Journal of Information Technology and Computer Science
Volume 6, Number 3, December 2021, pp. 261-272
Journal Homepage: www.jitecs.ub.ac.id

Evaluation Quality and Success Implementation of Nganjuk Smart City Mobile Application Using Technology Acceptance Model (TAM) and Delone Mclean Model Approach

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Received 10 May 2021; accepted 21 December 2021

Abstract. Nganjuk Smart City is an android-based mobile application that was created to help Nganjuk citizen obtain public information and services. This research uses Technology Acceptance Model (TAM) and Delone & Mclean in order to determine quality and success implementation condition of Nganjuk Smart City. Data retrieval was conducted by sharing online and offline questionnaires to 175 respondents and used purposive sampling techniques to determine research samples. The result of this research is quality condition implementation of Nganjuk Smart City based on Technology Acceptance Model (TAM) falls into high category and get 71.4% score, while successful condition implementation of Nganjuk Smart City based on Delone & McLean model falls into the high category and get 69.4% score. There are 4 variables and 18 indicators that get improvement recommendations because they get scores lower than the total average scores.

Keyword: Nganjuk Smart City, evaluation, Technology Acceptance Model, DeLone McLean Model

1. Introduction

In this digital era, it cannot be denied that all human activities are inseparable from the use of technology. In Indonesia, the number of internet users reached 175.4 million out of 272.1 million people in Indonesia. Meanwhile, the use of mobile phones connected to the internet is 171 million, which is about 98 percent of the total internet users, using mobile phones to connect to the internet [1]. To respond the trend of using mobile phone technology, the government is flocking to make a technological innovation, one of these technological innovations is Smart City. Ministry of Communication and Informatics (Kementerian Komunikasi dan Informatika), Ministry of Home Affairs (Kementerian Dalam Negeri), Ministry of PUPR, Bappenas, and Presidential Staff Office (Kantor Staf Kepresidenan), forming a program called "Gerakan 100 Smart City", this program aims to create improved public services by maximizing the application of technology [2]. One of the districts that implements Smart City program is Nganjuk Regency Government, in East Java. Nganjuk Smart City is an android-based mobile application that has variety service menus, namely:

Health Services, Tourism, Wadul Mas Novi, Education, E-Government, Job Vacancies, Hoax Issue Reports, Regional Events, Public Services, DPRD, Smart Village, Licensing and the latest news about the Nganjuk Regency Government [3].

The results of an interview with the Head of Development, Data Management and Application Section of the Nganjuk Regency Communication and Information Office (Dinas Komunikasi dan Informatika) as the manager of Nganjuk Smart City on November 02, 2020, showed that the number of Nganjuk Smart City installers until November 2020 reached about five thousand more since its initial launch in December 2019. However, there are still many problems in this application, the main problem in Nganjuk Smart City is the introduction of applications to Nganjuk residents which is still felt less. Socialization of Nganjuk Smart City has been conducted at the sub-district level and then penetrated to the village level, but after on the monitor, the level use of Nganjuk Smart City by Nganjuk residents is still relatively low. In addition, based reviews on Google Play Store, there are still many problems that users have complained, among others is, failure to log in public services, difficulty when registering, difficulty reading information files because size of information file is too large and application responds very slowly. There are some job vacancies information, licensing, and the latest news that are considered less updated. There are some features that cannot be used such as SIUP (Trade Business License) search feature, SIMPKB (Professional and Sustainable Development Information System) feature, and video or photo upload feature in Wadul Mas Novi menu.

Based on the problem, low usage rate indicates low acceptance from users of Nganjuk Smart City, in addition to the constraints that users complain when Nganjuk Smart City has been implemented, shows that implementation of Nganjuk Smart City has not fully achieved success. Therefore, evaluation are needed to know clearer and more detailed condition of each factor that affects quality and success implementation of Nganjuk Smart City mobile application. To evaluate quality implementation of Nganjuk Smart City used Technology Acceptance Model (TAM), while to evaluate success implementation of Nganjuk Smart City used Delone Mclean model 2003.

