: Corona Fear Moderates Relationship between PE and BI LMS
H8: Corona Fear moderates the relationship between EE and BI LMS
H9: Corona Fear Moderates SI's Relationship with BI LMS
H10: Corona Fear moderates the relationship between FC and BI LMS
H11: Corona Fear moderates the relationship between Social Isolation and BI LMS

Research Methods

Data Collection and Instrumentation

The samples used in this study were students enrolled in private universities in Gresik and several state universities in Surabaya and Madura, East Java, as well as private universities in Bireuen Regency, Aceh and also high school students in the city of Gresik. For the development of the scale of data collection, items are adapted from existing literature. Items for measuring variables were adapted from Venkatesh et al. (2003) and Zwain (2019). The scale for measuring construction is based on a five-point Likert scale design and consists of a total of 34 items. Responses to the analysis were collected from students and/or students of High School or Vocational High School by spreading questionnaires online. Nonetheless, the exact size of the samples to be taken depends largely on the type of research being worked on. According to Raza and Hanif (2013), Comrey and Lee (2013), and Raza et al. (2020), 50 samples are considered bad, 300 are good, 500 are excellent and 1000 are being considered excellent samples with respect to factor analysis. However, we only managed to gather a total of 101 responses. The question instrument was then translated into Indonesian for the purpose of this study. The instrument grid is presented in Table 1.

Research Methodology

Since the original UTAUT model by Venkatesh et al. (2003) offer relevant factors to determine students' behavioral intentions towards LMS and their use behavior, then Raza et al. (2020) expand the UTAUT model by adding moderating variables. Therefore, to meet the objectives of this study, the UTAUT model which has been modified by (Raza, et al., 2020), is used as shown in Figure 1. Meanwhile, the following (Figure 2) is a structural model formed from the formulation of the problem.

Table 1. Questionnaire

Items	Sub-items	Question
Performance Expectancy (X1)	X1.1	I find LMS useful for studies.
	X1.2	LMS allows me to accomplish class activities more quickly.
	X1.3	LMS increases learning productivity.
Effort Expectancy (X2)	X2.1	I live and work.
	X2.2	Learning how to use LMS is easy for me.
	X2.3	I find the system to be flexible to interact with.
Social Influence (X3)	X3.1	My peers who influence my behavior think that I should use LMS.
	X3.2	My friends who are important to me think that I should use LMS.
	X3.3	Instructors whose opinions that I value prefer that I should use LMS.
	X3.4	I use the system because of the proportion of classmates who use the system.
Facilitating Condition (X4)	X4.1	I have resources to use LMS
	X4.2	I have the knowledge to use LMS
	X4.3	A specific person (or group) is available to assist when difficulties arise with LMS
	X4.4	Using the system fits into my study styles.
Social Isolation (X5)	X5.1	I felt alone and friendless.
	X5.2	I felt isolated from other people.
	X5.3	I have someone to share my feelings with
	X5.4	I found it easy to get in touch with others when I needed others to felt they had to help me.
	X5.5	When with other people, I feel separate from them.
Corona Fear (M)	M1	I do not want to leave the house because of the risk of getting infected by COVID 19 pandemic
	M2	I am concerned that I may get sick from COVID-19 pandemic during the next 6 month.
	M3	I am feeling anxious about COVID-19 pandemic.
	M4	I am concerned that someone in my immediate family may get sick from COVID-19 pandemic during the next 6 months.
	M5	I am scared about getting infected by COVID-19 pandemic.
	M6	I see the possibility that Covid-19 pandemic will break out in the area where.
Behavioral Intention (Y)	Y1	I intend to continue using LMS.
	Y2	For my studies, I would use LMS.
	Y3	I will continue to use LMS on a regular basis.
	Y4	Because of the possibilities that LMS offers, I plan to approach my next course more effectively.
Use Behavior of LMS (Z)	Z1	I use LMS frequently during my academic period.
	Z2	I use many functions of LMS (e.g., discussion forum, chat session, messaging, download course contents, upload assignments, etc.
	Z3	I depend on LMS.
	Z4	Use of LMS by our university is a good idea.
	Z5	LMS makes learning more interesting for the students.

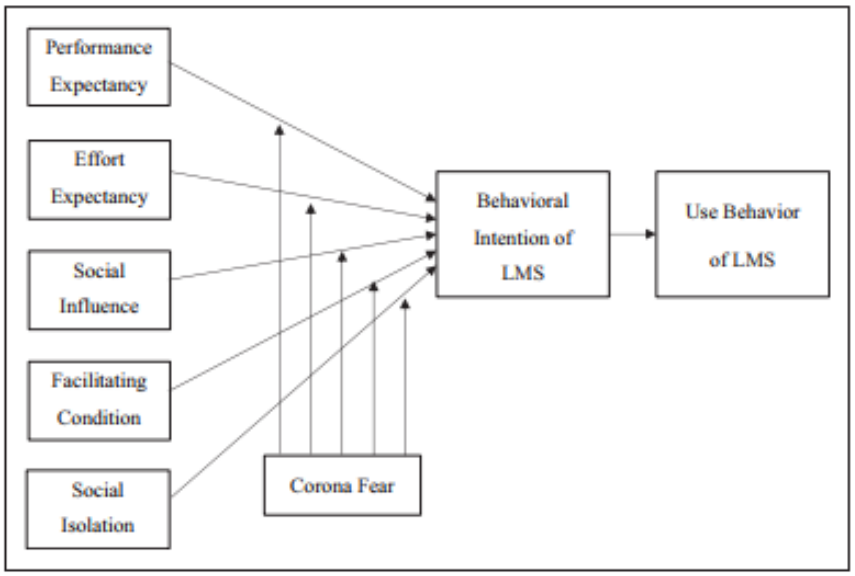

Figure 1. Conceptual Model (source: Raza, et al., 2020)

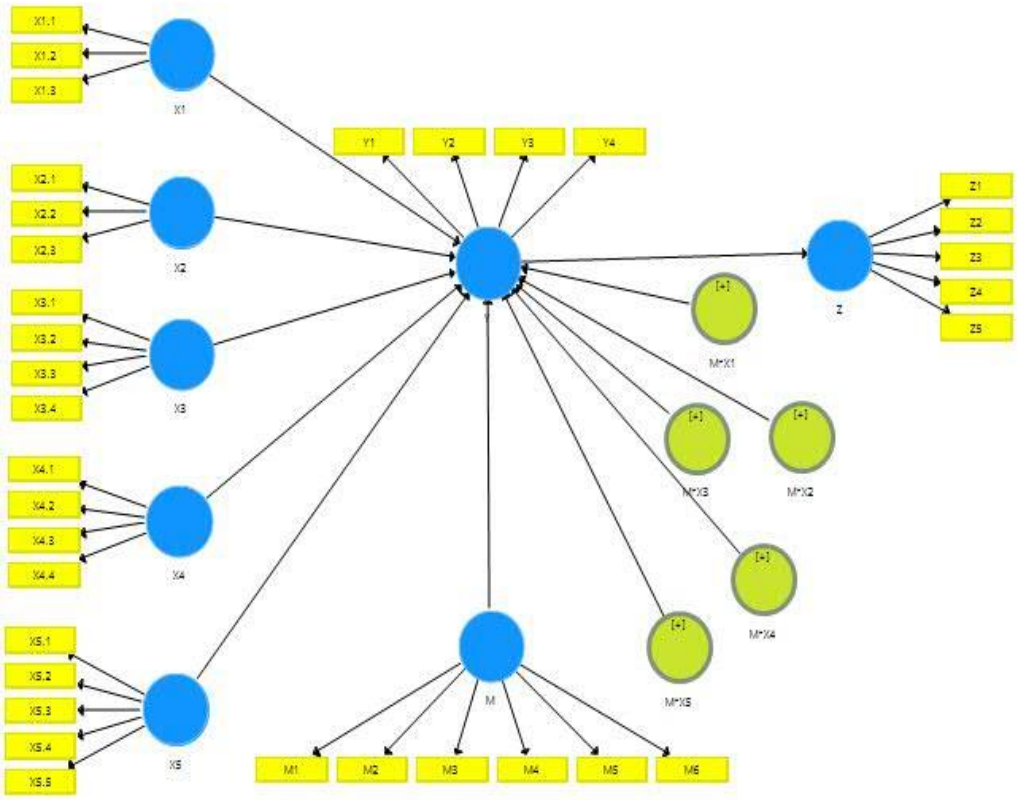

Figure 2. Model Construct with Smart PLS

Since the original UTAUT model by Venkatesh et al. (2003) offer relevant factors to determine students' behavioral intentions towards LMS and its use behavior, these factors were used to fulfill the objectives of this study. However, the model needs to be extended to explore LMS acceptance among college-enrolled students, during the COVID-19 pandemic. For this reason, social isolation was added as an independent variable, while Corona fear was included as a moderating variable (Raza, et al., 2020). Figure 3 below is the research stage.

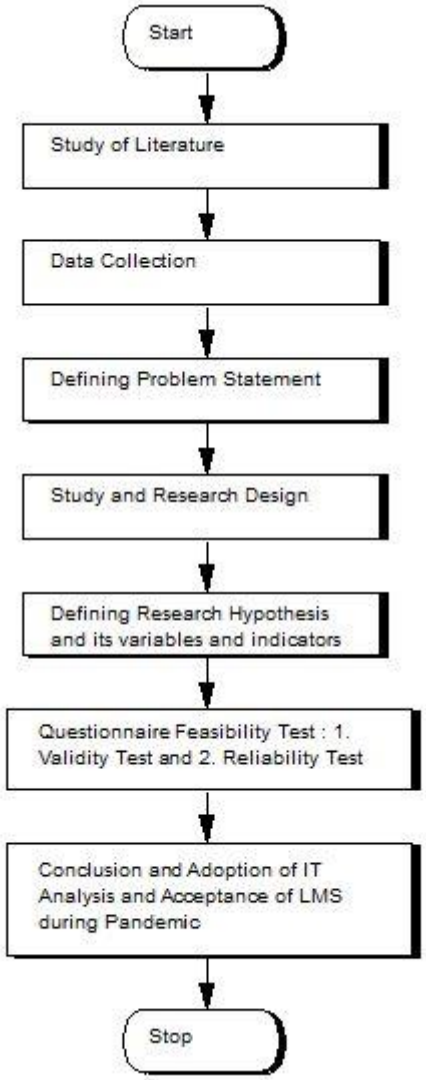

Figure 3. Research Stages

This section describes the research results and data analysis that has been collected through the distribution of questionnaires that the author conducted during May 2020 to March 2021. The author will analyze the data that has been collected in accordance with the main problems described at the beginning of the chapter. The results of data processing are information that will later show whether the formulated hypothesis can be accepted or not.

Results and Discussion

This section outlines the results of research and analysis of data that has been collected through the dissemination of questionnaires conducted during May 2020 to March 2021. In this study, modeling of the smallest partial square structural equation (PLS-SEM Technique) was applied to the data, using Smart PLS version 3.2.3 (Ringle, Wende, & Becker, 2015). The author will analyze the data that has been collected in accordance with the main problems described at the beginning of the chapter. The results of data processing are information that will later indicate whether the formulated hypothesis can be accepted or not.

Analysis of Respondent Characteristics

Respondent's Gender

The results of the analysis of the characteristics of respondents by gender can be shown in Figure 4. Based on Figure 4, it can be seen that the respondents are divided into two categories, namely men and women. From the data obtained from 101 respondents, the composition of respondents based on gender is 65 respondents are female and the remaining 36 are male as shown in Figure 4. The results shown in Figure 4 are the largest number of respondents are 65 women.

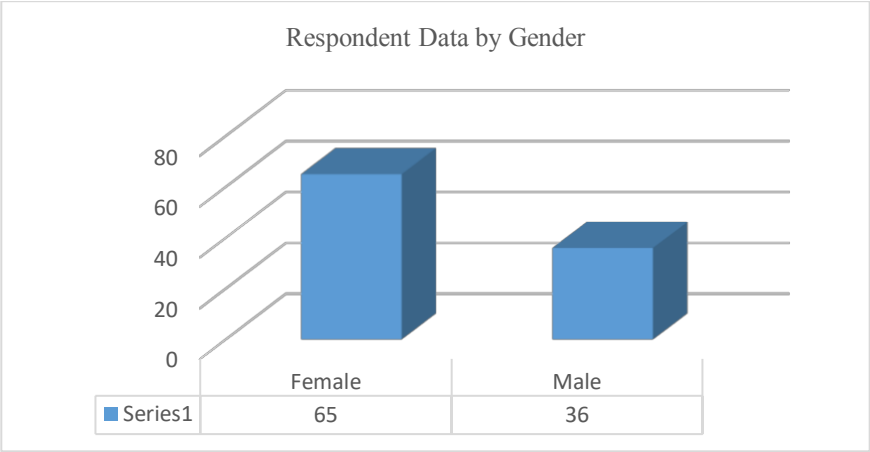

Figure 4. Respondent Data by Gender

Respondent's Age

The results of the analysis of the characteristics of respondents based on age can be shown in Figure 5. Based on Figure 5, it can be seen that respondents are divided into six categories, namely age less than and equal to 19 years, 20 years to 24 years, 25 years to 29 years, 30 years to 34 years, 35 years to 39 years and ages more than and the same with 40 years. From the data obtained from 101 respondents, the composition of respondents based on age was 31 people aged less than and equal to 19 years, 61 people aged 20-34 years, 3 people aged 25-29 years, 1 person aged 30-34 years, while the age of 35 - 39 years old only got 3 people and age more than and equal to 40 years got 2 people. The results shown in Figure 5 are dominated by the number of respondents aged 20-24 years who are young.

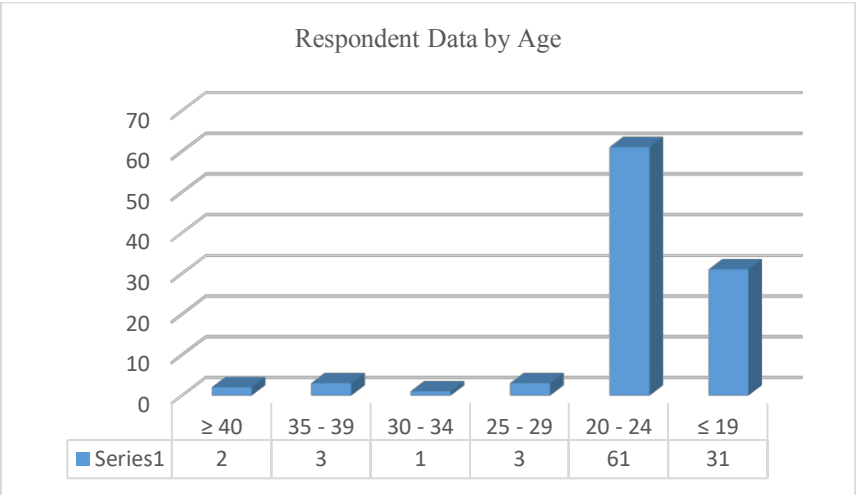

Figure 5. Respondent Data by Age

Respondent's Education

The results of the analysis of the characteristics of respondents based on education can be shown in Figure 6.

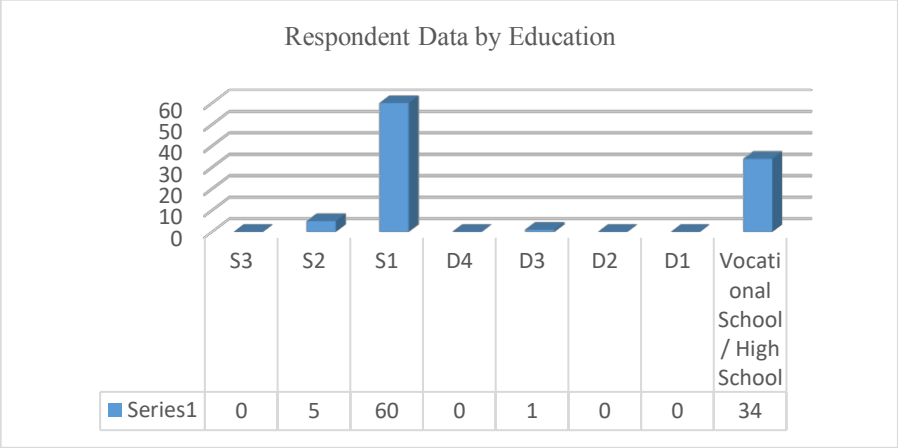

Figure 6. Respondent Data by Education

Based on Figure 6, it can be seen that the respondents are divided into eight categories of education, namely SMA/SMK, D1, D2, D3, D4, S1, S2, and S3. From the data obtained from 101 respondents, the composition of respondents based on education is 34 SMA/SMK, 0 D1, 0 D2, 1 D3, 0 D4, 60 S1, 6 S2, and 0 S3. The results shown in Figure 4.3 the number of respondents is dominated by S1 with a total of 60 people.

Structural Model Testing

In this study, hypothesis testing uses the Partial Least Square (PLS) analysis version 3 for windows, and by calculating the algorithm (missing value: -0.1, data metric: mean 0 and variance 1, Weighting scheme: Path, Max number of iterations: 300 , accuracy of stopping criteria: 0.0000001). Based on Figure 7, the schema of the PLS program model tested gets the following values:

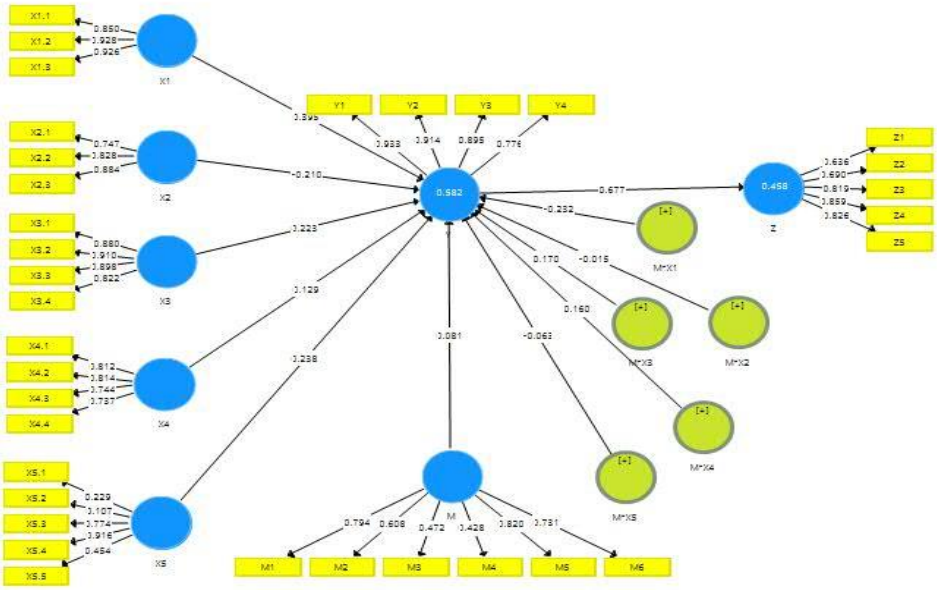

Figure 7. Output Calculation Algorithm

The output that explains the relationship between the latent variable and its indicators is as follows:

Table 2. Outer Model (Weights of Loading)

	M	X1	X2	X3	X4	X5	Y	Z
M1	0.794							
M2	0.608							
M3	0.472							
M4	0.428							
M5	0.820							
M6	0.731							
X1.1		0.850						
X1.2		0.928						
X1.3		0.926						
X2.1			0.747					
X2.2			0.828					
X2.3			0.884					
X3.1				0.880				
X3.2				0.910				
X3.3				0.898				
X3.4				0.822				
X4.1					0.812			
X4.2					0.814			
X4.3					0.744			
X4.4					0.737			
X5.1						0.229		
X5.2						0.107		
X5.3						0.774		
X5.4						0.916		
X5.5						0.454		
Y1							0.933	
Y2							0.914	
Y3							0.895	
Y4							0.776	
Z1								0.636
Z2								0.690
Z3								0.819
Z4								0.859
Z5								0.826

Based on Table 2,

a. M1 (don't want to leave the house for fear of the risk of contracting the COVID-19 pandemic) has a relationship of 0.794 to M (Corona Fear).
b. M2 (worried about getting sick due to the COVID-19 pandemic over the next 6 months) has a relationship of 0.608 to M (Corona Fear).
c. M3 (feeling anxious about the COVID-19 pandemic) has a relationship of 0.472 to M (Corona Fear).
d. M4 (worried that someone in the immediate family may get sick due to the COVID-19 pandemic over the next 6 months) has an association of 0.428 with M (Corona Fear).
e. M5 (fear of contracting the COVID-19 pandemic) has a relationship of 0.820 to M (Corona Fear).
f. M6 (looking at the possibility that the Covid-19 outbreak will spread in other areas) has a relationship of 0.731 to M (Corona Fear).
g. X1.1 (finding LMS useful for the study) has a relationship of 0.850 to X1 (Performance Expectancy).

