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EXTENDED DELONE & MCLEAN ISS MODEL TO EVALUATE IT ASSISTANCE APPLICATION USAGE LEVEL

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ABSTRACT

Application usage level is one indicator which can be used to measure the successful implementation of an IS/IT investment. In this study the authors propose to extend of Updated DeLone & McLean ISSM with 2 variables from UTAUT. Then use the propose model to evaluate the factors which influence IT assistance application usage levels. Data collection was carried out using questionnaire distributed via an online platform to 322 respondents. The collected data will be processed and analyzed using the SEM-PLS (Structural Equation Model-Partial Least Square) approach. Based on R-square results found the impact of variables in the proposed model are usage level is 51,6 % , user satisfaction is 65,8 %, and behavioral intention is 49,5 %. This study also finds that adding 2 variables from the UTAUT model, namely performance expectations and business expectations, can improve the capability of Updated DeLone & McLean ISSM in measuring the influence of Behavioral Intention variable into Use variable.

Keywords: *Usage Level, IT Assistance, Extend, Application*

1. INTRODUCTION

Information technology (IT) plays an important role in creating new opportunities and providing a competitive advantage for companies through a business-focused approach in managing IT resources [1]. One indicator of the successful implementation of an IS/IT investment can be seen based on the application usage level. Updated DeLone & McLean IS Success Model (ISSM) is commonly used to evaluate the success IS/IT implementation. Updated DeLone & McLean ISSM mostly considers on the stability of technical quality, but the Intention to Use (ITU) defined in the Updated DeLone & McLean ISSM cannot be fully explained by the three technical aspects that influence it because ITU factors have elements from a psychological decision side. Previous study states that ITU has the same meaning as Behavioral Intention (BI) [2] [3] [4]. This is what underlies the authors to propose adding another variables from UTAUT model into Updated DeLone & McLean ISSM. UTAUT is commonly used to evaluate the acceptance of technology, which in previous study that have integrated these models, reveals that Performance Expectancy (PE), Effort Expectancy (EE), and Social Influence (SI) significantly predict ITU [3].

This study use case study data at PT. Z company company which is a private energy company operating in 9 countries. IT Assistance is one of applications used in PT. Z company and become the object in this study to evaluate factors which influence this application usage level. The use of IT Assistance to support business processes is expected to provide convenience in problems faced in corporate business processes [5], where IT service management (ITSM) provides integrated services based on processes with a focus on satisfying business needs [6]. IT service management is a model to show examples of user-oriented IT service processes [7]. IT Assistance application in PT. Z company consisting of Ticket Problem to record complaints reported by employees and Ticket Request to document all requests for IT Assistance with a ticketing system. The IT Assistance application is used by all employees at PT. Z company, including all staff in the Information Technology Division.

Since its initial implementation, changes to IT Assistance applications in the user interface and process flow have rarely been made. Figure 1 illustrates how the level of use of IT Assistance applications tends to increase from year to year. However, in the period 2016 to 2019 the amount of ticket problems are 493, and 648 for ticket requests; where all unique users on ticket problem are also

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ticket request users; which is one fifth of the total number of employees on PT. Z company.

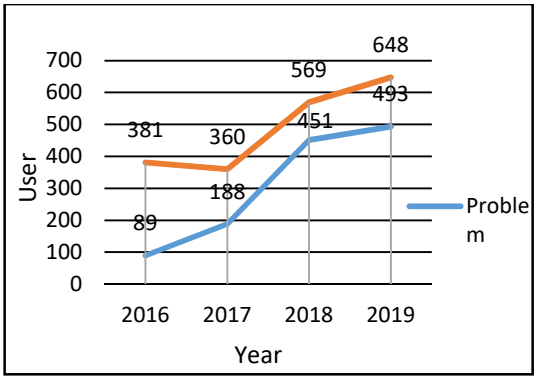

Figure 1. Graph of Total IT Assistance Ticketing for the 2016-2019 Period

One of the performance targets set by the IT Division in the Applications Department is the fulfillment of service level approvals (SLA) of 90%. To evaluate performance goals, a user assessment is carried out on each ticket that has been completed by the Application Department.

The SLA fulfillment rate from the Application Department in one year reported to management (the Reported SLA) does not include the number of tickets not rated by the user. Because if you take into account the number of tickets without a rating with a weight of 0, the actual service fulfillment rate (Actual SLA) from the Application Department is lower than the Reported Party's SLA as shown in Figure 2 and Figure 3.