This research has a purpose to describe quality condition implementation of Nganjuk Smart City based on the results of analysis on Technology Acceptance Model variables, namely, perceived usefulness, perceived ease of use, attitude toward using, behavioral intention to use, and actual system usage. As well as describing success condition implementation of Nganjuk Smart City based on the results of analysis on Delone Mclean model variables, namely, system quality, information quality, service quality, use, user satisfaction, and net benefit. In addition, improvement recommendations are given, so that the quality and success condition implementation of Nganjuk Smart City mobile application can be improved.

2. Basic Theory

Technology Acceptance Model (TAM) is a model that has uses to conduct estimates and analysis on components that have an influence on user's acceptance of application or information technology based on influence of perceived ease of use and perceived usefulness factors [4]. Technology Acceptance Model (TAM) is an adopted model from the previous model that is Theory of Reasoned Action (TRA). There are 5 main constructs or variables in the TAM model namely, perceived usefulness, perceived ease of use, attitude toward using, behavioral intention to use, and actual system usage [4].

In 1992, a theory was developed, that was used to analyze success of an information system, William H.DeLone and Ephraim R.McLean were experts who make this

theory, so the theory was named DeLone and McLean Information System Success Theory [5]. This theory have 6 variables to measure success of information technology or information systems, namely, system quality, information quality, user satisfaction, use, individual impact, and oraganizational impact. However, in 2003, a theory was developed which was the result of an update DeLone McLean's theory in 1992. The theory was also developed by William H.DeLone and Ephraim R.McLean, and named "DeLone and McLean information system success update model (2003)". There are several things updated, among others are: the addition of service quality variables to complement other quality variables. The addition of intention to use variables used as an alternative to use variables, and the last is existence of a new variable, that is net benefit variable which is a merger of individual impact and organizational impact variables [5].

3. Methodology

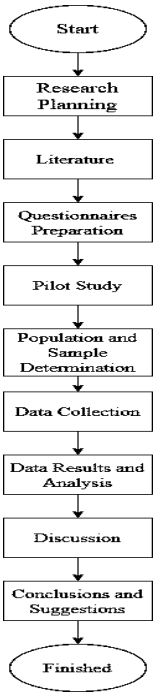

Figure 1. Methodology

The steps or systematic flows which used in this research are shown in Figure 1. First of all, the authors make a plan about research place and problem case study. The next stage is study literature, which is to find references related to the author's research, consisting of previous research and theoretical basis.

The next step is questionnaires preparation, this step is related to determining variables to be analyzed, then arrange questionnaire according to variables in model, these variables will be spelled out again into several indicators. There are 35 indicators consisting of 18 indicators from the TAM model and 17 indicators from DeLone McLean model. The number of statements for the initial questionnaires design consists of 38 statements with 35 indicators. Before the questionnaire are distributed to respondents, the questionnaire that has been designed will be tested for validity by three expert judgments, which are two lecturers and one Indonesian language teacher. The results show that 35 statements have valid results and 3 statements have invalid results, so it is necessary to correct 3 statements that have invalid results according to expert

suggestions.

The next step is to detect ambiguities and errors from questionnaires that have been designed using validity and reliability tests, that are part of pilot study. The pilot study involved 30 respondents as system users who did not include samples. All of the 38 tested statements items are found to be valid. This is because the score obtained from 38 statements have r count more than r table. The pilot study involved 30 respondents, so the value of r table in this study is 0.361. The next test is reliability test, the score of Cronbach's Alpha obtained from this reliability test is 0.997, so that the instrument can be set as a reliable instrument and fall into the very reliable category [6]. From the value obtained in validity and reliability test, 38 statements are stated to be valid and reliabel statements. However, in this study, if in one indicator has two statements, then selected one statement that has highest r count score. So, the final number of statements are 35 statements.