h. X1.2 (LMS allows me to complete class activities faster) has a relationship of 0.928 to X1 (Performance Expectancy).
i. X1.3 (LMS increases learning productivity) has a relationship of 0.926 to X1 (Performance Expectancy).
j. X2.1 (I live and work) has a relationship of 0.747 to X2 (Effort Expectancy).
k. X2.2 (LMS increases learning productivity) has a relationship of 0.822 to X2 (Effort Expectancy).
l. X2.3 (finding a flexible system to interact) has a relationship of 0.884 to X2 (Effort Expectancy).
m. X3.1 (friends influence the behavior of thinking that they must use LMS) has a relationship of 0.880 to X3 (Social Influence).
n. X3.2 (friends must use LMS) has a relationship of 0.910 to X3 (Social Influence).
o. X3.3 (instructors whose opinion is more respected suggest using LMS) has a relationship of 0.898 to X3 (Social Influence).
p. X3.4 (using the system because the proportion of classmates who use the system) has a relationship of 0.828 to X3 (Social Influence).
q. X4.1 (having resources to use LMS) has a relationship of 0.812 to X4 (Facilitating Condition).
r. X4.2 (have knowledge to use LMS) has a relationship of 0.814 to X4 (Facilitating Condition).
s. X4.3 (a certain person or group is available to help when difficulties arise with LMS) has a relationship of 0.744 to X4 (Facilitating Condition).
t. X4.4 (using a system according to learning style) has a relationship of 0.733 to X4 (Facilitating Condition).
u. X5.1 (feeling alone and having no friends) has a relationship of 0.229 to X5 (Social Isolation).
v. X5.2 (feeling isolated from others) has a relationship of 0.107 to X5 (Social Isolation).
w. X5.3 (having someone to share feelings with) has a relationship of 0.774 to X5 (Social Isolation).
x. X5.4 (feels easy to relate to other people when needing others to help) has a relationship of 0.916 to X5 (Social Isolation).
y. X5.5 (when with other people, feeling alone) has a relationship of 0.454 to X5 (Social Isolation).
z. Y1 (intends to continue using LMS) has a relationship of 0.933 to Y (Behavioral Intention of LMS).
aa. Y2 (for study purposes, will use LMS) has a relationship of 0.914 to Y (Behavioral Intention of LMS).
bb. Y3 (using LMS regularly) has a relationship of 0.895 to Y (Behavioral Intention of LMS).
cc. Y4 (because of the possibilities offered by LMS, I plan to follow my next study more effectively) has a relationship of 0.776 to Y (Behavioral Intention of LMS).
dd. Z1 (often using LMS during the academic period) has a relationship of 0.636 to Z (Use Behavior of LMS).
ee. Z2 (using multiple LMS functions (eg, discussion forums, chat sessions, messaging, downloading course content, uploading assignments, etc.) has a relationship of 0.690 to Z (Use Behavior of LMS).
ff. Z3 (depending on LMS) has a relationship of 0.819 to Z (Use Behavior of LMS).
gg. Z4 (the use of LMS by our university is a good idea) has a relationship of 0.859 to Z (Use Behavior of LMS).
hh. Z5 (LMS makes learning more interesting for students) has a relationship of 0.826 to Z (Use Behavior of LMS).

Convergent validity of the measurement model with the indicator reflective mode is assessed based on the correlation between the item score/component score and the construct score. The reflective measure is said to be high if the correlation is more than 0.70. However, for research in the early stages of developing a measurement scale, a loading value of 0.5 to 0.60 is considered sufficient.
Based on Table 2, it is known that there are 5 indicators in each latent variable that has a loading value of < 0.7 and there is no between loading values of 0.5 to 0.6 including the Corona Fear (M) variable, namely the M3 and M4 indicators, on the Social Isolation variable (X5), namely indicators X5.1, X5.2,

and X5.5. To correct the invalid variables to meet the predetermined criteria, the invalid indicators must be removed from the model or not included in the next test with the aim of increasing the measurement score (outer loading) of each item and the composite reliability score.

Output that describes the relationship between latent variables:

Table 3. Latent Variable Correlation

	M	X1	X2	X3	X4	X5	Y	Z
M	1.000	0.402	0.456	0.423	0.415	0.244	0.300	0.367
X1	0.402	1.000	0.592	0.739	0.806	0.454	0.676	0.800
X2	0.456	0.592	1.000	0.541	0.761	0.443	0.369	0.621
X3	0.423	0.739	0.541	1.000	0.647	0.501	0.619	0.716
X4	0.415	0.806	0.761	0.647	1.000	0.503	0.587	0.769
X5	0.244	0.454	0.443	0.501	0.503	1.000	0.535	0.660
Y	0.300	0.676	0.369	0.619	0.587	0.535	1.000	0.677
Z	0.367	0.800	0.621	0.716	0.769	0.660	0.677	1.000

Based on Table 3,

a. Corona Fear (M) has a relationship of 0.402 with Performance Expectancy (X1)
b. Corona Fear (M) has a relationship of 0.456 with the development of Effort Expectancy (X2)
c. Corona Fear (M) has a relationship of 0.423 with Social Influence (X3)
d. Corona Fear (M) has a relationship of 0.415 with Facilitating Condition (X4)
e. Corona Fear (M) has a relationship of 0.244 with Social Isolation (X5)
f. Corona Fear (M) has a relationship of 0.300 with Behavioral Intention of LMS (Y)
g. Performance Expectancy (X1) has a relationship of 0.676 with Behavioral Intention of LMS (Y)
h. Effort Expectancy (X2) has a relationship of 0.369 with Behavioral Intention of LMS (Y)
i. Social Influence (X3) has a relationship of 0.619 with Behavioral Intention of LMS (Y)
j. Facilitating Condition (X4) has a relationship of 0.587 with Behavioral Intention of LMS (Y)
k. Social Isolation (X5) has a relationship of 0.535 with Behavioral Intention of LMS (Y)
l. Behavioral Intention of LMS (Y) has a relationship of 0.677 with Use Behavior of LMS (Z)

Based on this interpretation, it can be analyzed that Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Condition, Social Isolation are very capable of influencing Behavioral Intention of LMS and Use Behavior of LMS or in other words influencing intention and use of LMS because the relationship level is almost 100%, while feeling isolated due to the pandemic COVID-19 does not have too much influence on students or students in the relationship between Behavioral Intention of LMS and Use Behavior of LMS.

Based on this interpretation, it can be analyzed that all latent variables in this study have a relationship of more than 50%, so it can be concluded that all latent variables in this study have a fairly large relationship. And the relationship is in accordance with the analysis model in the study that has been described in this study. Output that explains the effect of latent variables:

Table 4. Path Coefficients

	M	**X1**	**X2**	**X3**	**X4**	**X5**	**Y**	**Z**
M							0.027	
X1							0.401	
X2							-0.236	
X3							0.194	
X4							0.173	
X5							0.266	
Y								0.677
Z								

Based on Table 4,

a. Corona Fear (M) has an effect on Behavioral Intention of LMS (Y) of 0.027
b. Performance Expectancy (X1) has an effect on Behavioral Intention of LMS (Y) of 0.401
c. Effort Expectancy (X2) has an effect on Behavioral Intention of LMS (Y) of -0.236
d. Social Influence (X3) has an effect on Behavioral Intention of LMS (Y) of 0.194
e. Facilitating Condition (X4) has an effect on Behavioral Intention of LMS (Y) of 0.173
f. Social Isolation (X5) has an effect on Behavioral Intention of LMS (Y) of 0.266
g. Behavioral Intention of LMS (Y) has an influence on Use Behavior of LMS (Z) of 0.677

Table 5. AVE

	Cronbach's Alpha	Rho_A	Composite Reliability	Average Variance Extracted (AVE)
M	0.798	0.807	0.814	0.436
X1	0.885	0.892	0.929	0.814
X2	0.759	0.782	0.861	0.675
X3	0.902	0.918	0.931	0.771
X4	0.781	0.781	0.859	0.605
X5	0.644	0.789	0.651	0.341
Y	0.903	0.903	0.933	0.778
Z	0.830	0.856	0.879	0.594

Based on Table 5, composite reliability measures the real value of the reliability of a construct and is better at estimating the internal consistency of a construct (Salisbury et al., 2002; Abdillah & Jogiyanto, 2009). Cronbach's alpha measures the lower limit of the reliability value of a construct. The rule of thumb is that the value of alpha or composite reliability must be greater than 0.7, although a value of 0.6 is still acceptable. In Table 6, the variables are Corona Fear (M), Performance Expectancy (X1), Effort Expectancy (X2), Social Influence (X3), Facilitating Condition (X4), Behavioral Intention of LMS (Y), and Use Behavior of LMS (Z).) alpha value between 0.70 - 0.90 then high reliability, but for the variable Social Isolation (X5) alpha value 0.50 - 0.70 then moderate reliability. Pay attention to the Composite Reliability (CR) value in Table 6, the variables Corona Fear (M), Performance Expectancy (X1), Effort Expectancy (X2), Social Influence (X3), Facilitating Condition (X4), Behavioral Intention of LMS (Y), and Use Behavior of LMS (Z) with a CR value of more than 0.7, so the construct is said to be reliable, but for the Social Isolation (X5) variable, the CR value is less than 0.70. To evaluate discriminant validity, it can be seen by the average variance extracted (AVE) method for each construct or latent variable. The model has better discriminant validity if the square root of the AVE for each construct is greater than the correlation between the two constructs in the model. In this study, the AVE value, and the square root of AVE for each construct are presented in Table 6. In Table 6 it is known that the AVE value of each construct is still below 0.50. Therefore, there is still a convergent validity problem in the model being tested so that the constructs in this research model need to be modified.

Tabel 6. R Square

	R Square	R Square Adjusted
Y	0.556	0.528
Z	0.458	0.453

Based on Table 6, goodness of fit model was measured using R-square dependent latent variable with the same interpretation as regression. Q-Square predictive relevance for structural models, measuring how well the observed values are generated by the model and also the estimated parameters. The Q-square value > 0 indicates the model has predictive relevance, otherwise if the Q-square value 0 indicates the model lacks predictive relevance.

Conclusion

The purpose of this research is to explore the factors that influence the acceptance of e-learning systems in universities, schools, and their use during the current COVID-19 pandemic. The study aims to measure whether Social Isolation affects the BI of LMS by students or students. In addition, the extended model also investigates the effect of Corona Fear on the relationship of PE, EE, SI, FC, and Social Isolation with BI LMS, to analyze how students respond to technology during the unfortunate emergence of Coronavirus, a highly contagious disease. serious illness.

The findings show that social isolation, PE, SI, EE and FC are important factors that influence students or students in Indonesia to pursue the use of LMS. These results indicate that students or students are willing to use LMS to successfully complete their lectures due to their perception of the benefits provided by the e-learning system, during isolation. The results on Corona fear moderation revealed that increasing fear among college students or students about Coronavirus will moderate the PE and SI relationship in BI LMS, indicating that students or students will expect increased performance by using LMS and will be socially influenced by their friends and family to do so. In addition, students or students are not satisfied with the online learning process because of poor internet connectivity.

The work presented in this paper has limitations. The sample size used in this study was only one hundred and one respondents, so that future research can increase the sample size and thus the results are more generalizable. The authors suggest the need to investigate the extended UTAUT model in other developed and developing countries during the pandemic, to analyze what factors influence LMS acceptance and use of e-learning systems, to better provide course materials and assistance to students in pursuing education. In addition, moderating and mediating variables can also be added to further expand the model and evaluate mechanisms relevant to the current situation.

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Health Workers Readiness for Implementation of a Mobile Pregnancy Monitoring System in Primary Health Care: A Cross-Sectional Study

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Abstract

The study aims to describe factors related to the readiness of health workers with respect to implementation of a mobile Pregnancy Monitoring System in Primary Health Care (PHC) sites of the South Tangerang District in Banten Province, Indonesia using a socio-technical approach. A cross-sectional survey design was used among respondents who were involved during the antenatal care process. The participants (n=210) completed the questionnaire that measured information needs regarding the socio-technical aspect of readiness and factors affecting the readiness. The data was analysed using logistic regression analysis. The findings of this study showed that the majority of the health workers who were involved in the antenatal care process were ready to implement the mobile pregnancy monitoring system. Having social media (p= .013) and willingness (p= .007) to be involved in IT implementation are associated with IT readiness, while there is no significant association between demographic factors to the readiness of the health workers. Since there is no connectivity between the demographic factors to readiness, thus the supportive factors such as having a social media and willingness are associated to the level of health workers readiness in implementing mobile pregnancy monitoring system.

Keywords: Pregnancy Monitoring System; Mobile health; Women health workers; Antenatal care; Readiness

Introduction

As Primary Health Care Information Systems move forward using electronic devices in developing countries, its implementation has found many challenges and barriers to readiness which may prevent successful adoption (Afrizal et al. 2019b; Handayani et al. 2018). According to recent studies, the

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assessment of the readiness of organisational members is considered essential as a approach to a successful implementation of new technology (Ajami et al. 2011; Ghazisaeidi et al. 2014; Stock and Groß 2016). The aspect of readiness assessment aims to evaluate the preparedness of each component, provides a proper image of the existing conditions and gives valuable input to the healthcare organisation to infer the factors (Melas et al. 2013). A recent study showed that the impact of the socio-technical aspect of readiness has increased innovative work behaviour among the workers (Stock and Groß 2016).

In line with the implementation of a health information system in Indonesia, the introduction of a Sustainable Development Goals (SDGs) era still suffers from unresolved problems in that the preventable morbidity and mortality among pregnant mothers still remains high where the maternal mortality ratio is 14 times higher compared to those in the developed regions (United Nations 2015). Monitoring by the health providers during the pregnancy period such as to provide accurate real-time data on how many pregnant women are enrolled in antenatal care (ANC), the characteristics of pregnant women, interventions, and the outcome approaches would improve the ANC information systems which may reduce the maternal mortality cases (Harries et al. 2014). The current studies from Indonesia show that the ANC documentation is often poorly recorded in some primary care facilities due to several factors such as a lack of a monitoring system and having to write entries in multiple record books (Afrizal et al. 2020).

Previous research has determined that documentation during the ANC services in the community should be well-documented by the CHW through collection, collation and use of the health data in routine activities by use of electronic health (e-Health) solutions to ensure adequate reporting and supervision (World Health Organization 2018). Electronic health procedures such as the Electronic Health Record (EHR) are designed to provide information about an the health status of an individual and the health care given by multiple health providers (Mykkänen et al. 2016). Based on previous research in Palestine, the implementation of electronic records using mobile phones or m-Health for maternal and child health has enhanced the effectiveness and access for the monitoring system through an interactive checklist and clinical decision support which resulted in improvement of the quality of care for pregnant women (Venkateswaran et al. 2018). The implementation of e-Health in Indonesia currently is still dominated by hospitals (Handayani et al. 2016).

Before introducing an innovation such as the mobile pregnancy monitoring system in Primary Health Care, there is a need to evaluate the readiness of health workers to implement such a system (Holt et al. 2010). A previous review paper concluded that there are two enabling factors of readiness: individual readiness and organisational readiness. Both are influenced by psychological and structural aspects (Afrizal et al. 2019b). Individuals and organisations can be classified in terms of social readiness. Other research using the socio-technical methods has been discussed and used in the adoption of new technologies although there is little evidence that socio-technical methods as such have become a part of the language related to the readiness for change (Land 2000). A holistic approach, taking likewise individuals, technology and organisations into account is necessary (Noehring et al. 2019).

Earlier research investigated mHealth readiness which more discussed to the user perceptions in view of motivation and technological aspect (Handayani et al. 2021). Little information is available concerning evaluation of the socio-technical aspect of readiness and factors affecting readiness with respect to m-Health implementation amongst the health workers. Thus, the objective of this research is to assess the socio-technical readiness and factors influencing readiness before implementing an electronic monitoring system for ANC services among health workers in Primary Health Care. Consequently, there are two research questions in the preparation for IT implementation:

1. What factors influence the readiness to implement a mobile pregnancy monitoring system?
2. What are the recommendations in implementing a mobile pregnancy monitoring system?

The structure of this paper is organised as follows. In Section 2, a theoretical background is presented as substance for the research variables that have subsequently been developed into the conceptual

framework (Section 3). The methodological approach is detailed in Section 4 while the results are presented subsequently (Section 5). Section 6 concludes with a discussion of the theoretical and practical implications of the findings.

Theoretical Background

Role of Health workers in the ANC process in PHC

WHO defines health workers to be all people engaged in actions whose primary goal is to improve health (World Health Organization 2006). In view of the professional health workforce (such as Medical Doctors, nurses, midwives) facing shortages, maldistribution and performance challenges for health progress including access to healthcare a recommendation has been made to provide qualified employment opportunities among the community. This is named a community health service, and it is necessary to strengthen primary health care and the health workforce by delivering preventive, promotive and curative health services (World Health Organization 2018). In Indonesia, the term for a community health worker (CHW) is *Kader* in the Indonesian Language. The role of the CHWs in the community service such as a site clinic is very important because they provide health information for the community as well as a regular monitoring process for mother and child including ANC service, nutritional status, immunisation, and birth planning (Indonesia Ministry of Health 2012).

As the first level of care for pregnant women, a PHC in Indonesia does not only provide in-house ANC services in the clinic but also community services such as a site clinic and home visits (Mahendradhata et al. 2017). To improve the ANC services, the Ministry of Health has released regulations for integrated ANC implementation which has 2 (two) main activities, namely pregnancy registration and pregnancy monitoring. For the in-house ANC service, both activities are documented in the Cohort ANC register while ANC in the community is still recorded separately using paper-based forms and the community midwives submit their report regularly at the end of the month (Afrizal et al. 2020). This practice enables communication and care-coordination between the different health-care providers involved in the care of women during pregnancy and childbirth (Kemenkes RI 2015; Pattinson 2007).

Socio-technical Context of Health Information System Readiness

A Health Information System is a collection of interrelated components that aim to work together to achieve common goals. A system can include software, mechanics, electricity, and electronic hardware (Sommerville, 2004). Individuals and organisations where they are situated are responsible for the entire system development process. Health information systems that are interrelated, can cause the system to become complex. This is the biggest challenge faced by an organisation that seeks to develop, utilise and control a new technology to improve the quality of the performance of the organisation.

Based on previous research, a model that integrates social aspects in technology development is also an important component in the development of information technology-based health information systems, namely (1) individual characteristics (people); (2) the nature or complexity of the work or task performed (task process); (3) workplace environment and organisational characteristics namely social, environmental and management (structure); and (4) User interface or technology used (technology) (Bogh et al. 2015). The socio-technical model in the implementation of technology was first introduced by Bostrom and Heinen (1977) as seen in Figure 1. Socio-Technical Analysis in the development of Information Systems placed by applying a user-centred approach which is more focused on the needs and satisfaction of the users of the system.

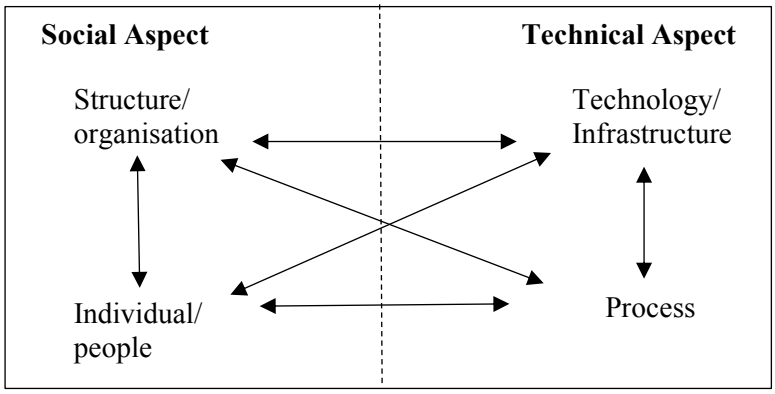

Figure 1. Socio-technical Model for Technology Adoption (Bostrom and Heinen 1977)

Methodology

A quantitative survey method was conducted from February to June 2019 in six Public Primary Health Care centres in South Tangerang to assess the readiness of health workers to accept the mobile pregnancy monitoring system among those who are involved in the antenatal care process. South Tangerang District was chosen as the research location because the district has already adopted the health information system especially for Primary Health Care for 5 years and currently the District Major encourages the implementation of mobile technology in all government sectors including health sector.