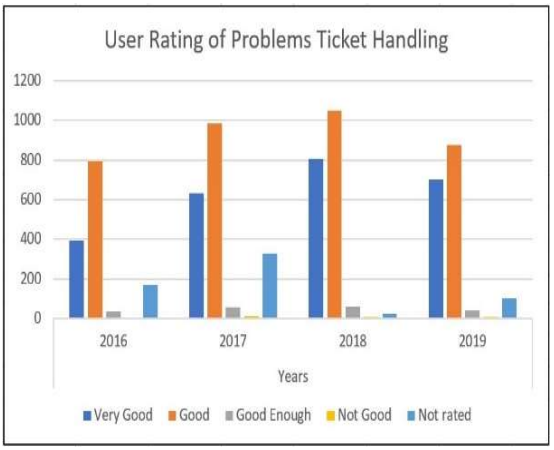

Figure 2. Problems Ticket Handling Rating

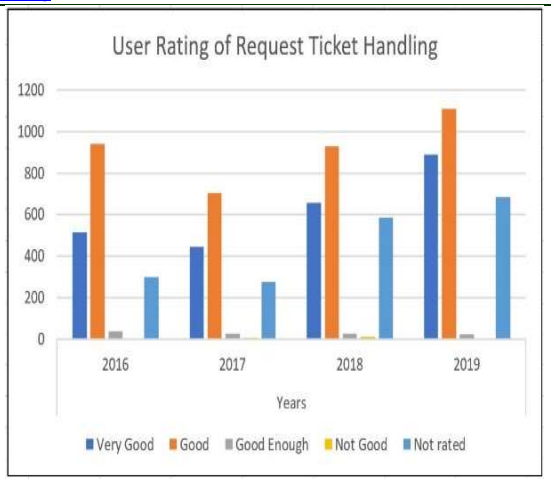

Figure 3. Request Ticket Handling Rating

So far, there has never been an evaluation of factors which influence the usage level of IT Assistance applications. Based on this background, the authors intend to do the evaluation using combination of Updated DeLone & McLean IS Success Model and UTAUT Model of IT Assistance application. This is in accordance with the research question of this paper, namely "What are the factors that affect the usage level of IT Assistance applications at PT. Z company?" The result of this study will be used as a guideline for management to measure the success of an IS / IT investment through application usage level.

2. METHODS

2.1 Extended DeLone & McLean ISS Model

Referring to previous research, the Intention to Use (ITU) factor contained in the Updated DeLone & McLean IS Success Model (ISSM) cannot be fully explained by the three technical aspects that influence it because the ITU factor has elements from a psychological decision side where users will not use a system or technology if it is not preceded by the intention or interest to use it [3], [8]. Research that further explores the UTAUT literature on the DeLone & McLean ISSM [3] has revealed that only Performance Expectancy (PE), Effort Expectancy (EE), and Social Influence (SI) are significant predict ITU. It was said in previous research that integrated several models including UTAUT and DeLone & McLean ISSM that the DeLone & McLean ISSM only considers the stability of system quality, while UTAUT fully

considers the characteristics of the operating system, so imperfections in each model can be compensated for by integrating the use of models [9], [10],[11]. In addition, previous research [2], [3], [4] states that ITU has the same meaning as Behavioral Intention (BI). This is what underlies the authors to propose a combination of the Updated DeLone & McLean ISSM with UTAUT in this case study which is supported by an evaluation study of the quality and acceptance of technology in previous research to measure the success of an information system implementation and acceptance of technology use [4].

2.2 Proposed Model

Based on literature review on previous study, the models used in this study are as follows:

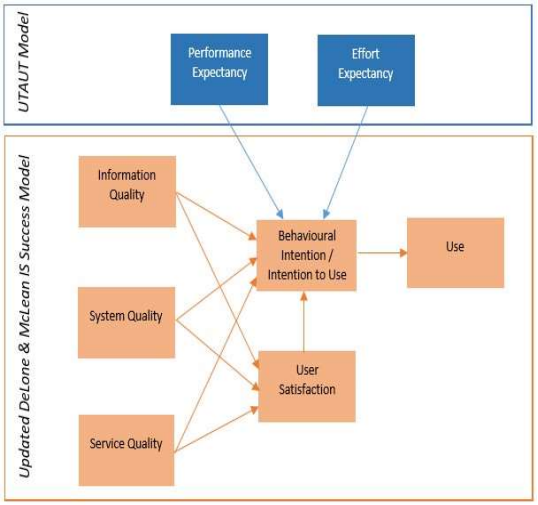

Figure 4. Proposed Model

The research hypothesis is a temporary answer proposed to solve the problem formulation. The research hypothesis is a reference that will be used in writing research conclusions.