The next step is to determine the population and sample. Users of Nganjuk Smart City mobile application as a whole are the population defined in this study. While, purposive sampling technique is a sampling technique used in this study, this technique is used to determine research samples based on certain criteria so that the data obtained is more representative [7]. The sample criteria used are Nganjuk Smart City users who are Nganjuk residents or residents who live in Nganjuk Regency. Since the population number in this study cannot be defined definitively, the number of samples is determined using theory 5 multiplied by number of indicators is the minimum number of samples used in the study, and the number of appropriate samples is in the range of 100-200 samples [6]. Therefore, this study used a total sampel of 5 multiplied by 35 research indicators, so that 175 samples were obtained.

The next step is process of collecting research data by distributing questionnaires to research respondents. The questionnaire containing statements and likert scale. The questionnaire is distributed through social media or online media in the form of google form and through offline media.

The next step is results and data analysis, it is related to analysis of collected data by conducting a basic assumption test, then proceed to descriptive statistical analysis. Normality, linearity, and homogeneity tests are tests used in basic assumption tests. Measures of data centering and dispersion are part of descriptive statistical analysis. Mean, mode, and median are three types measures of data centering [7]. While standard deviation and variance are types measures of data dipersion.

The next step is discussion, related to give improvement recommendations. Recommendations are given on variables and indicators that get a lower average score than the total average score. The latter are conclusions and suggestions, conclusions help answer research questions, while suggestions are intended for next researchers.

4. Results and Data Analysis

4.1. Basic Assumption Test

Normality test, linearity test, and homogeneity test are tests used on basic assumption tests. Normality test is a useful test to ensures the data that has been collected is data with normal distribution. Normality test results showed that 11 models were normally distributed and 7 models were abnormally distributed.

Linearity test is a useful test to detect the existence of linear relationships of two variables significantly. The results of the linearity test showed that 15 models had linear

relationships and 3 models had no linear relationships.

To detect whether the data obtained is sourced from a population with homogeneous variants or not, a homogeneity test is used. Homogeneity test results showed that 6 models are homogeneous, while 13 models are not homogeneous.

4.2. Descriptive Statistic Analysis

Measures of data centering and dispersion that are part of descriptive statistical analysis. Descriptive statistical analysis was used for data processing in this research.

Table 1. Result of Descriptive Statistical Perceived Usefulness

Indicators	Standard Deviation	Variance	Mean	
			Scores	%
Work more Quick	0,829	0,688	3,53	70,5%
Increase productivity	0,796	0,634	3,64	72,8%
Effectiveness	0,793	0,628	3,55	71%
Make job Easier	0,791	0,626	3,57	71,4%
Usefull	0,854	0,729	3,67	73,4%
Total Mean			3,59	71,8%

Table 1 presents the results of descriptive statistical analysis of perceived usefulness variable and indicators. Perceived usefulness variable gets mean of 71.8% and reached a high category. Indicators that get an average scores below variable scores are indicators work more quick, effectiveness, and make job easier.

Table 2. Result of Descriptive Statistical Perceived Ease of Use

Indicators	Standard Deviation	Variance	Mean	
			Scores	%
Easy become Skillfull	0,984	0,969	3,70	74,1%
Controllable	0,951	0,904	3,72	74,4%
Clear and Understandable	1.021	1,042	3,55	71,1%
Flexible	1,041	1,084	3,30	65,9%
Easy to use	1,066	1,136	3,50	69,9%
Total Mean			3,55	71,1%

Table 2 presents the results of descriptive statistical analysis of perceived ease of use variable and indicators. Perceived ease of use variable gets mean of 71.1% and reached highly categorized. Indicators that get an average scores below variable scores are flexible and easy to use indicators.

Table 3. Result of Descriptive Statistical Attitude Toward Using

Indicators	Standard Deviation	Variance	Mean	
			Scores	%
Acceptance	0,862	0,743	3,55	71%
Affective	0,897	0,805	3,80	76%
Cognitive	0,791	0,626	4,03	80,6%
Total Mean			3,79	75,8%

Table 3 presents the results of descriptive statistical analysis of attitude towards using variable and indicators. Attitude towards using variable gets mean of 75.8% and

reached highly categorized. Indicator that gets an average scores below variable scores is acceptance indicator.