Participants

The population of midwife and community health workers in Public Primary Health Care was estimated to be 5500 in the South Tangerang District (Dinkes Kota Tangsel 2017). The sample size was estimated using a sample size calculator ("Sample Size Calculator" n.d.) with a confidence level of 95 %. The sample size should be 169 participants accordingly. Hence, it was possible to distribute 250 questionnaires which were a number higher than the proposed number of respondents. The convenience sampling method was adopted for the field survey where the items were written using the Indonesian language to obtain the perspectives of the respondents. Altogether, around 250 ANC providers (100 midwives and 150 CHWs) were approached. After removal of some incomplete feed-back forms, the final data was collected for 210 respondents.

Instrumentation

The research instrument consisted of two parts as follows:

a. Part I included questions about the demographic variables (age, profession, level of education, working experience, and computer skills and associate factors (Having a social media, Internet access, monthly Internet budget, experience in HIS, coordination of care, smartphone ownership, and willingness)).
b. Part II contained 20 items from instruments adopted from (Aydin and Tasci 2005) which assess readiness for Information and Technology implementation using a socio-technical approach. The options were coded as 1, 2, 3, 4, and 5, as in a five-point Likert-scale. Based on the research, the 3.4 mean scores could be identified as the middle point level of readiness, while other responses enabled organisations to show higher or lower levels of readiness. The 3.4 mean average was determined after identifying the critical level: 4 intervals/5 categories = 0.8. As a result of this analysis, the levels of readiness were determined as depicted in Figure 2.

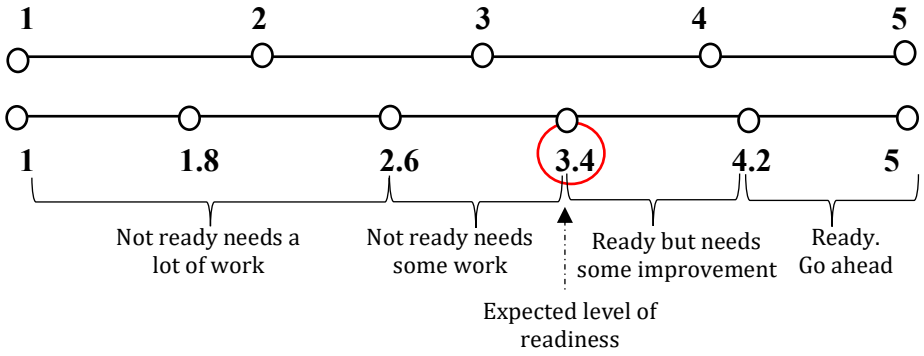

Figure 2. Level of Readiness Based on Mean Average of the Likert Score (Aydin and Tasci 2005)

The internal consistency reliability for the instrument was estimated using the Cronbach alpha coefficient. According to the Cronbach Alpha analysis, the reliability of the instrument was found overall to be 0.72 (>0.7). Data was analysed by logistic regression to test for associations between variables. Like all regression analyses, logistic regression is a predictive analysis where a model is tested to find out whether the value of one variable, or the combination of values of multiple variables, can predict the value of another variable (Frey 2018).

Results

A total of 210 health workers participated in this study. Of that number, 70 of the participants (33 %) were midwives and the other 67 % were community health workers. More than one-third (39.5 %) were at an age above 45 years old. With regard to the working experience, about 38.5 % of participants have been doing ANC monitoring for between 6 to 10 years, and 27.6 % were between 11 and 20 years. The participants were asked if they have skills related to computer applications where 58.5 % of them indicated that they have good computer skills. The majority (90 %) of the respondents indicated that they have a Social Media application on their mobile phone. Almost 82 % of the respondents claimed to have a monthly Internet budget. With regard to HIS experience, 57 % of the respondents claimed that their experience in HIS implementation was still inadequate. However, 98 % of the respondents had a smartphone using the Android Operating System and 67 % of the participants used the phone for care-coordination amongst the health workers and other health professions. Finally, more than 64 % of the respondents were willing to implement innovation such as the mobile pregnancy monitoring system (see Table 1).

As seen in Table 2, the socio-technical aspect of readiness was divided into four categories: innovation to organisation, people, technology infrastructure, and process improvement among the health workers was found ready to implement the innovation with a few improvements (Mean = 3.77). The result showed that the process improvement that supported the technical aspect has the highest mean score (Mean = 3.84, S.D. = 0.62). The result also implied that the technology infrastructure was very useful to improve the technical readiness as the mean for the category was (Mean = 3.77, S.D. = 0.62). The highest mean of the items answered by respondents for the technical aspect of readiness was item 10 which stated “Internet access is available at the PHC to support the implementation of a mobile Pregnancy Registration-Monitoring System” (Mean= 4.10, S.D. = 0.72).

Table 1 Distribution of Demography and Associate Factors amongst Health Workers (N=210)

Variable	CHW n (%)	Midwife n (%)
Age		
<=25	3 (23.1)	10 (76.9)
26 to 35	8 (18.6)	35 (81.4)
36 to 45	58 (81.7)	13 (18.3)
≥ 46	71 (85.5)	12 (14.5)
Education Level		
Primary & Secondary	121 (100.0)	0 (0.0)
Diploma	19 (26.8)	52 (73.2)
Degree & Post Grad	0 (0.0)	18 (100.0)
Computer Application Knowledge		
Good	59 (48.0)	64 (52.0)
Limited	81 (93.1)	6 (6.9)
Working Experience		
<= 5 years	28 (62.2)	17 (37.8)
6 to 10 years	55 (67.9)	26 (32.1)
11 to 20 years	43 (74.1)	15 (25.9)
≥ 21 years	14 (53.8)	12 (46.2)
Android ownership		
Yes	137 (66.2)	70 (33.8)
No	3 (100.0)	0 (0.0)
Experience in HIS implementation		
Yes	48 (53.9)	41 (46.1)
No	92 (76)	29 (24)
Internet Access		
Good	10 (18.9)	43 (81.1)
Limited	130 (82.8)	27 (17.2)
Social Media Apps in Handphone		
Yes	123 (64.7)	67 (35.3)
No	17 (85.0)	3 (15.0)
Monthly Internet Budget		
Yes	116 (67.4)	56 (32.6)
No	24 (63.2)	14 (36.8)
Use Handphone for care-coordination		
Yes	87 (61.3)	55(38.7)
No	53 (77.9)	15 (22.1)
Willingness to use e-Health for pregnancy monitoring system		
Yes	92 (67.6)	44 (32.4)
No	48 (64.9)	26 (35.1)

Table 2 Means and Standard Deviations of Four Aspects of Readiness among Health Workers in Primary Health Care (N = 210)

Aspect of Readiness	Category	Mean	Standard Deviation
Social Aspect	Innovation to organisation	3.72	0.39
	People	3.76	0.55
Technical Aspect	Infrastructure/Technology	3.77	0.62
	Process of Improvement	3.84	0.62
Mean		3.77	

The other aspect of readiness is the social aspect which was divided into two categories: innovation to organisation and people. The highest score for this aspect was for the people category (Mean=3.76, S.D.=0.55). The result showed that the highest mean score for the people category was for question #12 which stated: "Officers who can facilitate the technology implementation will help you to implement the mobile Pregnancy Monitoring System". For the innovation to organisation category (M=3.72, S.D.=0.39), the highest score was for question #9 (M=4.12, S.D.=0.75) which stated: "Reward can increase the adoption of an innovation in the organisation". The detailed score for each question is described in Table 3.

Based on these scores, it shows that the majority of the respondents had a low perception of innovation within the organisation with respect to IT implementation. Moreover, the majority of respondents felt the existing computer facilities were not adequate enough to be used since they do not have access to use a computer individually at work. Further, most respondents disagreed with punishment regulation to enhance IT implementation.

To evaluate the factors related to the readiness of health workers, a multivariate analysis using logistic regression was used (see Table 4). The current result shows that having a social media in HP and willingness for IT implementation are associated with readiness ($P \leqq .05$). It also shows that there is no significant association between demographic factors such as age, education level, working experience etc. on the readiness of health workers.

Table 3 List of Questions and Statistics for Items Related to Socio-Technical Aspects Of Readiness

Question	Mean	Std. Deviation
1. Most of the employees are experienced in using an m-Health system (People)	3.76	.893
2. The management of the PHC organisation has declared to use a health information system in daily tasks (innovation to organisation)	3.82	.749
3. IT officer assistance for m-Health system is available in the organisation (People)	3.74	.881
4. Previous experience in implementing a health information system in the organisation has improved the efficiency in monitoring system (innovation to organisation)	3.76	.891
5. Most of the health workers are willing to implement the mobile Pregnancy Monitoring System (People)	3.60	.819
6. Based on previous experience, health information system is able to improve the process of coordination of care between professions (Process of improvement)	3.55	.933
7. Monitoring from the organisation management is carried out during the adoption of an innovation (such as the mobile Pregnancy Monitoring System) (innovation to organisation)	3.93	.677
8. Legal issues such as punishment is able to reduce the barrier of the adoption of an innovation in the organisation (such as the mobile Pregnancy Monitoring System) (innovation to organisation)	2.96	1.057
9. A reward is able to increase the adoption of an innovation in the organisation (innovation to organisation)	4.12	.751
10. Internet access is available at the PHC to support the implementation of a mobile Pregnancy Monitoring System (Technology & Infrastructure)	4.10	.726
11. The PHC has achieved the organisational change target (such as total quality indicators) after an innovation implementation such as a Health Information System (innovation to organisation)	3.89	.665
12. Officers who can facilitate the technology implementation will help you to implement a mobile Pregnancy Monitoring System (People)	3.85	.887
13. You have access to use a computer individually at work (Technology & Infrastructure)	2.93	1.119
14. Based on previous experience, health information system is able to save the patient personal data securely (innovation to organisation)	3.83	.873
15. Your computer has the ability to create, save, delete and protect files (Technology & Infrastructure)	4.10	.907
16. You can follow the directions on a computer screen to accomplish a task in an application (Technology & Infrastructure)	3.97	.917
17. The Mobile Pregnancy Monitoring System as an innovation that will integrate the health care service for community and personal health care (Process of improvement)	3.97	.735
18. The Mobile Pregnancy Monitoring System as an innovation will improve the record completeness and ease of access (Process of improvement)	3.96	.741
19. The Mobile Pregnancy Monitoring System as an innovation will improve the timely antenatal care visits for pregnant mothers (Process of improvement)	3.86	.846
20. The Mobile Pregnancy Monitoring System as an innovation meets the needs of the organisation to change the previous manual monitoring system (Process of improvement)	3.88	.827
Total	3.77	

Table 4 Determinant Factors Related to the Readiness of Health Workers

Variable	Category	Readiness		Total (%)	Sig.	Odds Ratio (95 % CI)
		Ready n (%)	Not Ready n (%)			
Age	≤ 25 years	13 (100)	-	13 (6.2)		Not Eligible
	26 to 35	40 (93)	3 (7)	43 (20.5)		
	36 to 45	61 (85.9)	10 (14.1)	71 (33.8)		
	≥ 46	74 (89.2)	9 (10.8)	83 (39.5)		
Education Level	Primary & Secondary	103 (85.1)	18 (14.9)	121 (57.6)		1
	Higher Education	85 (95.5)	4 (4.5)	89 (42.4)	.179	0.4(0.108 to 1.515)
Working experience	≤ 5 years	41 (91.1)	4 (8.9)	45 (21.4)		1
	6 to 10	68 (84)	13 (16)	81 (38.6)	.276	2.05(0.56 to 7.49)
	11 to 20	56 (96.6)	2 (3.4)	58 (27.6)	.282	0.36(0.59 to 2.28)
	≥ 21	23 (88.5)	3 (11.5)	26 (12.4)	.857	1.17(0.202 to 6.85)
Smartphone ownership	Yes	185 (89.4)	22 (10.6)	207 (98.6)		Not Eligible
	No	3 (100)	-	3 (1.4)		
Experience in HIS adoption	Yes	82 (92.1)	7 (7.9)	89 (42.4)		Not Eligible
	No	106 (87.6)	15 (12.4)	121 (57.6)		
Computer Application Knowledge	Good	115 (93.5)	8 (6.5)	123 (58.6)	.298	1.81(0.59 to 5.54)
	Limited	73 (83.9)	14 (16.1)	87 (41.4)		1
Access to Internet	Good	47 (88.7)	6 (11.3)	53 (25.2)		Not Eligible
	Limited	141 (89.8)	16 (10.2)	157 (74.8)		
Social Media Apps in Handphone	Yes	175 (92.1)	15 (7.9)	190 (90.5)	.013	4.6(1.39 to 15.61)
	No	13 (65)	7 (35)	20 (9.5)		1
Monthly Internet Budget	Yes	154 (89.5)	18 (10.5)	172 (81.9)		Not Eligible
	No	34 (89.5)	4 (10.5)	38 (18.1)		
Use of HP for coordination	Yes	130 (91.5)	12 (8.5)	142 (67.6)		Not Eligible
	No	58 (85.3)	10 (14.7)	68 (32.4)		
Willingness to use App	Yes	129 (94.9)	7 (5.1)	136 (64.8)	.007	4.1(1.4 to 11.39)
	No	59 (79.7)	15 (20.3)	74 (35.2)		1
Job Title	Midwife	66 (94.3)	4 (5.7)	70 (33.3)		Not Eligible
	CHW	122 (87.1)	18 (12.9)	140 (66.7)		

Discussion

Previous studies have concluded that the implementation of e-Health has caused an impact by increasing efficiency and quality in health services (Burton et al. 2004; Evans 2016). Factors that influence the successful implementation of e-Health are the acceptance and readiness of health service providers (Fritz et al. 2015). To the knowledge of the authors, there has been no research conducted in Indonesia to assess the readiness among health workers, especially ANC services and the readiness of service recipients (pregnant women) in e-Health implementation. This research has found that most of

the health workers in the PHCs who are involved during the ANC process of an urban area in Indonesia are ready to implement an electronic monitoring system. However, based on the level of readiness previously developed by Aydin & Tasci (2005), the mean score of readiness was 3.77 which need a few enhancements. Based on previous research, the implementation of e-Health in Primary Health care facilities especially in a developing country still has many constraints which result from limited information about e-Health implementation in terms of readiness which in turn brings barriers to IT adoption (Afrizal et al. 2019a).

This study has tried to explore the socio-technical readiness of midwives and community health workers to implement a mobile Pregnancy Monitoring System in the Primary Health Care of an urban area in Banten Province, Indonesia. The socio-technical aspect of readiness was divided into four categories: 1) innovation to the organisation and 2) people for the social aspect of readiness, 3) technology infrastructure and 4) process of improvement for the technical aspect of readiness. The result showed that the process improvement that supported the technical aspect was found to have the highest mean score. The highest mean of items answered by respondents for the technical aspect of readiness was item 10 which stated: "Internet access is available at the PHC to support the implementation of a mobile Pregnancy Monitoring System". The local government has committed to improve the public service by accelerating the installation of the internet network which has been more focused on the public primary health carers since 2016 (Kabar6 2016).

However, the majority of respondents felt the existing computer facilities were not comfortable enough to be used since they do not have access to use a computer individually at work. This may cause barriers to the e-Health adoption since implementing e-Health requires infrastructure such as Internet connection, software and hardware i.e. a computer and mobile phone. Previous study has shown that technical support and computer availability brought a positive influence on the readiness of students with respect to IT implementation (Kabonoki 2008). It also concluded that access to a computer has a positive influence on attitudes toward computers.

The current result shows that having social media on a HP, and willingness for IT implementation are both associated with the social aspect of readiness. These results are similar to a previous study which concluded that working experience and the ICT knowledge level are found to have a significant contribution on the innovativeness of teachers (Noh et al. 2016). Similar to that study, personal innovativeness is also related to the willingness of an individual to try out any new information technology (Agarwal and Prasad 1998).

Finally, there is no significant association between demographic factors among the health workers to IT readiness. A readiness assessment is an important step in change management, and including this step is a planning process that increases the chances of successful e-Health implementation (Li et al. 2012). Previous research concluded that supportive factors such as technological and infrastructure require attention before a new technology can be implemented in an institution (Coopasami et al. 2017). The research also acknowledged that IT users require the proper infrastructure to make optimum use of technology and to support them with the hardware facilities to enhance the innovation initiative.

Implication

The background of the study that some of the prior studies related to IT readiness were more focused on the barriers and drivers such as optimism, innovativeness, discomfort, and insecurity. This study measured readiness in adopting a mobile pregnancy monitoring system in an urban area which has less technical constraints and to analyse the association of demographic and supportive factors of the health workers. The findings are very useful to give information to the regulators as well as the Primary Health Care organisations before implementing any innovation in technology. Applying a socio-technical model during the assessment of readiness from the perspective of health workers and to evaluate the factors related to readiness gives strategic recommendations and specific actions that should be taken for improving IT readiness. The study was performed with a formal clearance number 783/UN2.F10/PPM.00.02/2018 received from the ethical board of Universitas Indonesia.

Conclusion

This study measures the association of demographic characteristics and associated factors of health workers to readiness. The findings of this study show that the majority of the health workers who are involved in the ANC process are ready to implement a mobile pregnancy monitoring system. Based on statistical analysis, this study has indicated that there was no significant association of the demographic factors to the readiness of m-Health implementation. The supportive factors such as having social media on a HP and willingness for IT implementation are associated with readiness.

Even though a readiness assessment before adopting a mobile pregnancy monitoring system is important, this research has only highlighted two aspects of the socio-technical model to measure IT readiness among health workers. Further research is recommended to evaluate another aspect of readiness in terms of the psychological aspect.

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Whistleblowing System Deployment using the Information Technology Infrastructure Library Framework: Evidence from a Public University in Indonesia

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Abstract

The Indonesian government has been urged to implement Whistleblowing system for public services to achieve integrity zone development. Almost all service desk software provides user convenience as well as manages the service process in an organization using standards based on the Information Technology Infrastructure Library (ITIL) v3. The service operation of Whistleblowing system and the service desk systems are almost the same. However, currently only a few studies have examined the implementation of Whistleblowing system which use such a framework in a public higher education institution. This study aims to design and develop a Whistleblowing system which is expected to fulfill the IT Service Management standard and to perform an integration process amongst the community and students. The software was designed and tested in the Universitas Islam Negeri Syarif Hidayatullah Jakarta using the ITIL v3 standards. The result showed that the efficiency parameter value produced a page speed point of 91 % and the fully loaded time was 2.4 seconds. A portability test showed a value of 100 % for the mobile-friendly score while the reliability test with a stress test also showed at 100 %. The alpha testing result was a very good predicate while beta testing received an acceptable score, good category, and classified as grade C. In conclusion, based on the abovementioned tests, this shows that the system can

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be used to manage student services, lecturers, and staff, as well as to integrate the current service within the community.

Keywords: Whistleblowing System, Information Technology Service Management; Information Technology Infrastructure Library; service desk, software development

Introduction

The Indonesian government has urged all public sectors to develop an integrity zone to achieve an overall corruption-free zone. Therefore, it has to generate bureaucratic reformation in some aspects, namely, change management, good governance, human resource management, performance accountability strengthening, surveillance strengthening, and public service quality improvement (Kementrian PANRB 2019). One way to improve public service quality to achieve a corruption-free zone is to develop a Whistleblowing policy which implements a Whistleblowing system (WBS) (Gholami and Salihu 2019). The term whistleblowing was created from the way of English policemen who blew their whistle when they saw the event of some crime (Dasgupta and Kesharwani 2010).

The WBS objective is as a media for receiving any report to find and identify events, conditions, and situations from the users (Nursalman et al. 2018). The service desk or Helpdesk which may facilitate the WBS objective in an organization is also the main "door" to facilitate communication and collaboration for end-users in the organization which helps in solving individual technical problems and makes it easy to interact with the IT personnel (Widyaningrum and Affandi 2012). The benefits and capabilities of the service desk are to align the IT business process between departments, to improve the organization management in terms of hardware and assets, to improve the business process efficiency, and to enable data collection analysis for better strategic planning and tracking (Tang and Todo 2013).

The widest framework for service desk operations is the Information Technology Infrastructure Library (ITIL) (Pereira and Da Silva 2011). The ITIL was developed by the UK Government to improve IT service management using five major strategies namely, service strategy, service design, service transition, service operation, and continual service improvement. ITIL research was developed worldwide, including in Indonesia. Research conducted by Wardani et al. 2016 built a procedure and policy to enhance the services provided by a government office. The results of this study showed that the ability of the IT management was still partially acceptable, and it was recommended that the ITIL implementation in the government offices must be aligned with business needs and also support the current business processes. Based on that research, the implementation of Information Technology Service Management (ITSM) provides a framework to improve the interaction of IT staff with users which is related to the ITIL. ITIL provides a set of facilities for IT service management and is the most widely accepted IT service management in developed and developing countries, including Indonesia.