Based on Figure 4, the following is the research hypothesis, as follow:

H1: Information Quality (IQ) influences on User Satisfaction (US).
H2: System Quality (SQ) influences on User Satisfaction (US).
H3: Service Quality (SerQ) influences on User Satisfaction (US).
H4: Information Quality (IQ) influences on Behavioral Intention (BI).
H5: System Quality (SQ) influences on Behavioral Intention (BI).
H6: Service Quality (SerQ) influences on Behavioral Intention (BI).
H7: Performance Expectancy (PE) influences on Behavioral Intention (BI).
H8: Effort Expectancy (EE) influences on Behavioral Intention (BI).
H9: User Satisfaction (US) influences on Behavioral Intention (BI).
H10: Behavioral Intention (BI) influences on Use (U).

2.3 Operationalization of Research Variables

The variables that will be used in this study are the variables shown in the research model in Figure 3. Furthermore, the operationalization of the research variables was carried out to determine the dimensions and indicators of the related variables.

Table 1: Research Variables and Dimensions

Variable	Dimension	Reference
Information Quality (IQ)	Accuracy	[10]
	Timeliness	
	Completeness	
	Relevance	
System Quality (SQ)	Functionality	[10]
	Reliability	
	Flexibility	
Service Quality (SerQ)	Responsiveness	[10]
	Assurance	
	Empathy	
Performance Expectancy (PE)	Perceived Usefulness	[11]
	Outcome Expectations	
Effort Expectancy (EE)	Perceived Ease of Use	[11]
	Complexity	
User Satisfaction (US)	Overall Satisfaction	[10]
Behavioral Intention (BI)	Attitude	[10]
Use (U)	Frequency of use	[10]

2.4 Data Collection Method

Observations were made directly at PT. Z company from January to March 2020 in order to obtain accurate supporting data which are going to be processed and analyzed in this research. Data obtained from observations such as the number of ticket request and ticket problems, the number of active users, the user assessment of the ticket request / problem ticket service, as well as the

process flow of the request ticket application and the problem ticket.

From the data obtained at the observation stage, the authors conducted a literature study on books, journals, and articles in order to obtain references to theories and research models.

Data collection was obtained directly from respondents through questionnaires distributed to employees of PT. Z company using online platform which contains 36 statements according to variables and dimensions used in this study. Each statement acts as an indicator for each dimension. Measurement of indicator is carried out using five Likert scale.

The total number of unique users will be the population and also the respondent of this study, a total of 322 employees.

2.5 Data Analysis Method

In this study, data processing and analysis used the SEM-PLS (Structural Equation Model-Partial Least Square) approach by utilizing the SmartPLS version 3.0 software. The SEM-PLS approach typically follows a two-step process that involves separate assessments of the measurement model and the structural model. The first step is to check the validity and reliability of the measurements according to certain criteria related to the specifications of the formative and reflective measurement models. If the steps prove correct, the second step involves assessing the structural model estimates to assess the hypothesis.

3. RESULT AND DISCUSSION

The electronic questionnaire has been distributed to 322 respondents who are employees of PT. Z company located in Indonesia on October 28th – November 2nd, 2020. All questionnaires that have been filled in by the respondents will go through testing in accordance with SEM principles, namely by testing the measurement model and structural model.

Figure 5 is a research model as outlined in the SmartPLS 3.0 application as an analysis tool chosen to process data using the SEM principle.

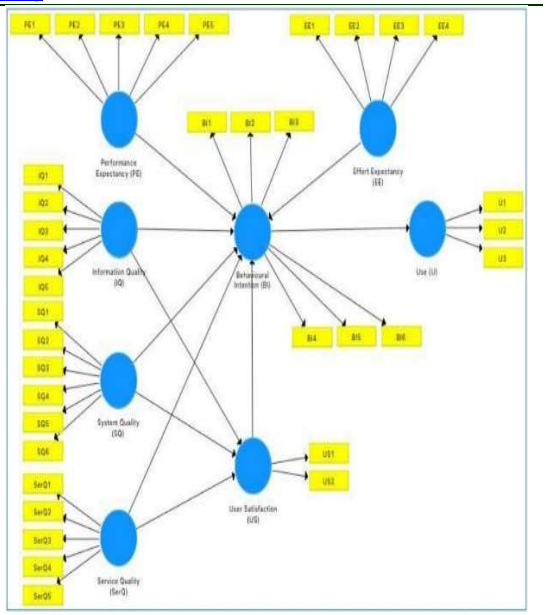

Figure 1: Research Model

3.1 Validity Test

Validity test is done by looking at the AVE value, outerloading, and crossloading. The lower limit for AVE is 0.5 while the lower limit for outerloading and cross loading is 0.7