Table 4. Result of Descriptive Statistical Behavioral Intention to Use

Indicators	Standard Deviation	Variance	Mean	
			Scores	%
Motivation of system usage	0.817	0,667	3,71	74,2%
Motivate other users	0,897	0,805	3,90	77,9%
Total Mean			3,80	76,1%

Table 4 presents the results of descriptive statistical analysis of behavioral intention to use variable and indicators. Behavioral intention to use variable gets mean of 76.1% and reached highly categorized. Indicator that gets an average scores below variable scores is motivation of system usage indicator.

Table 5. Result of Descriptive Statistical Actual System Usage

Indicators	Standard Deviation	Variance	Mean	
			Scores	%
Actual usage	0,916	0,839	3,20	64%
Time to use	1,019	1,039	3,04	60,8%
Total Mean			3,12	62,4%

Table 5 presents the results of descriptive statistical analysis of actual system usage variable and indicators. Actual system usage variable gets mean of 62.4% and reached quite high categorized. Indicator that gets an average scores below variable scores is time to use indicator.

Table 6. Result of Descriptive Statistical System Quality

Indicators	Standard Deviation	Variance	Mean	
			Scores	%
System Integration	0,757	0,573	3,71	74,3%
Error Recovery	0,981	0,963	3,16	63,2%
Time to Respon	0,999	0,998	3,35	67%
Reliability	1,020	1,041	3,21	64,2%
Usefull	0,854	0,729	3,67	73,4%
Total Mean			3,36	67,2%

Table 6 presents the results of descriptive statistical analysis of system quality variable and indicators. System quality variable gets mean of 67.2% and reached highly categorized. Indicators that get an average scores below variable scores are indicators of error recovery, time to response, and reliability.

Table 7. Result of Descriptive Statistical Information Quality

Indicators	Standard Deviation	Variance	Mean	
			Scores	%
Currency	0,885	0,784	3,67	73,5%

Relevance	0,793	0,629	3,54	70,9%
Accuracy	0,820	0,672	3,75	75%
Completeness	0,841	0,707	3,70	73,9%
Format	1,001	1,001	3,59	71,9%
Total Mean			3,65	73%

Table 7 presents the results of descriptive statistic analysis of information quality variable and indicators. Information quality variable gets mean of 73% and reached highly categorized. Indicators that get an average scores below variable scores are relevance and format indicators.

Table 8. Result of Descriptive Statistical Service Quality

Indicators	**Standard Deviation**	**Variance**	**Mean**	
			Scores	**%**
Assurance	0,963	0,927	3,31	66,2%
Empathy	0,818	0,669	3,75	75,1%
Responsiveness	0,967	0,936	3,63	72,6%
Tangibles	0,939	0,882	3,26	65,1%
Total Mean			3,49	69,7%

Table 8 presents the results of descriptive statistical analysis of service quality variable and indicators. Service quality variable gets mean of 69.7% and reached highly categorized. Indicators that get an average scores below variable scores are assurance and tangibles indicators.

Table 9. Result of Descriptive Statistical Use

Indicators	**Standard Deviation**	**Variance**	**Mean**	
			Scores	**%**
Daily used time	1,215	1,475	3,04	60,8%
Total Mean			3,04	60,8%

Table 9 presents the results of descriptive statistical analysis of use variable and indicator. Use variable gets mean of 60.8% and reached quite high categorized.

Table 10. Result of Descriptive Statistical User Satisfaction

Indicators	**Standard Deviation**	**Variance**	**Mean**	
			Scores	**%**
Repeat visit	0,955	0,913	3,57	71,4%
Total Mean			3,57	71,4%

Table 10 presents the results of descriptive statistical analysis of user satisfaction variable and indicators. User satisfaction variable gets mean of 71.4% and reached high categorized.