Indonesia as one of the developing countries with the largest community in the world has been committed to IT governance and development since early 2010. Much research has been conducted to improve service desk systems using ITSM to replace the traditional service desk in a government organization including the Higher Education Institutions (Tawar 2013; Widyaningrum and Affandi 2012). However, even by adopting ITSM, most of the organizations did not show improvement in the IT service management level due to barriers during the implementation. Most of the problems were related to the organizational culture and integration into the current business process (Tang and Todo 2013).

Universitas Islam Negeri Syarif Hidayatullah also widely known as UIN Jakarta, is one of the largest Universities in Indonesia which has implemented an IT services desk for academic purposes since early 2000 through its portal https://servicedesk.uinjkt.ac.id/. All the IT development and management is organized by the Information Technology Division or Pustipanda (*Pusat Teknologi Informasi dan Pangkalan Data*). However, based on previous experience, integration of the business process was one of the main problems for the service desk implementation such as unrecorded email complaints or redundant processes which may prolong the complaint follow-up and produce an inefficient working

process. Such an unintegrated process however may slow IT adoption as well as may lead to ineffective management procedures.

The success of IT service desk development is closely related to the User-Centered methodology which pays more attention to the interaction between humans and the computer. A User-Centered Design (UCD) or also known as human-centered design is an interactive system development approach which is focused on the current business process. The main role of UCD is to produce a system which is easy to use, safe, effective, and efficient. The model of interaction between humans and systems involves three components such as users, user to user interactions and the system itself (Waddell et al. 2015)

Currently, there is a lack of studies that have been conducted to design and implement a WBS through the ITSM framework in a university using a user-centered approach to improve the service. This is especially true amongst the community, which in this case consists of students, lecturers, employees, and other parties who have collaborative activities with the University, which can be integrated through an IT service desk system. This activity is to ensure that the community may be involved in organization monitoring and inspection. UIN Jakarta is committed to address the importance of early detection of any violation within the academic process through the implementation of a service desk operation system. Thus, the objective of this current research is to design, develop, and implement a WBS through a service desk operation system using the ITIL v3 Framework which integrates with the current system to facilitate the community services and students to report any issues to support integrity zone development.

Related Works

Whistleblowing Systems in Indonesia

Much research has been performed concerning the implementation of Whistleblowing systems (Dasgupta and Kesharwani 2010). One example was Pamungkas et al. (2017) who studied the effects of a Whistleblowing system on financial statement fraud, while (Nurhidayat and Kusumasari 2018) studied the effectiveness of the implementation of a Whistleblowing system in Indonesia. There has also been highly related research to this current study which examined the implementation of a Whistleblowing system in a public university in Indonesia (Nursalman et al. 2018). Those authors developed their system in three layers, namely presentation, business, and data layers.

However, there is a great opportunity for universities in Indonesia to implement and develop a Whistleblowing system and renew the current policies to support the communities to proactively advocate the ethical principles and reputation of the universities. Several universities have already implemented a Whistleblowing system, such as *Sistem Pelaporan Dugaan Pelanggaran Universitas Indonesia* (SPI Universitas Indonesia 2022), *Sistem Informasi Aspirasi Publik Universitas Gadjah Mada* (Universitas Gadjah Mada 2022), and *Whistle Blowing System Direktorat Logistik ITB* (Direktorat Logistik ITB 2017). However, these universities have applied different Whistleblowing regulations in their systems such as the scope of the Whistleblowers, Whistleblowing channels, the scope of the violation, and the confidentiality of the Whistleblowers. Furthermore, the current authors have not found any Whistleblowing system development which uses ITSM and ITIL standard.

ITIL and ITSM Implementation in Indonesia

The ITIL was developed by the UK Government to improve ITSM using five major strategies namely: service strategy, service design, service transition, service operation, and continual service improvement. ITIL research was developed worldwide including in Indonesia. Research conducted by Wardani et al. (2016) built a procedure and policy to enhance the services provided by the government office. The results of this study showed that the ability of the IT management was still partially acceptable, and it was recommended that the ITIL implementation in the government office must be aligned with business needs and to support the current business processes.

Previous research has shown that the ITIL application which is mostly implemented in developed countries improved the integration of the current processes in the IT organization (Marrone and Kolbe

2011). Most of the literature has proved that ITIL is a collection of best practice information technology governance services in various fields and industries, from manufacturing to finance, large and small industries, private and government (Iden and Eikebrokk 2013).

The other utilization of ITIL was found in a Health Care Organization (Wardani 2019). In that research, the service desk application using the ITIL V.3 framework was applied to handling complaints and information technology management in a hospital. The study concluded that the IT unit has responsibility for all issues of information technology infrastructure including hardware, software, databases, and networks in all departments.

IT Service Desk in Higher Education

The Mexican company Cotemar implemented an IT service information management framework (Lucio-Nieto et al. 2012) to propose the best services for clients. It introduced various frameworks for information technology service management, such as ITIL and Control Objectives for Information and Related Technologies (COBIT). It was found that implementing IT service management practices may provide useful insights for firms. A customer service desk for education was examined using incident management (Punyateera et al. 2014). This service desk was part of the service operation of the ITIL version 3 which consisted of best practices for ITSM. The result showed that the service desk could help education managers make decisions more efficiently.

User-Centered Design

Several methods or frameworks are available for website design and one of the well-known methods is the User-Centered Design (UCD) approach. According to Maguire (2001), service desk users should be facilitated with a user-friendly system which allows open communication from the community by entering a single identity and be able to select categories or complaints which need to be reported. The system should automatically transfer the issue to the relevant department and provide an assessment scale that can be used by the user to measure the service.

Previous research has been conducted in private companies to evaluate the implementation of ITSM and found that problems during the implementation could be minimized by designing a service desk application with a user-orientated design. In that study, after re-designing the service desk application interface using the UCD approach, the service improved and was better than the previous application (Budiyono et al. 2012). Based on quality testing, the application interface design in that study fulfilled the system requirements such as ease of learning, consistency, feedback, efficiency, clear labeling, visual clarity, appropriateness of site type, and conformity to user objectives.

Methodology

This section proposes a methodology based on User-centered Design steps to develop a Whistleblowing system that is aligned with the ITIL v3 standard for the service operation process. Figure 1 shows the specific phases which are summarized below:

- Phase 1- Planning of the process phase is carried out to classify the existing procedures and current service desk performance. Every step within the procedures should have a structured grading for problem classification. Problems that may arise include limited public access, high-cost and unintegrated system, and ineffective working procedures.
- Phase 2. Specification of the ‘context of use’ phase is to modify the current system into a newly developed design which complies with the parameters of the service operation process based on ITIL v3. Most common service desk operation systems do not allow for public intervention, especially for the higher education academic system. Therefore, a set design model can be included such as a Whistleblowing system to improve public access.
- Phase 3- The specification of the organizational demands phase is used to support the development of related requirements for a Whistleblowing system. UML diagrams are generated to assist in the development of a database.

- Phase 4- Development of a design solution and the evaluation phases are conducted to develop an interface based on the extraction of previous phases which allows access for the public into a newly developed design.

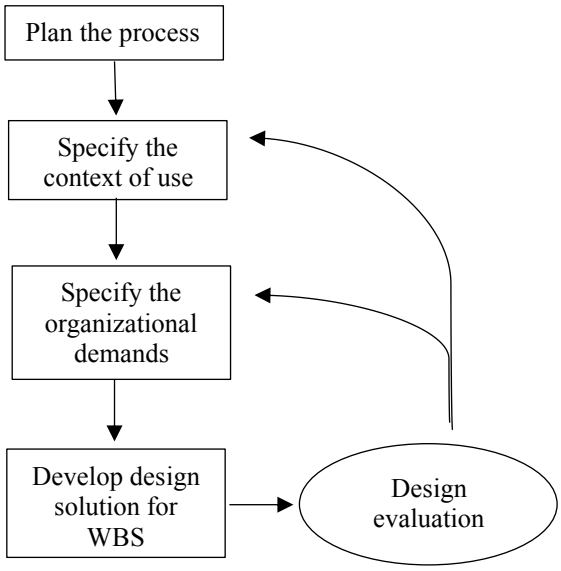

Figure 1. Research Framework

Develop a Process Plan

The first phase of the system operation improvement for an organization is to develop a process plan based on input from the head of Pustipanda and the Internal Auditor staff. It is necessary to understand and consider the basic process within the organization. When developing the process plan, it is important to determine the current procedures and problems that may arise within the organization as well as with the end-users. To encourage the improvement of system design throughout different developers, this research phase was conducted with the application of the ITIL v.3 service operation. The most important advantage of developing such a framework is the ability to integrate with the current system as well as a standard service desk service operation which is easily understood throughout the whole organization. For example, in the existing system the community or students send messages via e-mail or call to the operations section, so it is necessary to determine who the caller is that wants to be informed or wants to ask about some aspect of UIN Syarif Hidayatullah.

The operation section of UIN Syarif Hidayatullah records existing problems and provides solutions to existing problems, recording using a Pustipanda service desk. The society or students accept solutions to these problems and the operation section reports to a manager. Furthermore, from a data management perspective having the classification of functional output allows efficient data search, filtering, and export based on the function of the asset. As an example, if the estate management team wanted to analyze the operational performance of heating for a whole university campus, it would be possible to extract data from multiple systems (such as finance, resource management, and scheduling) based on the functional output. Figure 2 is an explanation of the system currently running at UIN Syarif Hidayatullah.

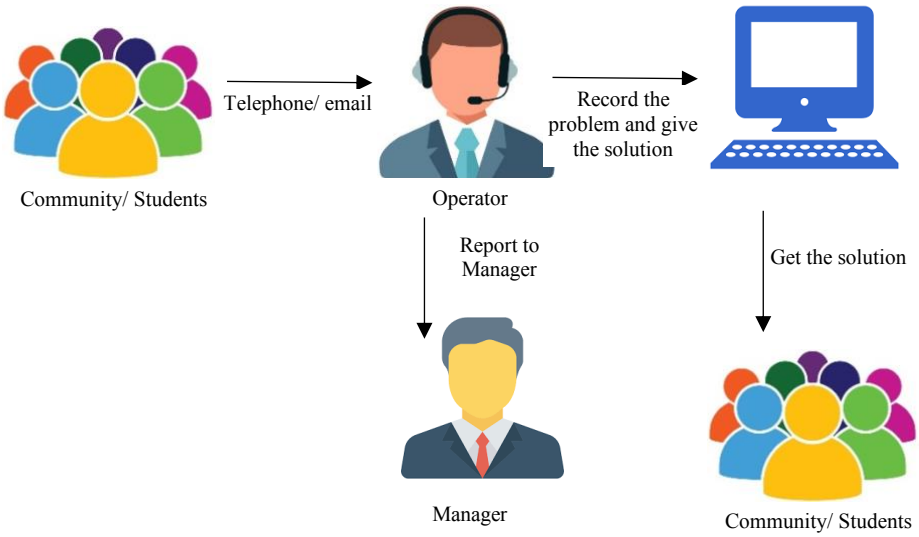

Figure 2. Current Procedures for Reporting Purposes in UIN Jakarta

Specify the Context of Use

The second phase is to identify the 'context of use' of the new system which is based on ITIL v.3 service operation classification based on Pustipanda's IT Support leader as seen in Table 1. An event management process is defined as a state for management to configure the IT service. The objective of the process is to make sure that the services are being monitored regularly. The context of use for this process generates notifications and well as notification detection, while the incident management process is a process for any unplanned situation occurring with the IT service. The objective of this process is to repair the normal service as soon as possible to reduce the impact on the business process. The functional output of the incident process is data restoration.

The access management process aims to provide access rights for authorized users and to prevent entry by non-authorized users. An example of this process for WBS is identity verification, logging steps, and role classification. The last process is the problem management process. The key objectives of this process are to prevent problems and minimize the incidents using appropriate identification. The context of use of this process is such as data storage, databases, and directory services. The outcome of this step is a classification of the system that specifies the structure of Whistleblowing system based on the specific requirement.

Table 1. Context of Use for Whistle Blowing System

ITIL v.3 Service Operation Classification	**Context of use for WBS**
Event Management Process	Generate notifications, notification detection
Incident Management Process	Data Restoration
Access Management Process	Identity verification, logging, role classification
Problem Management Process	Storage, directory services, data centre

Specify the Organizational Demands

The third step is to specify the organizational demands to develop an information system to improve the efficiency, effectiveness, and transparency to achieve the objective of implementation. The organization determines the capabilities of the Whistleblowing system which relates to the current working process. The outcome of this phase is a developed design that is based on organizational hierarchical relationships. This step is still led by Pustipanda's IT Support leader.

Develop Design and Evaluation

The fourth phase is to develop and evaluate the proposed design which is led by Pustipanda's System Developer leader based on the previous phases. Figure 3 illustrates the proposed system for service as the service desk system in UIN Syarif Hidayatullah.

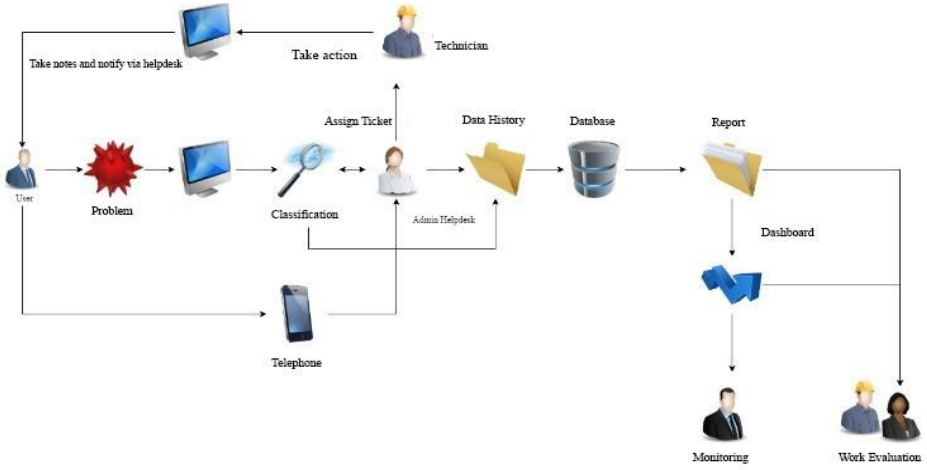

Figure 3. Service Desk System Design for UIN Syarif Hidayatullah Jakarta

Figure 3 shows that the system starts with a user who has a problem, then the user conveys the problem experienced through the system that has been created. After the problem has been written into the system, the system will send details of the problem to the UIN Syarif Hidayatullah service desk Jakarta. The admin service desk will classify the problem manually by looking at historical data information that has been previously made available and recorded in the database. If the problem that occurs includes minor issues and can be solved easily, the admin service desk will respond to the problem via telephone directly to the user in question and provide remedial solutions that can be tried by the user. However, if the solution provided does not resolve the problem, the admin will assign a technician/ agent to immediately resolve the problem for the user. The proposed design uses Unified Modelling Language (UML) with the following steps:

(1) Identify Actor

An actor is administrators, lecturers, students, third parties, and society.

(2) Identify Use Case

The use case is functional that has relations with the actor. The use-cases for this system are:

- Login
- Create Ticket
- Checking Ticket Status

- View Ticket
- View Knowledge Base
- Manage Ticket Data

(3) Class Diagram Model

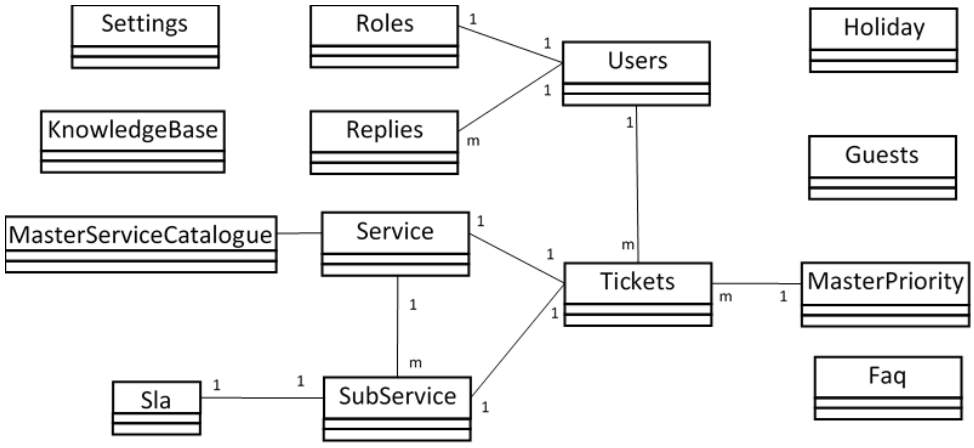

Figure 4. Class Diagram for Service Desk System Design for UIN Syarif Hidayatullah Jakarta

Figure 4 is the developed design of the class diagram of the service desk. This database is built using the migration feature in the Laravel framework which makes it very flexible if there are table additions and subtractions. This design consists of 13 tables with 8 related tables.

(4) User Interface Design

Figure 5 shows the user interface design of the system mockup homepage which has two sub-menus i.e., Internal Civitas Academica and Public.

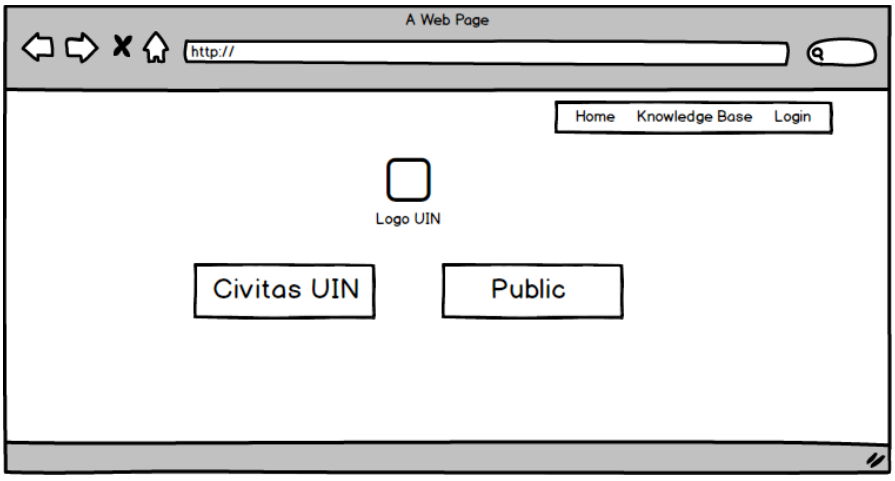

Figure 5. Mockup Homepage

For the Internal Civitas user simply log in using active user, however, for a public user it has to fill up the identity form first. Once the user log in successfully, it will appear service catalog menu as shown in Figure 6. While Figure 7 illustrates the create ticket form menu.