Table 2: Initial AVE

Variable	AVE
Behavioural Intention (BI)	0,531
Effort Expectancy (EE)	0,650
Information Quality (IQ)	0,603
Performance Expectancy (PE)	0,571
Service Quality (SerQ)	0,581
System Quality (SQ)	0,481
Use (U)	0,638
User Satisfaction (US)	0,841

Refer to Table 3, it was found that the AVE of all research variables was above 0.5. Then, after this, outer loading testing will be carried out to prove that all indicators used reflect the research variables. However, one of the indicators on variable system quality has an outer loading that is less than 0.7. Therefore, author exclude this indicator from the research model and rerun the outer loading process.

The result is that several indicators of variable system quality are removed from the research

model, namely BI6, IQ1, PE5, SerQ3, SQ4, SQ5, and SQ6.

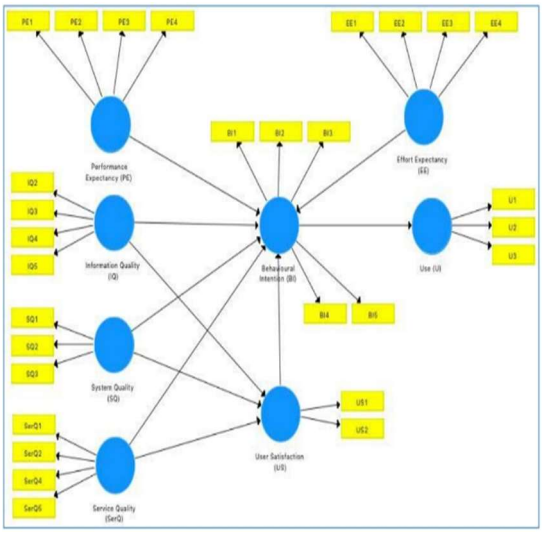

Figure 2: Adjusted Model

After removing those indicators, the AVE value of the variable behabioural intention, information quality, performance expectancy, and system quality increased. The AVE value as shown in Table 4.

Table 3: Adjusted AVE

Variable	AVE
Behavioural Intention (BI)	0,567
Effort Expectancy (EE)	0,650
Information Quality (IQ)	0,672
Performance Expectancy (PE)	0,630
Service Quality (SerQ)	0,644
System Quality (SQ)	0,639
Use (U)	0,639
User Satisfaction (US)	0,841

The next validity test is cross loading, in which this test is carried out to ensure that the indicators used actually reflect one variable. The next validity test is cross loading, where this test is carried out to ensure that the indicators used actually reflect one variable with a minimum value of 0.7.

Table 4: Cross loading

	BI	EE	IQ	PE	Ser Q	SQ	U	US
BI1	0,779	0,534	0,487	0,478	0,443	0,485	0,346	0,438
BI2	0,760	0,544	0,466	0,544	0,431	0,479	0,581	0,473
BI3	0,734	0,448	0,330	0,378	0,332	0,335	0,466	0,291
BI4	0,729	0,361	0,355	0,392	0,420	0,373	0,533	0,343
BI5	0,764	0,476	0,420	0,435	0,451	0,432	0,542	0,476
EE 1	0,485	0,761	0,426	0,436	0,422	0,560	0,469	0,409
EE 2	0,432	0,778	0,494	0,443	0,440	0,508	0,410	0,482
EE 3	0,547	0,830	0,533	0,567	0,499	0,475	0,532	0,577
EE 4	0,562	0,853	0,527	0,581	0,502	0,492	0,526	0,602
IQ2	0,347	0,396	0,762	0,486	0,517	0,404	0,571	0,483
IQ3	0,415	0,487	0,865	0,571	0,602	0,535	0,404	0,629
IQ4	0,530	0,542	0,835	0,640	0,653	0,536	0,455	0,594
IQ5	0,496	0,567	0,814	0,633	0,636	0,594	0,470	0,645
PE 1	0,464	0,517	0,574	0,790	0,601	0,414	0,468	0,548
PE 2	0,535	0,595	0,649	0,865	0,612	0,521	0,509	0,627
PE 3	0,453	0,467	0,520	0,803	0,487	0,420	0,428	0,534
PE 4	0,437	0,421	0,524	0,710	0,573	0,418	0,370	0,501
Ser Q1	0,384	0,378	0,579	0,532	0,770	0,392	0,362	0,543
Ser Q2	0,465	0,504	0,591	0,569	0,763	0,505	0,350	0,574
Ser Q4	0,440	0,500	0,580	0,614	0,832	0,474	0,403	0,616
Ser Q5	0,484	0,471	0,622	0,583	0,842	0,468	0,417	0,666
SQ 1	0,466	0,551	0,465	0,386	0,389	0,779	0,484	0,475
SQ 2	0,499	0,543	0,534	0,512	0,503	0,820	0,399	0,555
SQ 3	0,382	0,402	0,532	0,443	0,483	0,800	0,293	0,513
U1	0,572	0,442	0,415	0,447	0,356	0,391	0,806	0,430