Table 11. Result of Descriptive Statistical Net Benefit

Indicators	**Standard Deviation**	**Variance**	**Mean**	
			Scores	**%**
Learning	0,809	0,655	3,87	77,4%
Cost saving	0,753	0,567	3,63	72,7%
Time saving	0,769	0,591	3,67	73,4%

Total Mean	3,72	74,5%

Table 11 presents the results of descriptive statistical analysis of net benefit variable and indicators. Net benefit variable gets mean of 74.5% and reached highly categorized. Indicators that get an average scores below variable scores are cost saving and time saving indicators.

4.3. Comparison of Variable Analysis

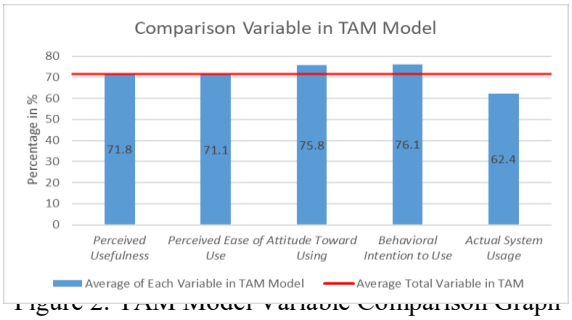

Figure 2. TAM Model Variable Comparison Graph

Figure 2 shows the average total variable in TAM model is 71.4% and falls into high category. For variables with a scores lower than the average of Technology Acceptance Model are perceived ease of use and actual system usage.

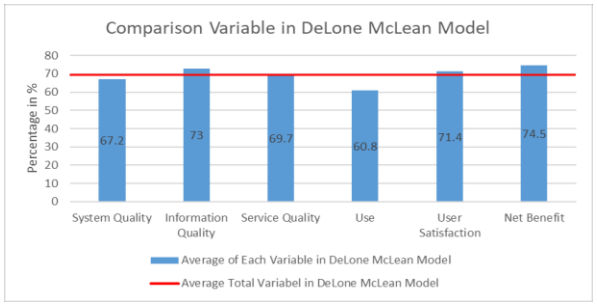

Figure 3 DeLone McLean Model Variable Comparison

Figure 3 shows the average total variable on the DeLone McLean model is 69.4% and falls into the high category. For variables with a scores lower than the average model DeLone McLean are system quality and use.

5. Discussion

Perceived usefulness variable is useful to take measurements related to the extent of usefulness provided by Nganjuk Smart City. Work more quick indicator regarding the user only takes a short time to complete the job. Delay is a condition where digital services are unable to match user speed [8]. So to improve the work more quick indicator can be done by increasing the system response time, so that users can get their work done quickly without experiencing delays. Effectiveness indicator related to technology can help people in achieving their goals. The application of ineffective information systems does not mean that all functions in the information system do not work properly and need to be disposed of, ineffectiveness can be overcome by removing unwanted functions and replacing them with new [9]. So, to improve effectiveness can

be done by updating and improving system functionality. Make job easier indicator related to using technology make user can get the job done easily. Ease of use can be obtained by improving the characteristics of ease of use, namely, flexibility, ease of understanding and optimization facilities [10]. So as to improve make job easier indicator can be done by improving the characteristics of ease of use that is, flexibility, ease to understand and ease of optimization.

Perceived ease of use variable is useful in assessing how easily the Nganjuk Smart City is used. By conducting trials and structured training, users will be easier to use information systems [11]. So as to improve ease of use indicator can be done by held training or socialization in a structured manner related to the procedure of application use. Flexible indicator is related to technology that can be used without limitations. Therefore, to increase flexibility can be done by providing Nganjuk Smart City application on other versions, such as iOS and desktop versions. In addition, it can be done by improving the Nganjuk Smart City application to match the portability characteristics of ISO/IEC 25010:2011 models, namely adaptability, installability, and replaceability.

Attitude toward using variable is useful for measuring the attitude felt by the user when using Nganjuk Smart City. Acceptance indicator is related to user attitude both pros and cons with the existence of a system. Perception of ease of use significantly influenced student acceptance behavior in the learning system [12]. So, to improve acceptance indicator can be done by improving ease of use of Nganjuk Smart City, this can be done by identifying problems that cause users feel difficulties or held evaluation of usability.