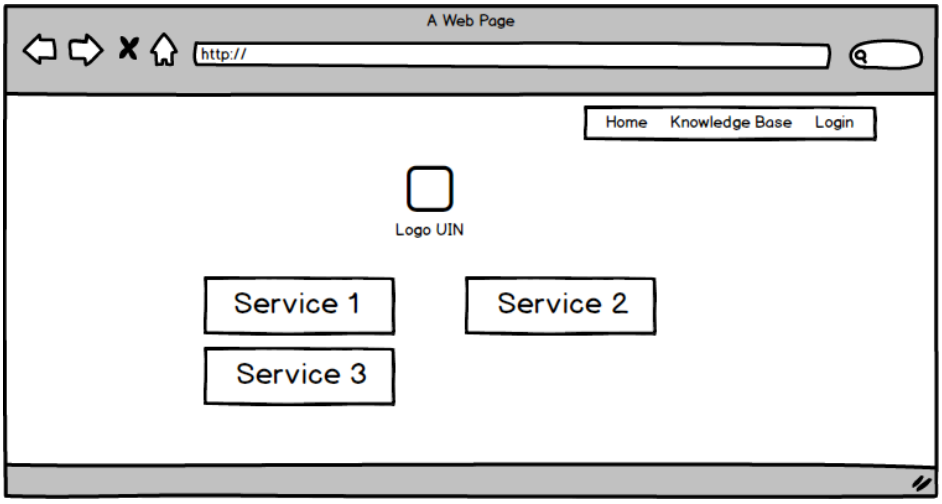

Figure 6. Service Catalog Menu

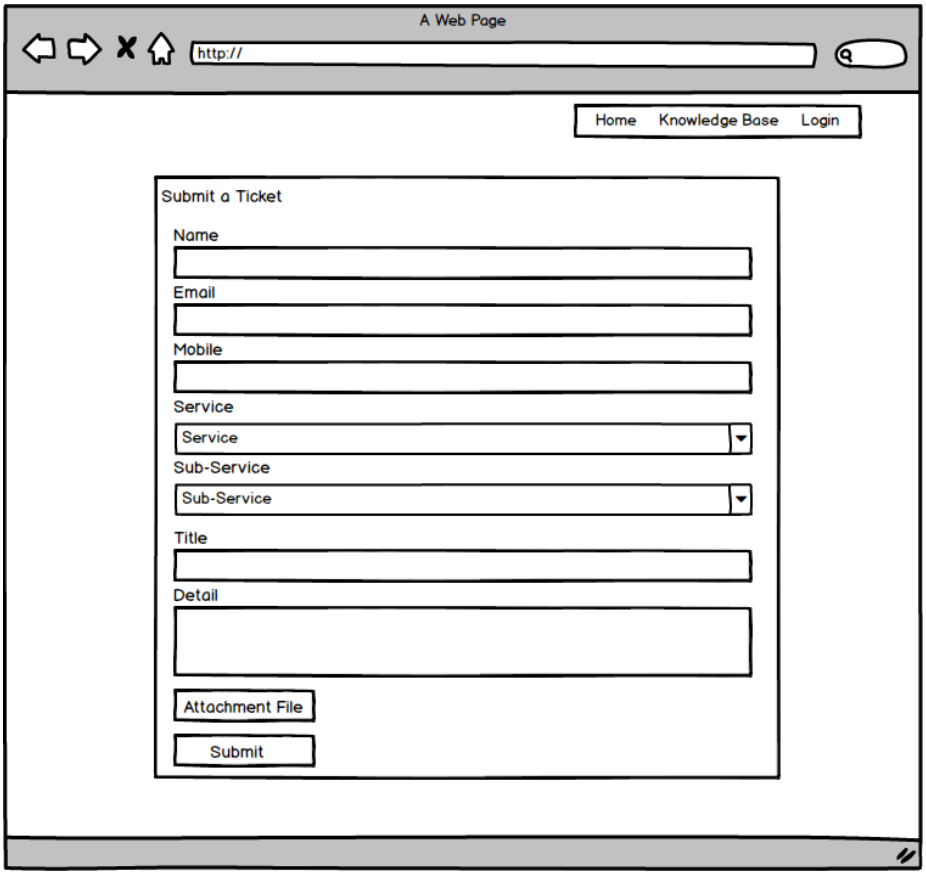

Figure 7. Create Ticket Menu

Result and Discussions

The system is built on the Internet so that the users should have an Internet connection to utilize the service desk system (see Figure 8).

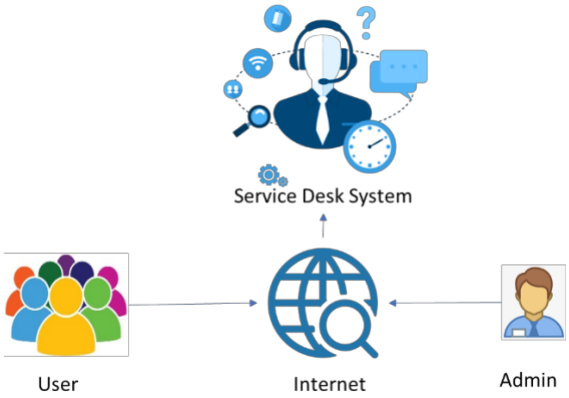

Figure 8. Architecture Design for Service Desk System Design for UIN Syarif Hidayatullah Jakarta

Based on the UCD Framework, the newest system to be developed and implemented should be based on the needs of the users. Thus, it is necessary to evaluate and test the system based on the proposed methods. Currently, the system may be accessed locally through http://helpdesk.uinjkt.ac.id.

User Acceptance Testing

User Acceptance Testing is a test carried out by end-users in which a staff/ employee of the company acts as a user and directly interacts with the system to verify whether the functions of the software are following the needs/ functions (Al Fatta 2007). This test uses a questionnaire which is addressed to four software experts, one agent, and one programmer. In developing commercial software and hardware, acceptance tests are usually referred to as "Alpha tests" (carried out by in-house users) and "beta tests" (which are carried out by users who are using or will use the system). If all aspects of Alpha testing are run successfully, the software developer has fulfilled the aspects of integration testing (Kartanti 2016). The results of the next alpha test are calculated and compared with a Likert scale as in Table 2. In this study, the questionnaire used in beta testing was the SUS (Software Usability Scale) questionnaire. Data analysis in beta testing is the analysis of acceptance (usability) (Pressman and Maxim 2014). The SUS value obtained is then compared with the scale in Figure 9 acceptability score, adjective rating, and grade scale, usability value will be better if they approach 100 (Lewis 2018).

Table 2. Likert Scale (Riduwan and Akdon 2006)

Percentage Score	Information
0 % to 20 %	Very bad
21 % to 40 %	Bad
41 % to 60 %	Neutral
61 % to 80 %	Good
81 % to 100 %	Very good

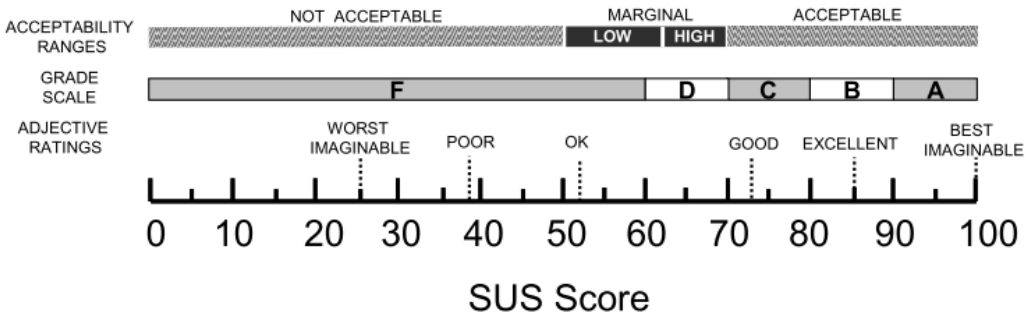

Figure 9. SUS Score (Bangor et al. 2009)

Performance System Testing

This test was performed by testing three aspects in ISO 25010, namely efficiency, portability, and reliability. Efficiency testing was verified using the website testing software Gtmetrix to obtain page speed values from the developed service desk system (Swathy 2016). A page speed score is also one of the references to determine efficiency, a higher value meaning the website has a good load speed (Singh and Verma 2014). Portability testing was undertaken using four browsers and the www.smallseotools.com website to test the ability of the service desk system to adapt to the access environment (Kumar et al. 2019). Stress testing was done using WAPT software with parameters of 20 users in 3 minutes (Rina and Tyagi 2013)

Alpha testing achieved a success percentage of 100 % with a very good predicate on the Likert scale in Table 2 of all aspects according to the functions designed according to needs in the ITIL V3 framework. The beta testing obtained a SUS value of 71.25, according to Figure 9, categorized as good and in grade C. Such a result suggests the system in the future would need improvement in the user experience so that the system would be easy to use and could be used by everyone. Efficiency testing showed the average response time of the system was 2.48 seconds with a score of 91 % using PageSpeed and a score of 91 % using Yslow. A response time under 5 seconds indicates that the system is built well and gives users the convenience to access it. Testing was conducted to run on various browsers (Mozilla Firefox, Google Chrome, Microsoft Edge, and Opera) without any errors found in the display or functionality. This result indicated that the system may be opened in all browsers and devices without reducing the functionality of the system. Stress testing showed a value of 100 %, said to have met the GR 282 Telcordia standard, and had good quality because a strong system may simultaneously receive many access requests.

The service operation of a Whistleblowing system (Nursalman et al. 2018) and a service desk system (Black and Larsson 2004) are almost the same in terms of the workflow, therefore the design applied the service desk ITIL v3 standard (Fitrani and Ginardi 2019). The user acceptance testing and performance testing results (Anggraini et al. 2020) show that the system presented good scores.

Research Implications

The implementation of a Whistleblowing system by using a service desk which is part of the ITIL standard in a service operation may improve the development system since it is best practice for ITSM and a professional discipline that concerns itself with the effective design, deployment, and management. A good service desk in a higher education institution improves efficiency and community appreciation by allowing the community to interact directly with the University as well as to increase efficiency after the implementation of the ITSM. A good service desk may lead to effective communication amongst end users.

Conclusion

The main goal of the current study was to design and develop a Whistleblowing system in a public Higher Education Institution as directed by the Indonesian government to achieve a corruption-free zone. Since the service operation of a Whistleblowing system and a service desk system are almost the same in terms of the workflow, therefore the design applied the service desk ITIL v3 standard. From the test results obtained it was apparent that a website-based service desk that can be accessed by the public, allowing complaints and questions from outside parties can be recorded and find the right solution to achieve an integrity zone as part of the Indonesian government requirement. Based on the system analysis, the quality of the IT service desk of UIN Jakarta showed good results in several unit testing procedures such as alpha testing, beta testing, efficiency testing, portability testing, and stress testing.

For further research, it is necessary to develop a mobile-based application, so that it would be easier and faster to report or request service and to integrate the system with social media to increase the impact on the community. There are other future research opportunities that may be developed for example implementation of reminders for service level agreement. Ticket reporting calculation may be implemented by using a particular algorithm to support the executive decision.

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Intention to Visit Tourist Destinations: The Effect of Mobile Tourism Recommender System on Visit Intention

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Abstract

This study aims to determine whether the use of the Mobile Tourism Recommender System (MTRS) application can affect the intention to visit tourist destinations and the level of influence of the factors that can influence it. The model in this study involves the Task-Technology Fit model and aspects, technological features, social motivation, visit intention, and use intention to identify visit intention. The method used to collect data in this research is a web-based online survey using Google Forms distributed through social media. The target respondents were individuals who had used the mobile tourism recommender system. Data from 213 valid respondents were processed and analyzed using Structural Equation Modeling with the help of the SmartPLS application. The conclusion is that the use of the MTRS application can affect the intention to visit tourist destinations.

Keywords: mobile tourism recommender system, task-technology fit, technological features, social motivation, use intention, visit intention

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Introduction

By 2025, smartphone users in Indonesia are estimated to reach 89% of the Indonesian population (Yosepha 2020). The number is very high compared to smartphone users in 2015, only 28.6% (Yosepha 2020). The increase occurs due to the changes in the behavior of Indonesian people. There are several differences in information dissemination media due to technology amid society (Ratnaya 2011). Information can be conveniently received or disseminated by one individual to another. However, it also brings adverse effects, such as people can receive information overload.

Information overload occurs when the number of inputs entered the system exceeds the capacity to digest information (Eppler and Mengis 2004). As a result, an individual can have difficulty making the right choice. A study explores how consumption decisions' quality depends on the information load. The study concluded that the higher the information received by a consumer, the lower the consumer's ability to choose the best (Jacoby et al. 1973).

Furthermore, humans as social beings need time off from the daily grind. They often carry out tourism activities by visiting various tourist destinations, attractions, cultural events, and others. Tourism is one of the drivers of the Indonesian economy, where Indonesian tourism was ranked 20th in the overall world tourism industry in 2017 (The Jakarta Post 2018). In addition, every year, the tourism industry in Indonesia continues to increase, ranking 9th in tourist growth in the world, ranking 3rd in Asia and ranking first in Southeast Asia (The Jakarta Post 2018). It shows that the tourism industry in Indonesia is highly relevant to the lives of Indonesian people.

Due to technological advances, a technology that can assist human social activities in making personalized choices has emerged; it is called a recommender system or recommendation system (Resnick and Varian 1997). The technology will provide information on recommendations for tourist destinations, places to visit, attractions to see, events to attend, and accommodation options in the tourism sector (Loh et al. 2003). Based on these facts, recommendation technology in the tourism sector is a profitable business and an exciting and relevant topic for further research.

The mobile tourism recommender system or MTRS is an application that can recommend a choice of tourist destinations to its users. Recommendations are personalized according to the user, providing the best choice according to the user's taste. Most studies only discuss MTRS in technical side such as extending the technology travel recommender systems by utilizing collaborative filtering techniques for deriving improved recommendations (Kenteris et al. 2010), providing review and insights on the MTRS's services (Gavalas et al. 2014) and discussing major techniques in mobile recommender systems and illustrate its computational model (Ricci 2010). No research has been conducted regarding the effect of MTRS on users' behavior, precisely intention to visit tourist destinations. As mentioned before, the demand for tourism in Indonesia increases from time to time, so the factors that influence people to visit tourist destinations are an exciting topic to be explored more. In this study, the authors will examine effect of MTRS on visit intention. Based on previous research, it is known that several aspects can determine the continuance intention or the intention to reuse an application or system (Wu and Chen 2017). Some of them are Task-Technology Fit (TTF), technological features, and social motivation. These aspects were chosen because they are proven to influence the continuance intention to use an application (Hu et al., 2016; Wu and Chen 2017).

The task-technology fit aspect measures the degree of compatibility between technology and the tasks performed by its users (Goodhue and Thompson 1995). If technology is suitable for completing a particular task, the technology will likely contribute to the performance of its users (Goodhue et al. 2000; Jarvenpaa 1989; Vessey 1991). In the context of MTRS, task-technology fit means the level of suitability of the MTRS application used by the user to the user's needs in completing their task, which is getting recommendations for tourist destinations. If the users are satisfied with their recommendations, they will likely continue to use the MTRS application. Customers' experiences and feelings when using applications are influenced by their perceptions of technological features (Parboteeah et al. 2009). Aspects of technological features, which can be described as a system's functional and non-functional characteristics, are needed to identify several related features. The authors want to know how features such as information about tourist destinations or sending messages can impact the visiting intentions of MTRS users. The last aspect is social motivation, which means the

motivation of an individual to get involved or interact with other people. If we look at the context of MTRS, social motivation refers to the influence of the environment on the individual's decision whether to use MTRS.

The buying decision process consists of five stages, namely knowing needs, seeking information, evaluating alternatives, purchasing decisions, and repurchasing behaviour (Kotler and Armstrong 2012). If someone has used the MTRS application, then it is very likely that he has gone through these decision processes. After going through the process, the user will determine whether he has the desire to visit the tourist destinations he sees in the MTRS application. Based on the adaptation and implications of these stages, we would like to examine whether the intention to visit tourist destinations will also increase if the users intend to use the MTRS application to get recommendations for tourist destinations. Usage intention can affect destination visit intention (Chung et al. 2015).

This study aims to determine whether using the MTRS application to get recommendations for tourist destinations influences users' intentions to visit tourist destinations. MTRS use is described using the aspects mentioned above TTF, technological features, and social motivation. In addition, to assess these aspects, the dependent variables, perceived usefulness, perceived enjoyment, and use intention, were chosen to explain the intention to use the application (Hu et al. 2016; Wu and Chen 2017) and finally explain the visit intention. MTRS developers and future researchers can feel the benefits of this research to find out an overview of MTRS use and its effect on users' intentions to visit tourist destinations.

Literature Review

Mobile Tourism Recommender System

A recommendation system is a platform or system that assists human social activities in determining whether the available options suit a particular individual (Resnick and Varian 1997). In the context of tourism, the recommendation system is a system that can provide information on recommendations for tourist destinations, places to visit, attractions to see, events to attend, accommodation options (Loh et al. 2003). Therefore, MTRS is a system that can provide recommendations for tourist destinations that can be accessed by users easily through mobile media, such as smartphones.

Several studies explore MTRS only in technical view. Previous research extends the technology travel recommender systems by utilizing collaborative filtering techniques for deriving improved recommendations (Kenteris et al. 2010) and provides review and insights on the MTRS's services (Gavalas et al. 2014). In addition, another research overview major techniques in mobile recommender systems and illustrate its computational model (Ricci 2010). However, no research has been found regarding the implementation of MTRS application on users' behavior, precisely intention to visit tourist destinations.

In Indonesia, MTRS can already be used using mobile applications, such as Google Maps, TripAdvisor, Airbnb, Traveloka, Tiket.com, and Instagram. The penetration of MTRS usage is also known from travel ticket purchase applications that provide tourist destination recommendation features, such as Traveloka and Tiket.com. It is known that Traveloka and Tiket.com are the two most frequently used travel agent applications, with Traveloka at 86% and Tiket.com at 57% (Statista Research Department 2021). With the high level of domestic tourism, these MTRS applications certainly help provide better tourist destination recommendations (Hapsari 2016). It shows that the level of use of the MTRS is already high in Indonesia and deserves further research.

Task-Technology Fit (TTF)

TTF is a theory that explains the degree of compatibility between technology and the tasks of its users (Goodhue and Thompson 1995). TTF is also defined as a reference to how well a particular technology completes or assists in completing the tasks of its users (Teo and Men 2008). In an optimistic scenario, the more technology appropriate to a particular task, the higher the likelihood that technology will contribute to better job performance (Goodhue et al. 2000; Jarvenpaa 1989; Vessey 1991). Therefore, the technology and the task should be highly compatible to complete the individual's task.

In the context of MTRS, TTF means the level of suitability of the system to the needs of its users to seek recommendations for tourist destinations. The author sees that several features in the MTRS, such as travel recommendations and reviews provided by users, can be analyzed using this model. This feature can complete users' tasks, such as finding tourist attractions that match their preferences. A relationship between aspects of TTF, task-technology fit, and individual-technology fit influence perceived usefulness and perceived ease of use (Wu and Chen 2017). In this study, identifying the task-technology fit aspect of the MTRS application was carried out by assessing two variables: task-technology fit and individual-technology fit

Technological Features

The experience and feelings of customers in using an application can be influenced by their perception of the technological features of the application (Parboteeah et al. 2009). Previous research discusses the features of the massive open online course (MOOC) application and use these features as a research construct (Wu and Chen 2017). They use it to see the relationship between the TAM model, the MOOC application's perceived ease of use, and perceived usefulness. The study found that the features in an application can be used as constructs that can describe the use of the application and are proven to influence perceived ease of use and usefulness.

In the context of MTRS, the example of technological features available is a recommendation feature that can provide suggestions based on detailed explanations of tourist destinations, ratings, or messaging. These features already exist in MTRS applications often used in Indonesia, such as Google Maps, TripAdvisor, Airbnb, Traveloka, Tiket.com, Instagram. In this study, identifying the technological features of the MTRS application was carried out by assessing two variables, namely support for recommendation and support for social interaction. These two constructs or variables were chosen because the recommendation and social interaction features are essential elements in developing the MTRS application to provide personalized recommendations. In addition, previous research also found that support for recommendation and support for social interaction affect perceived utilitarian value (Hu et al. 2016). Therefore, these two features are suitable for further research to describe MTRS use.

Social Motivation

Several studies explain the definition of social motivation. Social motivation as a human motivation to interact with other humans (Baumeister and Leary 1995). It is also a form of motivation for an individual to conduct social interaction with other individuals (Pluymen et al. 2021). This motivation is needed because humans cannot live without other humans as social beings.

In MTRS, social motivation can be defined as environmental encouragement to use the MTRS application. It is supported by study that finds the surrounding environment dramatically influences the use and adoption of an application (Wu and Chen 2017). The use of MTRS is influenced by external factors, such as family and relatives who have used the MTRS before. The study also discusses that social motivation, such as social recognition and social influence, influences perceived usefulness and perceived ease of use from using the application (Wu and Chen 2017). Therefore, the identification of social motivation as social recognition and social influence refers to studies mention above.

Visit Motivation

Visit intention refers to the desire of a tourist to visit a specific destination (Ahn et al. 2013; Baker and Crompton 2000). Visit intention combines several internal and external factors, but the most important is the combination of a person's interest and the possibility to visit a place. Several studies have shown that one's attitudes and preferences towards tourist destinations affect visit intention (Beerli and Martin 2004; Chen et al. 2014). In Indonesia, the intention to visit tourist destinations is increasing as the tourism industry in Indonesia continues to increase, by being ranked 9th in tourist growth in the world, ranked 3rd in Asia, and ranked first in Southeast Asia (The Jakarta Post 2018).

In the context of MTRS, visit intention is a person's intention to visit a tourist destination after receiving a recommendation from the MTRS. Factors that can influence a user's final intention are to use indicators such as perceived utilitarian value and perceived social value (Hu et al. 2016). Perceived usefulness, perceived enjoyment, and use intention are assessed as indicators of describing visit

intention (Beerli and Martin 2004; Chen et al. 2014). Therefore, it can be concluded that visit intention is a person's intention or desire to visit a place, in the context of this study, a tourist destination (Luo and Ye 2020).