	BI	EE	IQ	PE	SerQ	SQ	U	US
U2	0,602	0,531	0,451	0,448	0,383	0,395	0,827	0,492
U3	0,547	0,476	0,368	0,454	0,412	0,392	0,763	0,433
US1	0,499	0,610	0,655	0,618	0,662	0,595	0,516	0,915
US2	0,498	0,578	0,672	0,663	0,713	0,588	0,523	0,919

All indicators have the highest scores for the variables they reflect. Thus, testing will continue to the next stage, namely the reliability test.

3.2 Reliability Test

Reliability test is done by looking at Cronbach's Alpha. Cronbach's Alpha to measure absolute raw loading. In this model, all variables have a Cronbach's alpha greater than 0.7 as shown in Table 6.

Table 5: Cronbach's Alpha

Variable	Cronbach's Alpha
BI	0,810
EE	0,821
IQ	0,838
PE	0,802
SQ	0,815
SerQ	0,719
U	0,716
US	0,811

3.3 Coefficeients of Determination Test

Coefficeients of Determination test is done by looking at R-Square value. R-square is used to measure how well the model used in research. From the existing R-square results, it is found that the model is strong for predicting User Satisfaction (US) and moderate in predicting Behavioral Intention (BI) and Use (U).

The model is strong if the R-square is more than 0.67. moderate model if R-square is 0.33 and weak if R-square is 0.19. The R-Square value listed in Table 7.

Table 6: R-Square

Variable	R Square
BI	0,495
U	0,516
US	0,658

From the R-square, it can be seen that the research model is able to predict Behavioral Intention (BI) at 49.5% and Use (U) at 51.6%. However, the research model strongly predicts User Satisfaction (US) at 65.8%.

3.4 Predictive Relevance Test

The value of Q^2 is used to test whether the observed values have been reconstructed properly so that the model has predictive relevance. If Q^2 is greater than 0, then the model has predictive relevance; but if Q^2 is less than 0, then the model doesn't have predictive relevance.

Table 7: Q^2

Variable	Q^2
BI	0,266
U	0,540
US	0,325

From table 6, it can be seen that the observed values have predictive relevance, because all Q^2 value is greater than 0.

3.5 Path Coefficient

The path coefficient is used to quantify the relationship between latent variables in the model. with the path coefficient, the relationship between variables can be written into a mathematical equation as follows:

$$US = 0{,}261\,IQ + 0{,}236\,SQ + 0{,}422\,SerQ + 0{,}19$$

$$BI = 0{,}022\,IQ + 0{,}184\,SQ + 0{,}124\,SerQ + 0{,}214\,PE + 0{,}325\,EE - 0{,}044\,US + 0{,}498$$

$$U = 0{,}719\,BI + 0{,}035$$

3.6 Hypothesis Test

The hypothesis is tested by looking at the significance value (p-value) and t-value (T-

statistics). p-value must be less than 0.05 and T-statistics must be greater than 1.97 so that the previously made hypothesis can be accepted.

Table 8: T-Statistics and p-values

	T-Statistics	p-values
BI -> U	20,369	0,000
EE -> BI	4,103	0,000
IQ -> BI	0,232	0,817
IQ -> US	4,111	0,000
PE -> BI	2,411	0,016
SQ -> BI	2,535	0,012
SQ -> US	3,788	0,000
erQ -> BI	1,489	0,137
SerQ -> US	6,470	0,000
US -> BI	0,557	0,578

Based on the p-value and T-Statistics in Table 8, there are variables that have no influence on other variables, namely Information Quality (IQ) on Behavioral Intention (BI), Service Quality (SerQ) on Behavioral Intenton (BI), and User Satisfaction (US) on Behavioral Intention (BI).