Conceptual Model and Hypothesis

Task-Technology Fit and its influence on perceived usefulness and perceived enjoyment

As explained in the literature review, the level of task-technology fit is defined as the extent to which the capabilities of a system can match the tasks that the user must perform (Goodhue and Thompson 1995). Meanwhile, the perceived usefulness indicator assesses the level of confidence of an individual in a system that can affect its performance (Davis et al. 1989). The more technology fulfils the characteristics of a particular work task, the higher the likelihood that technology will contribute to improving job performance (Goodhue et al. 2000; Jarvenpaa 1989; Vessey 1991). Based on these explanations**,** if the task-technology fit is experienced by users, users will find it easier to use MTRS to get recommendations for tourist destinations. Research indicates a positive relationship between task-technology fit and perceived usefulness (Larsen et al. 2009). It is consistent with the findings of another research which states that task-technology fit is proven to affect the perceived usefulness of using MTRS (Wu and Chen 2017).

Perceived enjoyment is defined as the extent to which the activity of using a particular system is considered enjoyable, apart from the performance consequences resulting from the usage of the system (Venkatesh and Davis 2000). Furthermore, perceived enjoyment is similar to intrinsic motivation that drives the performance of an activity (Davis et al. 1992). In the context of MTRS, task-technology fit can be defined as the suitability of using technology in MTRS. Then, task-technology fit is assumed to affect the user's perceived enjoyment or pleasure when using MTRS to obtain recommendations for tourist destinations. It can also be interpreted that user will feel happy when using features of MTRS. This is consistent with the findings of a research which states that with a task-technology fit, users will find it easier and happier to use a system (Wu and Chen 2017). The higher the task-technology fit of technology, the higher the perceived enjoyment of the technology.

The effective use of a system by users depends on factors related to the suitability of individual technologies (Wu and Chen 2017). Thus, individual interactions with information systems are often related to their individual technology adaptation behaviour (Yu and Yu 2010). If the user has more experience in using technology, it means that there is a compatibility between the technology and the individual, then the user understands better the usefulness of a technology. Based on these studies, we predict that if users feel the compatibility when using the existing technology in the MTRS, users will also find it easier to get recommendations for the tourist destinations they want.

The suitability of technology with individual users is obtained through the process of adapting the individual to adapt his daily activities to the use of a technology (Yu and Yu 2010). If the users feel there is a match between their habits and the use of technology, then it can affect the pleasure they feel when using the technology (Wu and Chen 2017). Based on the findings of these studies, we predict that if there is individual technology fit when users use MTRS, users will also feel perceived enjoyment. Therefore, the following hypothesis are proposed.

H1: The level of Task-Technology Fit on the MTRS application has a positive effect on the user's Perceived Usefulness level

H2: The level of Task-Technology Fit on the MTRS application has a positive effect on the user's Perceived Enjoyment level

H3: The level of Individual-Technology Fit on the MTRS application has a positive effect on the user's Perceived Usefulness level

H4: The level of Individual-Technology Fit on the MTRS application has a positive effect on the user's Perceived Enjoyment level

Technological Feature and its influence on perceived usefulness and perceived enjoyment

Technological features can be described as a system's functional and non-functional characteristics. In this study we examine two technological features of MTRS, support for social interaction and support for recommendation. Support for social interaction is a model that describes the ability of technology to provide services where users can interact with each other (Hu et al. 2016). The MTRS application offers various methods to support communication between users, such as a review system and features for sending messages. Through these, users can increase their social presence and strengthen their relationships with each other (Zhang et al. 2014). In addition, users also get social support, both in the context of information and emotional (Liang et al. 2011). This support makes them feel more confident about the perceived usefulness of the MTRS application (Hu et al. 2016). Based on the explanations of these studies, it can be assumed that if MTRS can provide features that allow users to interact with other users, users will find it easier to use MTRS. Research indicates a positive relationship between support for social interaction and perceived usefulness (Larsen et al. 2009).

The existence of social interaction between one individual and another in an application can increase the perceived enjoyment of the application. In the context of MTRS, support for social interaction is the ability of MTRS to provide interaction features between users (Zhao and Lu 2012; Chen et al. 2016). If the MTRS application can provide this feature, it is assumed that the perceived enjoyment can also increase. These results are in accordance with the findings of research which remarks that support for social interaction has an influence on perceived utilitarianism (Hu et al. 2016). Based on these studies, it can be assumed that if MTRS can provide features that allow users to interact with other users, users will feel happier to use MTRS.

Support for recommendation explains the ability of a system to provide recommendations according to preferences taken from user data, making it easier for users to find relevant information (Arazy et al. 2010). Information overload from a website can cause users to find it difficult to find relevant information. Therefore, recommendations are needed to help users make their choices. It was found that users tend to accept the recommendations given by the system in making their choices (Smith et al. 2005). Based on the research findings, it can be assumed that if the MTRS has good and sophisticated recommendation features, users will also find it easier to get recommendations for the tourist destinations they want. Research indicates support for recommendation has a positive effect on perceived usefulness (Hu et al. 2016).

When users enjoy the use of the system due to reduced cognitive load, they may find the recommendation system useful to complete their tasks (Kumar and Benbasat 2006). It can be assumed that if the MTRS has a qualified recommendation feature, users will feel happier when they get recommendations for the tourist destinations they want. The recommendation feature is assumed to affect the user's enjoyment when using MTRS in getting recommendations (Hu et al. 2016). In the context of MTRS, it shows that there is a strong relationship and influence in the ability of an MTRS to provide recommendations on user comfort and pleasure in using the technology. Therefore, the following hypothesis are proposed.

H5: The level of Support for Social Interaction on the MTRS application has a positive effect on the user's Perceived Usefulness level

H6: The level of Support for Social Interaction on the MTRS application has a positive effect on the level of user's perceived enjoyment

H7: The level of Support for Social Recommendation on the MTRS application has a positive effect on the level of user’s Perceived Usefulness

H8: The level of Support for Social Recommendation on the MTRS application has a positive effect on the user's Perceived Enjoyment level

Social Motivation and its influence on perceived usefulness and perceived enjoyment

Social recognition is a model that explains the degree of recognition of the identity and self-esteem of someone or something by others (Basumallick 2019). In fact, acknowledgement plays an important role, not only in realizing the person's own abilities and skills but also in facilitating social interaction (Wu and Chen 2017). With social interaction, users can develop a deep understanding, not only about self-confidence and self-esteem but also relationships with other people in society (Wu and Chen 2017). The level of perceived usefulness of users towards an application will increase when they know that other people who have a relationship with them also feel the same value and benefits for the application (Wu and Chen 2017). Based on the explanations of these studies, it can be assumed that if users get recognition from their environment for using MTRS, users will feel that MTRS can make it easier for them to obtain recommendations for tourist destinations.

The interaction between one individual and another requires the recognition of the identity of an individual to another individual (Chen et al. 2016). The study also states that the recognition of identity has a positive effect on the perceived enjoyment of the system. Based on the explanations, it can be assumed that if users get recognition from their environment for using MTRS, users will feel that MTRS can provide pleasure and enjoyment for them when getting recommendations for tourist destinations.

Social influence is an individual's ability to make a real change based on feelings and behaviors because of interactions with other people who have the same characteristics, desired people, or people who are experts in a field (Ogara et al. 2014). Social influence is assessed as a condition in which a person weighs the opinions of those closest to him to do something. In addition, it was also found that social influence is one of the variables that have a positive impact on perceived usefulness (Yang et al. 2009). Based on the findings of these studies, it can be assumed that if there are social influences that encourage users to use MTRS, users will also feel the perceived usefulness of using MTRS to get recommendations for tourist destinations.

Social urges can lead to enjoyment of the use of technology (Junglas et al. 2013). From a socialization perspective, technologies such as websites (Wang et al. 2007; Wakefield et al. 2011), instant messaging (Li et al. 2005), virtual communities (Brown and Bell 2006; Bailenson and Beall 2006), or computer-supported collaborative learning environments (Kreijns et al. 2007) are experienced differently depending on existing technological capabilities. Based on these findings, it can be assumed that if social influence encourages users to use MTRS, users will feel happiness and pleasure in using MTRS to get recommendations for tourist destinations. Therefore, the following hypothesis are proposed.

H9: The level of Social Recognition on the MTRS application has a positive effect on the level of Perceived Usefulness of users

H10: The level of social recognition in the MTRS application has a positive effect on the level of user's perceived enjoyment

H11: The level of Social Influence on the MTRS application has a positive effect on the user's Perceived Usefulness level

H12: The level of Social Influence on the MTRS application has a positive effect on the user's Perceived Enjoyment level

The influence of perceived Usefulness and perceived enjoyment on use intention and visit intention

Use intention is a strength of a person's desire to do a specific behaviour (Fishbein and Ajzen 1975). The perceived usefulness of the MTRS application can be described as the extent to which a person believes that the application can be a driving force to achieve his goal, which is to get tourist recommendations. Perceived usefulness is a direct determinant of sustainable use intentions (Lee et al. 2013). For example, in the MOOC literature written it is stated that the intention to continue using the MOOC system is significantly influenced by a person's perceived usefulness of the system (Alraimi et al. 2015). In this study, it is assumed that someone may want to use the MTRS application if he believes that the MTRS application can help him to achieve his goal. Therefore, we predict that perceived usefulness affects use intention.

Visit intention, which explains a person's willingness or desire to visit a tourist destination after seeing interesting information (Chen et al. 2014), has a positive relationship with perceived usefulness. This is due to the information overload phenomenon that has been discussed previously. Information overload can lead to reduced quality of decisions, lack of confidence in the choices chosen, and the time needed to reach a decision becomes longer (Chervany and Dickson 1974). We predict that the existence of information overload can reduce the visit intention indicator from users. On the other hand, perceived usefulness will help users make their choices in the midst of information overload, thereby reducing the effects of information overload itself. Therefore, we predict that perceived usefulness affects visit intention.

Perceived enjoyment has a significant effect on the frequency of use or the frequency of using technology (Teo et al. 1999). This is consistent with the findings of research which explain that perceived enjoyment of internet use has a positive relationship with use intention (Moon and Kim 2001). Then, other studies also found that perceived enjoyment can significantly affect the intention of use of a technology (Teo and Noyes 2011). We predict that in the context of MTRS use, perceived enjoyment also affects use intention.

Perceived enjoyment can be interpreted as the user's feeling of pleasure when using MTRS. Previous research has found that perceived enjoyment has a significant effect on the behavioural intentions of users (Van der Heijden 2003; Hsu and Lin 2008). In this study context, the behavioural intention of the user is the intention to visit a tourist destination or visit intention. Thus, we predict that perceived enjoyment or pleasure can have a significant influence on user intentions in the context of MTRS, namely the intention to visit tourism.

The buying decision process consists of five stages, namely knowing needs, seeking information, evaluating alternatives, purchasing decisions, and repurchasing behaviour (Kotler and Armstrong 2012). This process can also be adapted to the context of tourist visits. As explained in the previous section, many factors are assumed and proven to influence a person's intention to use the MTRS application. If someone has used the MTRS application, then it is very likely that he has gone through these decision processes. After going through the process, the user will determine whether he has the desire to visit the tourist destinations he sees in the MTRS application. Based on the adaptation and implications of these stages, we predict that if the user already has the intention to use the MTRS application to get recommendations for tourist destinations, it is very likely that the intention to visit tourist destinations will also increase. Usage intention can affect destination visit intention (Chung et al. 2015). Therefore, the following hypothesis are proposed.

H13: The level of Perceived Usefulness on the MTRS application has a positive effect on the level of user's Use Intention

H14: The level of Social Influence on the MTRS application has a positive effect on the level of user's Perceived Usefulness

H15: The level of Perceived Enjoyment on the MTRS application has a positive effect on the level of user's Use Intention

H16: The level of Perceived Enjoyment on the MTRS application has a positive effect on the user's Visit Intention level

H17: The Use Intention level in the MTRS application has a positive effect on the user's Visit Intention level

Figure 1 describes the proposed model.

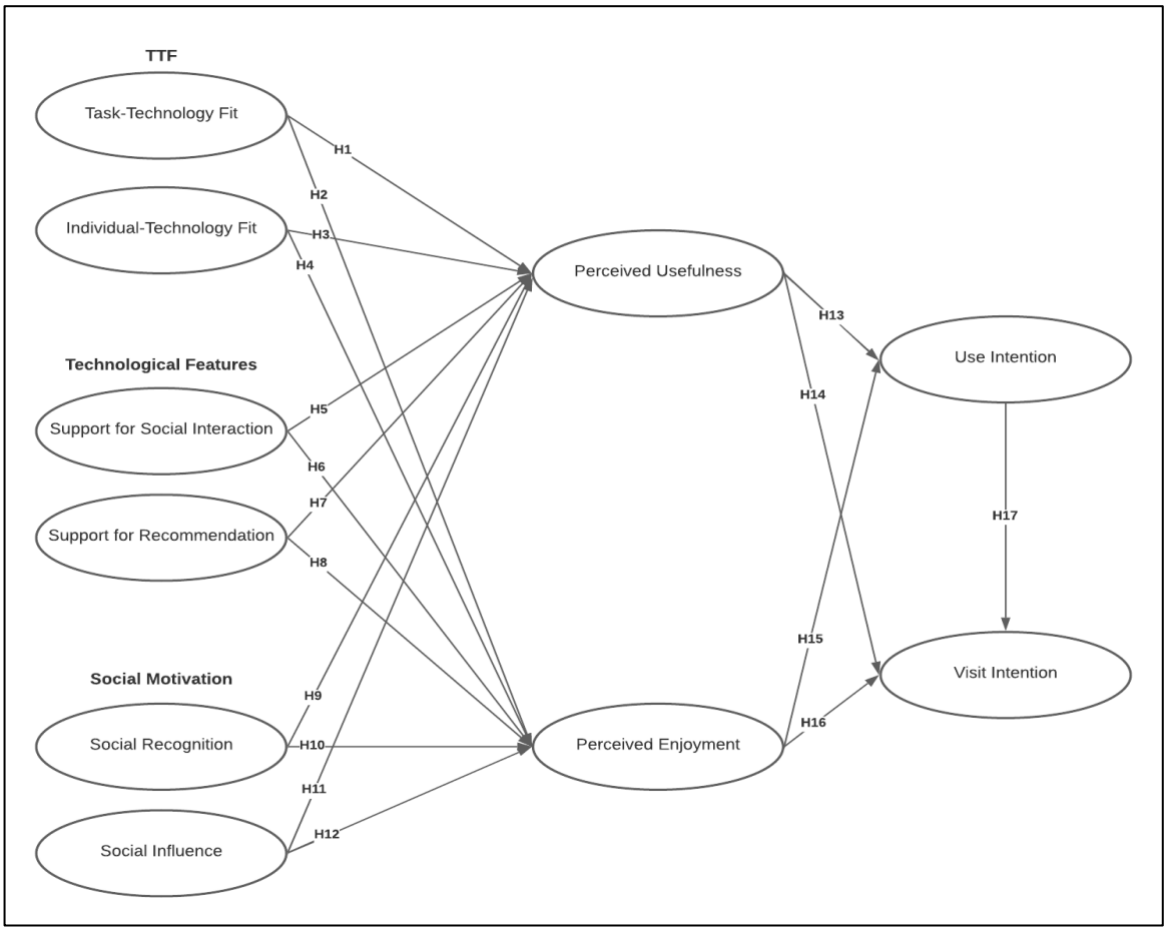

Figure 1. Proposed Research Model

Research Methodology

Sampling and data collection

The questionnaire is distributed online through social media for one month, from May 5, 2021, to June 5, 2021. The author uses social media such as Twitter, Facebook, Instagram, LINE to facilitate the distribution of the questionnaire. The criteria of respondents are individuals who have used MTRS application. Finally, the amount of valid data to be analyzed is 213 data. Table 1 summarizes the demographic characteristics of the respondents.

Table 1. Respondent Demographics

Demographic Types	Options	Percentage
Gender	Men	39%
	Women	61%
Age	17 - 25 years	32.1%
	26 - 35 years	6.7%
	36 - 45 years	8.1%
	> 45 years	53.1%
Education Level	High School	6.6%
	Diploma	7.5%
	Bachelor	71.4%
	Master	12.7%
	PhD	1.9%
Frequency of MTRS use	< 2	40.4%
	2 - 3	31.9%
	4 - 5	10.3%
	> 5	17.4%

Then, for the discriminant validity testing, this study employs Fornell-Larcker Criterion test. The loading factor of an indicator must be higher than other constructs' cross loading and each of indicator must have AVE value higher than another constructs' AVE (Hair et al. 2011). For the last evaluation, this study puts on the composite reliability test and Cronbach Alpha test. The results of those two tests must be more than 0.7 for each of the indicators. As shown in Table 2, the model passes all the tests.

Table 2. Result of Measurement Model Evaluation

	ITF	PE	PU	SI	SR	SFR	SSI	TTF	UI	VI	CA	CR	AVE
ITF	**0.871**										0.842	0.904	0.759
PE	0.610	**0.885**									0.908	0.935	0.783
PU	0.519	0.703	**0.877**								0.850	0.909	0.769
SI	0.516	0.518	0.518	**0.920**							0.909	0.943	0.846
SR	0.546	0.538	0.416	0.589	**0.881**						0.857	0.912	0.776
SFR	0.614	0.630	0.659	0.506	0.429	**0.842**					0.794	0.879	0.709
SSI	0.516	0.310	0.301	0.344	0.382	0.464	**0.890**				0.913	0.938	0.791
TTF	0.634	0.641	0.594	0.430	0.375	0.548	0.272	**0.847**			0.868	0.910	0.717
UI	0.572	0.812	0.714	0.551	0.511	0.624	0.302	0.647	**0.894**		0.874	0.923	0.799
VI	0.673	0.748	0.623	0.549	0.587	0.596	0.391	0.615	0.792	**0.885**	0.907	0.935	0.782

Structural Model Evaluation

This study uses a one-tailed test with a significance level of 0.05. This can be a reference to accept or reject H0 by looking at the p-values. If the p-values are greater than 0.05, then hypothesis is not significant or fails to reject H0. As shown in Table 3 and Figure 2, of the 17 hypotheses proposed, ten were accepted, and seven were rejected.

The coefficient of determination test results as shown in Table 4. The value of the coefficient of determination or R Square can measure how far the model can explain the variation of the dependent variable. The value of the coefficient of determination is in the range of zero (0) and one (1). Based on the test results, it can be concluded that the existing statistical model can explain 58.8% of the variance of perceived enjoyment, 54% of the variance of perceived usefulness, 70% of the variance of use intention, and 66.1% of the variance of visit intention. It shows that the coefficient of determination for these variables are large enough to provide almost all the information needed to predict the variation of the dependent variable (Ghozali 2009).

Table 3. Result of Structural Model Evaluation

Hypothesis	Parameter			T Statistics	P Value	Remarks
H1	TTF	→	PE	3.714	0.000	Accepted
H2	TTF	→	PU	3.585	0.000	Accepted
H3	ITF	→	PE	1.275	0.202	Rejected
H4	ITF	→	PU	0.282	0.778	Rejected
H5	SSI	→	PE	1.356	0.175	Rejected
H6	SSI	→	PU	0.781	0.435	Rejected
H7	SFR	→	PE	4.017	0.000	Accepted
H8	SFR	→	PU	5.810	0.000	Accepted
H9	SR	→	PE	2.716	0.007	Accepted
H10	SR	→	PU	0.814	0.416	Rejected
H11	SI	→	PE	1.064	0.287	Rejected
H12	SI	→	PU	2.776	0.006	Accepted
H13	PU	→	UI	3.616	0.000	Accepted
H14	PU	→	VI	0.720	0.472	Rejected
H15	PE	→	UI	8.762	0.000	Accepted
H16	PE	→	VI	2.869	0.004	Accepted
H17	UI	→	VI	5.731	0.000	Accepted

Table 4. R-Square Results

Parameter	R Square	R Square Adjusted
PE	0.588	0.576
PU	0.540	0.526
UI	0.700	0.697
VI	0.661	0.656

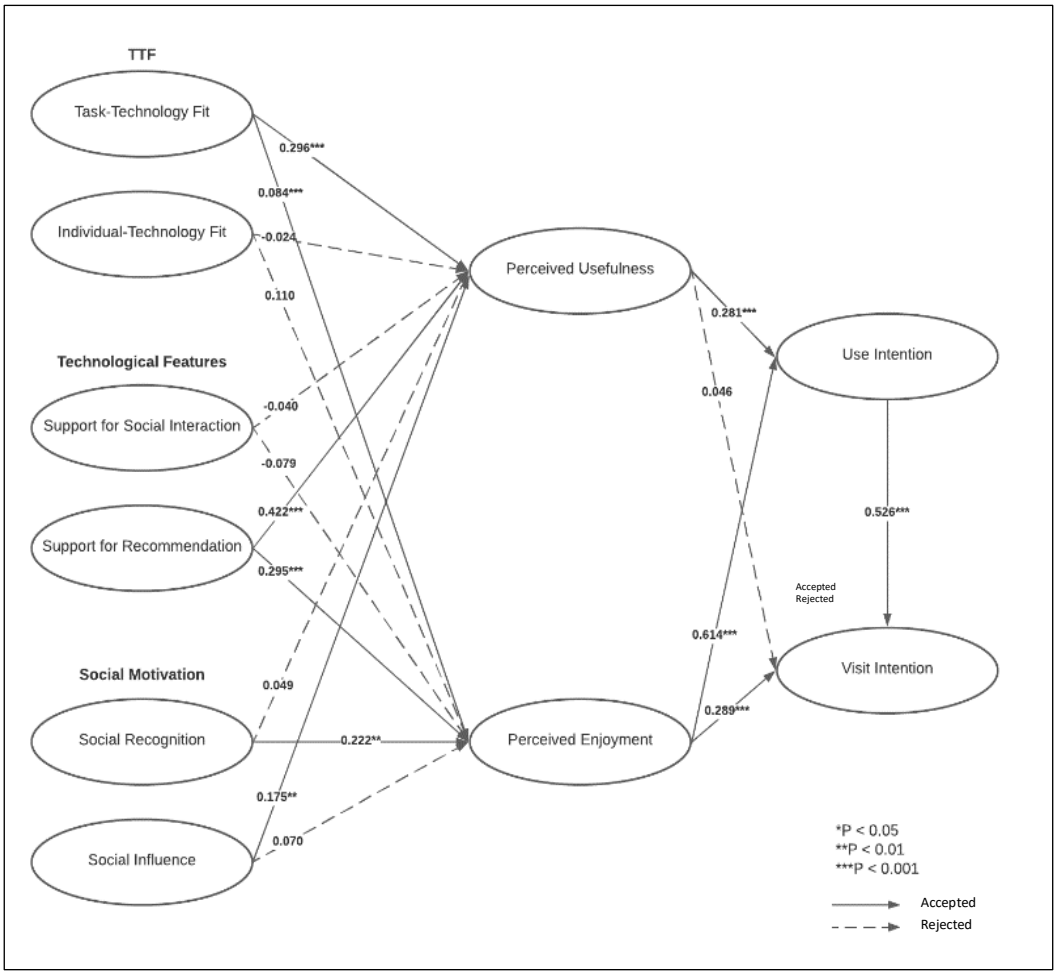

Figure 2. Hypothesis Testing Result Model

Discussion

As predicted, task-technology fit positively affect the perceived usefulness and the perceived enjoyment of using MTRS. These results are in line with research by Wu and Chen (2017), which shows that task-technology fit can affect the perceived usefulness of and perceived ease of use in the context of education, or more precisely, the MOOC digital learning platform.

This is also in line with research by Yu and Yu (2010), which shows the effect of task-technology fit on perceived usefulness and perceived ease of use in the context of e-commerce. In contrast to task-technology fit, this study finds that the component of TTF, individual-technology fit, has no effect on perceived usefulness and perceived enjoyment. These results are almost in line with research by Wu and Chen (2017), which indicates that individual-technology fit does not have a direct influence on perceived usefulness but is mediated through an intermediary relationship of influence with perceived ease of use. This discrepancy may be the result of the context of the MTRS under study. When the individual-technology fit level becomes larger, users will perceive that the MTRS is easier to use to find tourist destination recommendations, which will influence task-technology fit more than individual technology fit. The implication for MTRS developers is they should provide detailed explanations of the features so that users feel suitable and appropriate to use them. By providing travel recommendations through features that are easy and clear to use, users will find it easier to get recommendations for tourist destinations, affecting increasing intentions to visit tourist destinations.

This study also finds that only one of the two technological features constructs, support for recommendation, has an influence on perceived usefulness and perceived enjoyment. It indicates that

the MTRS feature in providing recommendations for tourist destinations is the most useful feature for users to make their choices in determining tourist destinations. In addition, it is very rare that there are MTRS applications that provide support for social interaction features. These features include the ability for users to interact or discuss with other users on MTRS. So, it is assumed that users do not have a basic connection or relationship with these features when using MTRS, so there is no influence between support for social interaction with perceived usefulness and perceived enjoyment. The results obtained are in line with research conducted by Hu et al. (2016), which demonstrates that support for recommendation influences perceived utilitarian value and research by Wu and Chen (2017), which learns that technological features also affect perceived usefulness in the context of MOOC. The implication for MTRS developers is they must improve their tourist destination recommendation features by utilizing users' data and artificial intelligence technology so that the feature would be more personalized and match user preferences.

Social recognition and social influence also influence perceived usefulness and perceived enjoyment. More specifically, social recognition only affects perceived enjoyment, and social influence only affects perceived usefulness. These results are not consistent with research conducted by Wu and Chen (2017) which states that the two constructs on social motivation have an influence on perceived usefulness in the context of e-commerce. In addition, the results of this study are also not consistent with research conducted by Venkatesh and Davis (2000), which reveals that job relevance has a direct effect on perceived usefulness. It can be concluded that the construct of social recognition and social influence can be used to examine visit intention from the use of MTRS. This finding also holds valuable implications for MTRS application developers to be able to continue to develop marketing activities that can increase the social motivation of users.

Finally, perceived usefulness, perceived enjoyment, and use intention were found to have different effects on visit intention. It is known that perceived enjoyment and use intention of MTRS directly affect visit intention. It shows that the pleasure experienced by users and the intention to use MTRS application can increase the users' visit intention to a tourist destination. In contrast, perceived usefulness indirectly affects visit intention through use intention. This finding explains that if users find MTRS is easy to use and can improve their work, they will increase their intention to use MTRS application and eventually lead them to visit a tourist destination. In addition, we found that the use intention of MTRS had the most substantial influence on visit intention.

Based on the explanation described previously, we can conclude that the perceived usefulness and enjoyment of using MTRS affect the user's visit intention. Therefore, MTRS developers should consider usefulness and enjoyment factors when developing MTRS applications.

Conclusion

This study is conducted to determine the effect of using the MTRS application on the intention to visit tourist destinations. The use of the MTRS application is identified based on factors that are divided into several aspects. To measure the intention to visit a tourist destination, perceived usefulness and perceived enjoyment are used to measure aspects of the use of MTRS; TTF, technological features, and social motivation. Based on the results of data processing and analysis, it is known that there are 10 out of 17 hypotheses that are successfully accepted. The support for recommendation variable has the most influence on perceived enjoyment and perceived usefulness variable. Then perceived enjoyment variable has the most influence on the use intention variable, and the use intention variable has the most influence on the visit intention variable. Finally, this research is expected to be useful to be able to provide a general description of the intention to visit tourist destinations owned by users by using MTRS as a medium for finding recommendations for tourist destinations**.**

This research uses a cross-sectional study to find the relationship between variables to determine the effect of MTRS application on the intention to visit tourist destinations. However, user behavior is dynamic and cannot be measured only once. Aspects such as TTF, technological features, and social motivation of users will always change following changes in the environment and technology owned by MTRS. In addition, force majeure circumstances, such as the current COVID-19 pandemic, can also be considered to determine MTRS use and intentions to visit tourist destinations during the pandemic.

Therefore, future research may use longitudinal study to provide a more accurate picture of the influence of existing constructs on intentions to visit tourist destinations.

Finally, we suggest for future research is to focus more on technological features. It can be helpful for MTRS developers because one of the variables from this aspect, support for recommendation, has a significant effect on the two dependent variables, perceived usefulness, and perceived enjoyment, which are then proven to increase users' intentions to visit tourist destinations. Developers can develop more up-to-date and sophisticated recommendation features by using various user data to create recommendations that match the user. It can be done by utilizing artificial intelligence technology that is more personalized to suit user preferences.

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Evaluation of Academic Information System Using Delone and Mclean Success Model: A Case Study of Academic Information System Hasanuddin University

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Abstract

This study examines the effectiveness of the utilization (individual impact) of academic information systems at Hasanuddin University using the DeLone and McLean information system success model. Analyze future system development strategies and find the best solution that can be given to the information system management in the context of developing the information system itself. This model has seven hypotheses to examine the construct relationships including system quality predicts user satisfaction (H1), information quality predicts user satisfaction (H2), system quality predicts actual use (H3), information quality predicts actual use (H4), user satisfaction predicts actual use (H5a), actual use predicts user satisfaction (H5b), user satisfaction predicts individual impact (H6), and actual use predicts individual impact (H7). We use structural equation modeling with Partial Least Square technique. The results show that H1, H2, H6, H7 have a significant positive impact and the remaining hypothesis have no significant positive impact. In conclusion, indicators that influence the effectiveness of using the system are on the system quality variable and the quality of information with the greatest influence on the quality of information.

Keywords: Academic Services; Information Systems Success; DeLone and McLean; Individual Impact

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Introduction

Academic services in a university are one of the factors that support the creation of a conducive academic atmosphere for students and faculty members. The academic services include teaching and learning activities and administrative services for students and lecturers. One of the supporting infrastructure for academic services is an integrated Academic Information Systems with the aim of facilitating academic service activities for the academic community, especially for students and lecturers. An information system is an organized combination of people, software, hardware, communication networks, and data resources in collecting, transforming, and disseminating information within an organization (O'Brien, 2007). An organization uses an information system to support the effective and efficient operation of the organization. Moreover, information systems are also a key competitive differentiator (O'Brien, 2006), Organizations will use information systems to develop products, services, and capabilities that will give them an edge in competitive markets (Budiyanto, 2009).

There are technical and non-technical failures in an information system. The technical failures occur due to the poor technical quality of the information system including syntax errors, logical errors, and misinformation. Non-technical failures occur when user are reluctant to use the information system that has been developed (Jogiyanto, 2007). The success of system implementation is influenced by various complex factors. While the failure of system implementation, usually occurs because the system is not compatible with the business processes and information needed by the organization (Lucas et al, 1988).

In this study, we examine the academic information system (NeoSIA) that was developed and used by Hasanuddin University using DeLone and McLean information system success model. The NeoSIA is an application infrastructure used for supporting academic services on campus. The users of this service are students and faculty members (lecturers and staff). This study will examine the effectiveness of the utilization (individual impact) of the information system application by users with regard to the variable of the system and usage. Seeing the impact on users so that they can analyze future system development strategies and find the best solution that can be given to the information system management in the context of developing the information system itself. With the development of this information system, it is hoped that the academic services of Hasanuddin University can run smoothly and can satisfy its users.

Literature Review

Several studies have used the DeLone and McLean model to evaluate the success of academic information systems. Meilani, L. (2020) evaluated the quality of academic information systems (SIAKAD) and analyze the factors that influence the use, user satisfaction, and net benefits of SIAKAD at Sultan Ageng Tirtayasa University. Suaryana (2016) evaluated the quality of web-based academic information system in Faculty of Economy and Business (FEB) Udayana University (Unud) and its impacts to users' satisfaction. The users of this system are students, lectures, and academic staffs of FEB Unud. Sultono (2015) evaluated the academic information system in Indonesia University of Education (UPI) using structural equation modeling (SEM). An ex post evaluation by users of an information system (IS) dedicated to the automotive industry (XPPS) proposes by Roky and Al Meriouh (2015), which is based on the DeLone and McLean's information systems success model. Jumardi (2020) evaluated the benefits of the Academic Information System for students at the Bontang Technological College. Dalle et al. (2020) examines the adaptation of the DeLone and McLean information system success models that are commonly used in the university's information systems domain.

The model used Meilani (2020) is the information system success model from DeLone and McLean, and structural equation modeling (SEM) with Partial Least Square (PLS) analysis is used to analyze the factors that influence the successful implementation of SIAKAD. Suaryana (2016) study surveys the perception of students, lectures, and staffs and their satisfaction on the quality of the Academic Information System. The quality system includes three elements, information quality, the system quality, and the service quality. Roky and Al Meriouh (2015) using analysis of data by the technique of structural equation modeling confirms that information quality plays a key role in increasing user

satisfaction and intention to use of the system, the significance of the relationship between the quality of service and the use of the IS, the effect of both intention to use and use on individual impact and finally the positive influence of the individual impact on the organizational performance of XPPS. Jumardi (2020) research uses an adaptation of the success model of DeLone and McLean information systems with some modifications to assess the quality of Academic Information Systems. The study of Dalle et al. (2020) was based on the model by DeLone and McLean. Its focus was on assessing the quality of information systems that have been used in the selected university. Researchers evaluated the quality of each information system by focusing on the six major elements of the DeLone and McLean Model.

The results of hypothesis testing in Meilani (2020) study show that the quality of information systems and services have a significant positive effect on the use and satisfaction of users, and usage and user satisfaction have a significant positive effect on net benefits. In Suaryana (2016) the quality of web-based academic information system is expected to affect the satisfaction of the users, the study succeeded in proving the influence of system quality, information quality, and service quality on user satisfaction of WEB-based information systems at FEB Unud. The better the quality of the system, the quality of information, and the quality of service will increase the satisfaction of information system users at FEB Unud. Improved system quality, information quality, and service quality have been shown to increase user satisfaction of academic information systems. Evaluation results from Sultono (2015) show that all research variables and indicators have significant relations, also that the academic information system quality (system quality, information quality, and service quality) toward user satisfaction has a significant impact. Research discovery shows the necessity of periodical evaluation by the academic information system administrator with user participation, to ensure users need fulfillment. Roky and Meriouh (2015) study provides an empirical validation of the IS success model developed by DeLone and McLean in the automotive industry, a little investigated topic in the literature, and shows the managerial implications of using such a model. From Jumardi (2020) research the research prove that user satisfaction and user involvement are influenced by the quality of the system and the quality of information. User Involvement and User Satisfaction significantly influence net benefits. From data analysis from Dalle et al. (2020) research shows the quality of the system, the quality of information, and the impact of the individual are the determining factors for the success of the information system at the university so it is very important that the information system at the university is designed so that it is easy to use, flexible, and functional to meet its objectives.

Methodology

The selection of the method must consider several aspects such as the objectives of the research, the context of the organization using it, aspects of the information system, and the independent variables used to assess its success, the research method, and the level of analysis whether at the individual, organizational, or community level. The DeLone and McLean model is an information system success model that has been widely applied by researchers in Indonesia and abroad. This model is used as the basis for the initial hypothesis of the research in the technical preparation of data collection. The research questions based on the 6 measurements used in the DeLone and McLean model are as follows (Jogiyanto, 2007):

1. Does the perceived information quality have a positive effect on user satisfaction?
2. Does the perceived system quality have a positive effect on user satisfaction?
3. Does the perceived information quality have a positive effect on its use?
4. Does the perceived system quality have a positive effect on its use?
5. Does user satisfaction have a positive effect on system use?
6. Does use have a positive effect on user satisfaction?
7. Does the use of the system have a positive effect on individual impact?
8. Does user satisfaction have a positive effect on individual impact?

The theoretical framework in this study adopts the DeLone and McLean information system success model used by Iivari (2005) to conduct studies on the application to public sector organizations of mandatory use information systems, the model used is as follows in Figure 1:

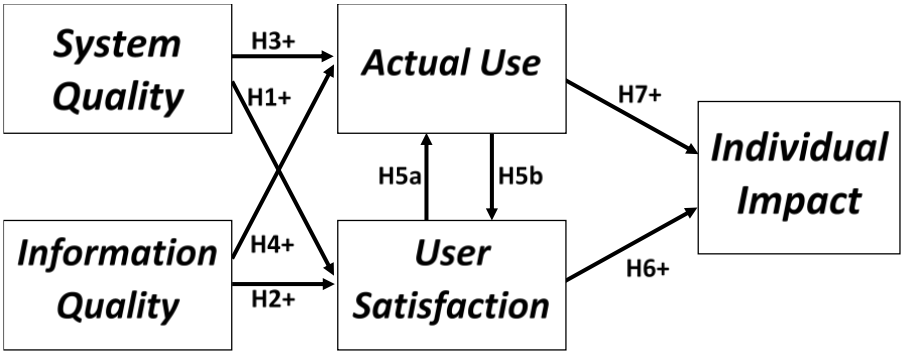

Figure 1. Application of the DeLone and McLean Model in the Public Sector of Oulu City, Finland (Iivari, 2005)

H1: Perceived system quality predicts user satisfaction
H2: Perceived information quality predicts user satisfaction
H3: Perceived system quality predicts actual use
H4: Perceived information quality predicts actual use
H5a: User satisfaction predicts actual use
H5b: Actual use predicts user satisfaction available
H6: User satisfaction predicts individual impact
H7: Actual use predicts individual impact

Population and Research Sample

In this study, the population is the users of the NeoSIA Academic Information System in the Unhas which consists of students, faculty members, and administration staff. The sampling method that used in this research is purposive sampling, which is a sampling method based on certain criteria.
According to Hair et al. (2014) for determining the sample size for (SEM) is the sample size is 5-10 times the number of indicators, this formula is used because the number of populations is undefined. So in this study, we take a sample size of 140 respondents from 28 (number of indicators) x 5.
The data collected from questionnaire using google form and distributed online, total of collected respondents is 140 with 46 lecturers/staff (33%) and 94 students (67%)

Variables and Operational Definitions

The questionnaire is designed based on 5 (five) variables including System Quality, Information Quality, User Satisfaction, Actual Use, and Individual Impact. The five variables and the Questionnaire Model refer to the questionnaire used by Iivari (2005) which applies the DeLone and McLean model in the public sector, the variables and questionnaire model are described as follows:

1. Quality System adapted from Bailey and Pearson (1983) which consists of six scales as follows: Flexibility of the system; integration of the system; response time/change (response/turnaround time); troubleshooting (error recovery); convenience of access; and Language. Each of these scales is measured using four items as proposed in the original source.
2. Information quality (information quality) was adapted from Bailey and Pearson (1983) which consists of six scales as follows: Completeness; accuracy; accuracy; reliability; current (currency); and format of output. Each of these scales is measured using four items as proposed in the original source.
3. User satisfaction using six items adapted from Chin et al. (1988)
4. Actual use in the form of items: Daily use time and frequency of use.
5. Individual impact is associated with the work performance of system users and is measured by a six-item instrument proposed by Davis (1989).

Data analysis method

The model was analyzed using SEM. SEM allows the analysis of a series of relationships simultaneously to provide statistical efficiency (Hair et al., 2014). SEM was used to assess the relationship between the constructs simultaneously and also to assess the testing power of the research model. The Partial Least Squares (PLS) technique was chosen because this tool is widely used for complex causal-predictive analysis and is a suitable technique for theory development research as in this study (Jogiyanto, 2007). PLS does not require a lot of assumptions. The data does not have to be multivariate normally distributed and the number of samples does not have to be large (recommends between 30-100) (Ghozali, 2008). Because the number of samples used in this study was less, PLS was used as an analytical tool. To perform testing with component-based SEM or PLS, we use an application software called SmartPLS version 2.0 (Budiyanto, 2009).

Meanwhile, in this study, the DeLone and McLane Information System Success model will be applied to the public sector which tests 5 (five) variables, namely System Quality, Information Quality, User Satisfaction, Real Use, and Individual Impact, then the model is analyzed by structural equation modeling (SEM) based on partial (partial-least-square-based). The object of this research is users of academic information systems at Hasanuddin University Makassar City.

Result

DeLone and McLane Model Analysis

Test Outer Model

The outer model is a model that specifies the relationship between latent variables/contracts and their indicators or it can be said that the outer model defines how each indicator relates to its construct. The outer model is interpreted by looking at several things, including convergent validity, discriminant validity, composite reliability, Average Variance Extracted (AVE), and Cronbach's alpha.

1) Convergent validity
   Convergent value is measuring the magnitude of the loading factor for each construct. A loading factor above 0.70 is highly recommended, however, a loading factor between 0.5 - 0.60 can still be tolerated as long as the model is still in the development stage. The complete PLS Algorithm model and loading indicator values are presented in Figure 2 and Table 4.