Table 9: Hypothesis test results

No	Hypothesis	Result
1	H1: Information Quality (IQ) influences on User Satisfaction (US)	Accepted
2	H2: System Quality (SQ) influences on User Satisfaction (US)	Accepted
3	H3: Service Quality (SerQ) influences on User Satisfaction (US)	Accepted
4	H4: Information Quality (IQ) influences on Behavioral Intention (BI)	Rejected
5	H5: System Quality (SQ) influences on Behavioral Intention (BI)	Accepted
6	H6: Service Quality (SerQ) influences on Behavioral Intention (BI)	Rejected
7	H7: Performance Expectancy (PE) influences on Behavioral Intention (BI)	Accepted
8	H8: Effort Expectancy (EE) influences on Behavioral Intention (BI)	Accepted
9	H9: User Satisfaction (US) influences on Behavioral Intention (BI)	Rejected
10	H10: Behavioral Intention (BI) influences on Use (U)	Accepted

3.7 Discussion

From the initial 36 indicators used in this study, in the final model only 29 indicators were used according to the validity test results.

From overall test results that have been done, a final model on Figure 7 can be used as a refferance to evaluate the usage level and user satisfaction of the IT Assistance application at PT. Z company.

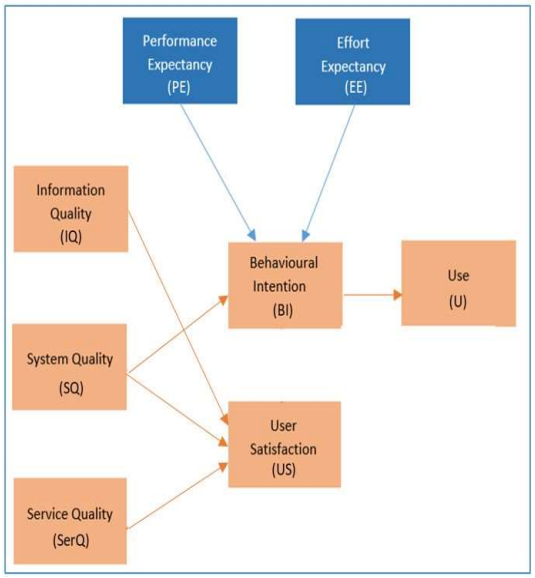

Figure 3: Final Model

H1 which states that IQ has an influence on US is accepted and H2 which states that SQ has an influence on US which means it strengthens previous research that has also found an effect of IQ on US [12], [13], [14], [15], [16], [17], [18].

However the acceptance of H3 from this study contradicts the results of previous studies which did not find a relationship between SQ and US [14], [16].

H4 states that there is an influence of IQ on BI. The rejection of H4 is not in accordance with several previous studies [12], [19], [14], [15], [16] which found the influence of IQ on BI.

In contrast to the H5, the acceptance of H5 which strengthens previous research where there is an influence between SQ on BI [12], [19], [14], [15], [16].

The rejection of H6 which proves there is no influence of SerQ on BI strengthens several previous studies which also did not find the influence of SerQ on BI [13], [14], [16], [17], [18].

H7 and H8 where there is an effect of PE and EE on BI in accordance with previous research [20], [21], [3], [22], [23], [24]. But also contrary to several other studies that did not find any effect of EE on BI [19], [25], [23], [26].

Furthermore, for H9 which in this study was rejected, it weakens the previous study which found the influence of US on BI [12], [14], [15].

The last one is H10 which states the influence of Behavioral Intention (BI) on Use (U). By accepting this hypothesis, it strengthens the previous study which also found the effect of BI on U [12], [23], [27], [24].

4. CONCLUSION

The factors used in this study are able to predict application usage level at 51.6%. From this study, it can be found that the three variables which describe the quality factor, such as Information Quality, System Quality, and Service Quality in Updated DeLone & McLean ISSM are strongly predict User Satisfaction but only System Quality has an ability to predict Behavioral Intention. Meanwhile, the two variables adopted from the UTAUT proposed by the authors to predict Behavioral Intention, namely Performance Expectancy and Effort Expectancy, both have the ability to predict Behavioral Intention. So, it can be concluded that the imperfections of ISSM in predicting Behavioral Intention can be compensated by combining it with the UTAUT model.

For further research, it is suggested to use this extended model in other cases of IT Assistance application or another application services.

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