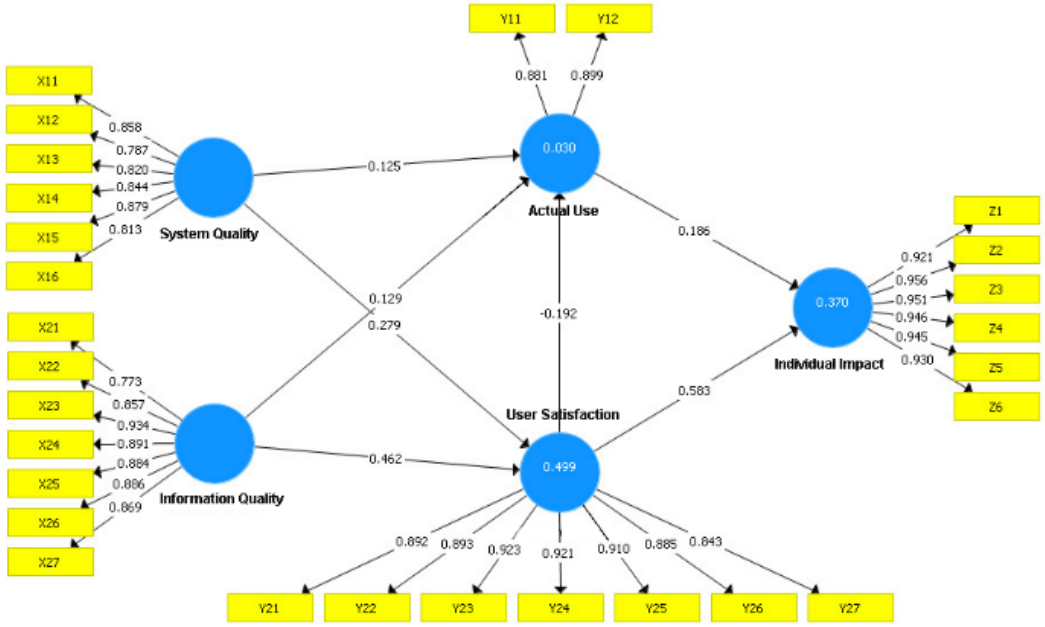

Figure 2. PLS Algorithm Model

Table 1. Loading Indicator Value

Indicator	Individual Impact	User Satisfaction	Information Quality	System Quality	Actual Use
X11				0.858	
X12				0.787	
X13				0.820	
X14				0.844	
X15				0.879	
X16				0.813	
X21			0.773		
X22			0.857		
X23			0.934		
X24			0.891		
X25			0.884		
X26			0.886		
X27			0.869		
Y11					0.881
Y12					0.899
Y21		0.892			
Y22		0.893			
Y23		0.923			
Y24		0.921			
Y25		0.910			
Y26		0.885			
Y27		0.843			
Z1	0.921				
Z2	0.956				
Z3	0.951				
Z4	0.946				
Z5	0.945				
Z6	0.930				

Table 1 shows the loading indicator value where all indicators in each construct have a loading value > 0.7 means that each indicator is valid as a measure of the construct.

2) Discriminant validity.
The discriminant value is useful for assessing whether the variable has adequate discriminant validity, by comparing the indicator correlation with the intended construct, it must be greater than the correlation with other constructs. If the indicator correlation value has a higher than the indicator correlation with other constructs, it means that the variable has high discriminant validity.

Table 2. Cross Loading Value

Indicator	Individual Impact	User Satisfaction	Information Quality	System Quality	Actual Use
X11	0.652	0.610	0.722	***0.858***	0.124
X12	0.691	0.541	0.639	***0.787***	0.037
X13	0.495	0.464	0.598	***0.820***	0.066
X14	0.623	0.500	0.678	***0.844***	0.115
X15	0.623	0.583	0.688	***0.879***	0.097
X16	0.520	0.536	0.682	***0.813***	0.072
X21	0.461	0.476	***0.773***	0.514	0.099
X22	0.624	0.673	***0.857***	0.705	0.054
X23	0.592	0.595	***0.934***	0.725	0.070
X24	0.561	0.551	***0.891***	0.668	0.127
X25	0.566	0.646	***0.884***	0.781	0.060
X26	0.583	0.591	***0.886***	0.699	0.075
X27	0.594	0.624	***0.869***	0.772	0.119
Y11	0.134	-0.051	0.061	0.081	***0.881***
Y12	0.173	0.009	0.110	0.103	***0.899***
Y21	0.514	***0.892***	0.657	0.580	0.003
Y22	0.483	***0.893***	0.583	0.566	-0.041
Y23	0.534	***0.923***	0.600	0.582	-0.048
Y24	0.486	***0.921***	0.594	0.547	-0.038
Y25	0.571	***0.910***	0.686	0.655	-0.029
Y26	0.529	***0.885***	0.607	0.590	0.067
Y27	0.502	***0.843***	0.565	0.548	-0.056
Z1	***0.921***	0.526	0.600	0.699	0.162
Z2	***0.956***	0.550	0.617	0.694	0.177
Z3	***0.951***	0.548	0.606	0.690	0.148
Z4	***0.946***	0.540	0.641	0.678	0.171
Z5	***0.945***	0.565	0.642	0.666	0.181
Z6	***0.930***	0.540	0.599	0.663	0.138

Table 2 shows cross-loading value of the loading indicator. For X11-X16 indicators, the loading value of system quality has the highest value. For X21-X27 indicators, the loading value of information quality has the highest value. For X11-X12 indicators, the loading value of actual use has the highest value. For X21-X27 indicators, the loading value of user satisfaction has the highest value. For Z1-Z6 indicators, the loading value of individual impact has the highest value.

3) Composite Reliability
A high composite reliability value indicates a good consistency of each indicator in the construct. The criterion of composite reliability value of above 0.7 indicates that the variable has good internal consistency. The complete composite reliability value is presented in Table 3.

Table 3. Composite Reliability Value

Construct	Composite Reliability
Individual Impact	0,979
User Satisfaction	0.966
Information Quality	0.957
System Quality	0.932
Actual Use	0.884

4) Average Variance Extracted (AVE)
Table 7 shows the AVE value, that is, the value of the variance on each indicator in the construct that can be captured by these variables is more than the variance caused by measurement errors. The expected AVE value is above 0.5. As shown in table 6, the individual impact has the highest AVE value than other constructs.

Table 4. Average Variance Extracted (AVE) Value

Construct	Average Variance Extracted (AVE)
Individual Impact	0.887
User Satisfaction	0.802
Information Quality	0.760
System Quality	0.696
Actual Use	0.793

In addition to the AVE value, the evaluation of discriminant validity can use the Fornell-Larchker test which is seen in the correlation value between the construct and the AVE root (see Table 5). The AVE root value is expected to be higher than the correlation value among the constructs.

Table 5. AVE root value and correlation between constructs

Construct	Individual Impact	User Satisfaction	Information Quality	System Quality	Actual Use
Individual Impact	**0,942**				
User Satisfaction	0.579	**0.895**			
Information Quality	0.656	0.687	**0.872**		
System Quality	0.724	0.651	0.804	**0.834**	
Actual Use	0.173	-0.022	0.097	0.104	**0.890**

Table 8 shows that the value in the diagonal direction box is the root value of AVE and the other values are correlations among constructs. The AVE root value of individual impact is higher than other constructs.

5) Cronbach's Alpha
The reliability test was strengthened by Cronbach's alpha value. Cronbach's alpha reliability test limits > 0.7. The results of Cronbach's alpha values in full are presented in Table 6.

Table 6. Cronbach's Alpha Values

Construct	Cronbach's Alpha
Individual Impact	0.974
User Satisfaction	0.959
Information Quality	0.947
System Quality	0.912
Actual Use	0.739

Structural Model Test (Inner Model)

Structural model test is done by looking at the value of R2 (R-Square) and f2 (effect size, goodness of fit index (GoF)), which is the Goodness of the fit model test.

1. R^2 (R-Square)
   The R-square value was obtained on the endogenous construct with the provision that if it was generated from the model with an R-square value of 0.75 (strong model), 0.50 (moderate model), and 0.25 (weak mode). The individual impact construct has an R^2 value of 0.370 indicating that the variation in the individual impact can be explained by the actual use construct and user satisfaction of 37.0% (0.370 x 100%). while the remaining 63.0% (100% - 37.0%) is explained by other variables outside research. Likewise, with the user satisfaction construct with an R2 value obtained of 0.499 or 49.9%. This value indicates that the variation of the user satisfaction construct can be explained by the system quality and information quality constructs of 49.9%. While the R-square value of actual use only obtained 0.030 or 3%. The results of the complete R-square value are presented in Table 7.

Table 7. R-Square Value

Construct	R Square
Individual Impact	0,370
User Satisfaction	0.499
Actual Use	0.030

2. The value of f^2 (effect size)
   Changing the value of R-squares can be used to explain the effect of exogenous constructs on endogenous constructs whether they have a substantive effect. The evaluation criteria for f2 are 0.02 less effect, 0.15 moderate/middle effect and 0.35 large effect. The results of the full value of f2 (effect size) are presented in Table 8.

Table 8. Value of f2 (effect size)

Construct	Individual Impact	User Satisfaction	Actual Use
User Satisfaction	0,539		0.019
Actual Use	0.055		
Information Quality		0.151	0.005
System Quality		0.055	0.005

3. Goodness of fit index (GoF)
   GoF index is for the evaluation of the measurement model and the structural model for the overall prediction of the model. The GoF value is calculated from the square root value of the average community index with average R-squares with the criteria of 0.10 small GoF, 0.025 medium, and 0.36 large category. The results of the GoF value are presented as follows:

$$GoF = \sqrt{\overline{com}\ X\ \overline{R^2}}$$

$$GoF = \sqrt{0.787\ X\ 0.300}$$

$$GoF = \sqrt{0.235}$$

$$GoF = 0.485$$

From the results of the calculation of the GoF value obtained at 0.486, it can be concluded that the model has a large GoF category.

The next test is to see the significant effect between independent constructs on the dependent constructs and answer what has been hypothesized. Tests with a significance level of 5% if the t-statistic value > 1.96 then the null hypothesis (H0) is rejected. The t-statistical value of the coefficient of influence of the construct was obtained from PLS Bootstrapping. The results of the PLS Bootstrapping Model are presented in Figure 3.

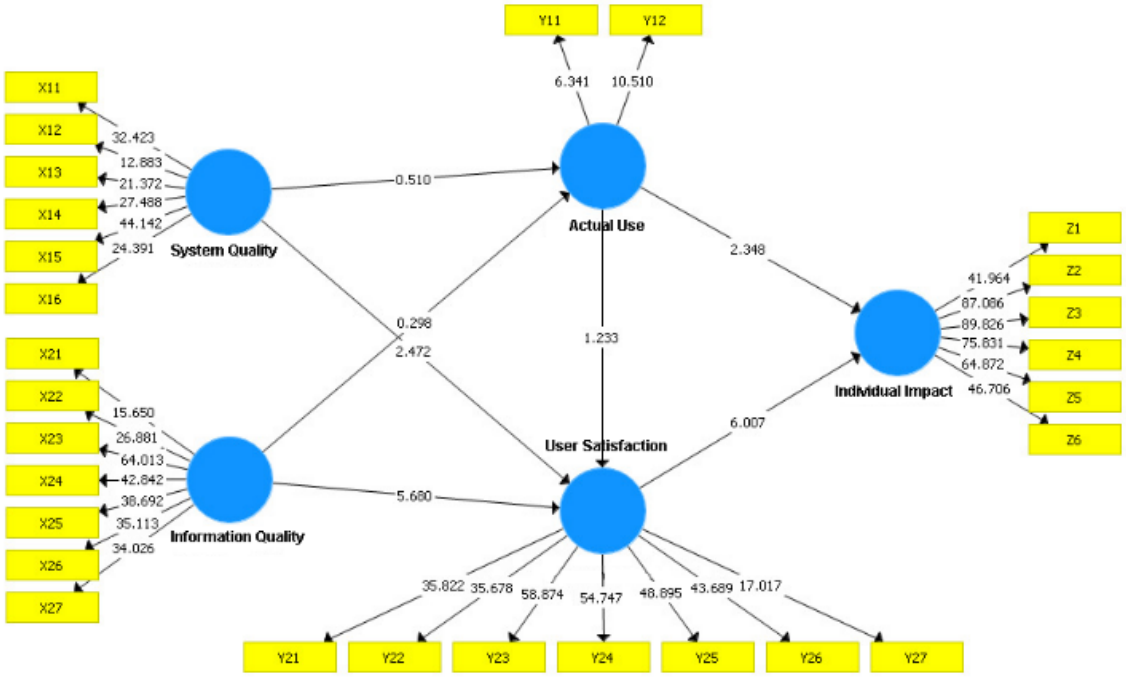

Figure 3. The 1st PLS Bootstrapping Model

Parameter coefficient values can be seen in the original sample value, error value (standard deviation), t-statistics, and p-values can be seen in Table 9.

Table 9. Coefficient Value (Original Sample), Standard Error and T-Statistics

Effect	Original Sample (O)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
User satisfaction → Individual impact	0,583	0.092	6.341	0.000
User satisfaction → Actual use	-0.192	0.147	1.308	0.191
Information quality → User satisfaction	0.462	0.083	5.545	0.000
Information quality → Actual use	0.129	0.142	0.904	0.367
System Quality → User satisfaction	0.279	0.109	2.569	0.010
System Quality → Actual use	0.125	0.145	0.860	0.390
Actual use → Individual impact	0.186	0.078	2.380	0.018

- Hypothesis 1
  The coefficient value of the influence of system quality on user satisfaction is 0.279, the standard error value is 0.109, the t-statistic value is 2.569 and the p-value is 0.010. Because the t-statistic value is 2.569 > 1.96, then reject H0. This indicates that the quality of the system has a significant positive effect on user satisfaction.
- Hypothesis 2
  The coefficient value of the influence of information quality on user satisfaction is 0.462, the standard error value is 0.083, the t-statistic value is 5.545 and the p-values are 0.000. Because the t-statistic value is 5.545 > 1.96, then reject H0. This indicates that the quality of information has a significant positive impact on user satisfaction.
- Hypothesis 3
  The coefficient value of the influence of system quality on actual use is 0.125, the standard error value is 0.145, the t-statistic value is 0.860 and the p-values is 0.390. Because the t-statistic value is 0.390 < 1.96, then accept H0. It can be concluded that the quality of the system has no significant positive impact on actual use.
- Hypothesis 4
  The coefficient value of the influence of information quality on actual use is 0.129, the standard error value is 0.142, the t-statistic value is 0.904 and the p-values is 0.369. Because the t-statistic value is 0.369 < 1.96, then accept H0. This indicates that the quality of information has no significant positive impact on actual use.
- Hypothesis 5a
  The coefficient value of the effect of user satisfaction on actual use is -0.192, the standard error value is 0.147, the t-statistic value is 1.308 and the p-value is 0.191. Because the t-statistic value is 1.191 < 1.96, then accept H0. This indicates that user satisfaction has no significant positive impact on actual use.
- Hypothesis 6
  The coefficient value of the influence of user satisfaction on the individual impact is 0.583, the standard error value is 0.092, the t-statistic value is 6.341 and the p-values are 0.000. Because the t-statistic value is 6.341 > 1.96, then reject H0. This indicates that user satisfaction has a significant positive impact on individual impacts.
- Hypothesis 7
  The coefficient value of the actual use effect on the individual impact is 0.186, the standard error value is 0.078, the t-statistic value is 2.380 and the p-value is 0.018. Because the t-statistic value is 2.380 > 1.96, then reject H0. This indicates that actual use has a significant positive impact on individual impacts.

- Hypothesis 5b
  For testing hypothesis 5b, because SmartPLS cannot perform tests with reciprocal models such as user satisfaction with actual use and actual use on user satisfaction. So the 2nd PLS bootstrapping test was carried out to produce the model estimate.

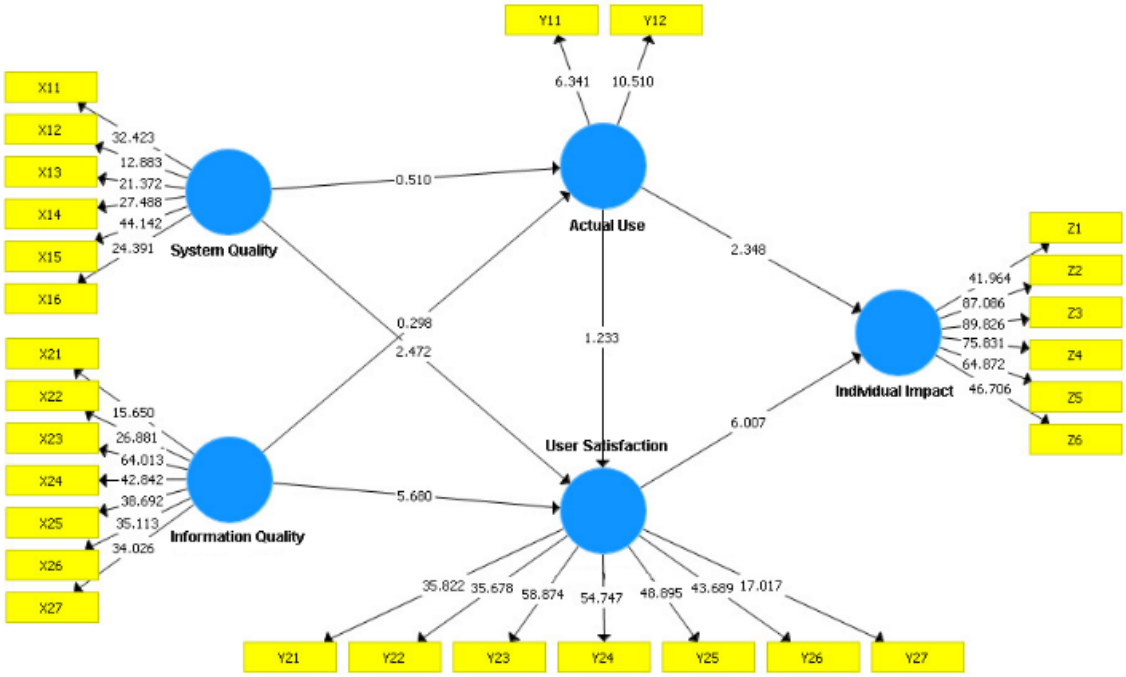

Figure 4. 2nd PLS Bootstrapping Model

Table 10. The value of the coefficient of influence

Effect	Original Sample (O)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Actual Use → User satisfaction	-0,096	0.078	1.233	0.218

The coefficient value of the actual use effect on user satisfaction is -0.096, the standard error value is 0.078, the t-statistic value is 1.233 and the p-values is 0.218. Because the t-statistic value is 1.233<1.96, then accept H0. This indicates that actual use has no significant impact on user satisfaction.

Discussion

As we can see in Table 11 below, System quality and information quality have a significant positive impact on user satisfaction (H1 and H2). This indicates an increase in the quality of information and the quality of information will increase user satisfaction. Meanwhile, on Actual use, System Quality, and Information Quality, there is no significant positive relationship (H3 and H4). These results indicate that changes in System Quality and Information Quality have little impact on Actual use. This is because users access the NeoSIA at certain time including when students register for courses/classes at beginning of semester and when faculty members input the students' grade at the end of semester. So that the intensity of use will not be affected by the quality of the system and information.

Table 11. Conclusion of Test Results (significance level 5% if the t-statistic value > 1.96 then the null hypothesis (H0) is rejected)

Hypothesis	Effect	T Statistics	Conclusions
H1	System Quality → User satisfaction	2.569	*significant positive effect*
H2	Information quality → User satisfaction	5.545	*significant positive effect*
H3	System Quality → Actual use	0.860	*no significant positive effect*
H4	Information quality → Actual use	0.904	*no significant positive effect*
H5a	User satisfaction → Actual use	1.308	*no significant positive effect*
H5b	Actual use → User satisfaction	1.233	*no significant positive effect*
H6	User satisfaction → Individual impact	6.341	*significant positive effect*
H7	Actual use → Individual impact	2.380	*significant positive effect*

The relationship between user satisfaction and actual usage (H5a and H5b) gives a positive insignificant relationship. These results indicate that these two variables do not affect each other, the level of satisfaction will not change the intensity of use and the intensity of use will not change the level of user satisfaction, because the NeoSIA application is an information system application that is mandatory for the needs of academic activities. The Individual Impact of Actual use and User Satisfaction variables (H6 and H7) provide a significant positive relationship. This hypothesis shows that the effectiveness of NeoSIA at the user level is influenced by the intensity of use and user satisfaction.

Conclusions

In the study, it can be concluded that the indicators that have an influence on the effectiveness of the use of the system (user satisfaction and individual impact) are on the system quality variable and the quality of information with the greatest influence on the quality of information. So if we want to improve the quality of information, we need to improve the volume of information The actual use variable is not so affected by the condition of the system and also has little effect on the individual impact. But it is possible that by modifying the indicators on the quality variable, indicators will be found that can affect actual use, further study is needed to see the factors for enhance the quality that can encourage more people to use the system.

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