Behavioral intention to use variable is useful to measure the usage intention of Nganjuk Smart City. Motivation of system usage indicator is related to the turmoil that arises from the user to use the system. Although individuals feel that they are spending more effort using the system, they tend to pay more attention to the uses and benefits of using the system [13]. So as to increase the value of motivation of system usage indicator can be done by providing a more understanding of the usefulness and benefits obtained when using Nganjuk Smart City.

Actual system usage variable is used to measure actual usage level of Nganjuk Smart City. Low system usage can be affected by factors such as system usage experience, computer skills, and age [14]. So, to increase the real use of the application can be done by improving the user experience by improving the ease of use of the application and adding functionality to increase productivity.

System quality variables are used to assess the performance of Nganjuk Smart City quality. To improve the quality of the system can be done by conducting periodic maintenance. Maintenance is carried out with the aim of eliminating system failures, adding requirements to the system and adding new features to the system [15]. Error recovery indicator is related to the system that automatically provides repairs when there is a failure on the system. The improvement recommendations provided are to add functional or features to the system in order to handle errors and provide help and documentation. Time to response indicator is related to system response time to the request. The improvement recommendation is to increase the response time speed to 0.1 seconds to 1 second. Where 0.1 seconds will make the user feel the app responds instantly, 1 second makes the user feel uninterrupted when using the system [16]. Reliability indicators are related to the system that avoids damage and errors. To improve reliability can be done by backing up the server, which is one of the disaster recovery strategies. Backup is the process of duplicating data into a separate media, the

main purpose of backup is the recovery of data damaged by disasters and human error [17].

Information quality variable is useful to assess the quality of output provided by Nganjuk Smart City. Relevance indicator is related to the information provided is information that suits needs of the users. To obtain relevant information can be done by sorting between inappropriate, contradictory and redundant information with important and accurate information. Format indicators are related to the form of information presentation. To improve the format can be done by conducting learning and guidance on human resources who have the task of presenting information [18].

Service quality variables are used to assess the level of service performance obtained by users. Assurance indicators that are related to service providers or information systems provide guarantees if occur an error. So as to increase the value on assurance indicator can be done by adding an online call center service and can be accessed through Nganjuk Smart City. Tangible indicator related to the services provided in the form of an interface view. The beautiful and friendly interface will give comfort to one's view [19]. So, to increase the value on the tangible indicator can be done by improving the interface design with more beautiful and friendly.

Use variable in this study was used to assess the daily use of Nganjuk Smart City application. Mobile banking users in Saudi Arabia tend to become regular users after feeling that mobile banking has a high level of usability, availability, reliability, adaptability, and response time [20]. So as to increase use indicator, Nganjuk Smart City manager can focus on improving system quality at the level of usability, availability, reliability, adaptability, and response time.

User satisfaction variable is useful for assessing responses users arising from the use of Nganjuk Smart City. There is a direct influence between perceptions regarding information quality and user satisfaction [21]. Therefore, the management can pay more attention to the quality of information to create user satisfaction.

Net benefit variable is used to assess the benefits obtained by users when using the Nganjuk Smart City. Cost saving indicator is related to the system that can reduce the cost of user expenses. The discrepancy in the cost of digital services occurs due to system failures that cause the system fail to access, fail to adapt, fail to navigate, experience delays and insecurity [8]. So as to increase the value of the cost saving indicator can be done by improving the quality of the system, so there is not occur a failure. The time saving indicator is related to the reduction of time required by the user. To save users time when using the app, it can be done by providing instant responses, and the flow and submission process can be further simplified to minimize time.

6. Conclusion

The results of descriptive statistical analysis of Technology Acceptance Model (TAM) showed that the average percentage of all variables in TAM obtained a score of 71.4%, this shows that the quality implementation of Nganjuk Smart City mobile application falls into high category. The results of descriptive statistical analysis on Delone and Mclean models show that the average percentage of total variables in Delone and Mclean models scored 69.4%, indicating that the successful implementation of the Nganjuk Smart City mobile application falls into the high category. Improvement recommendations are given on 4 variables and 18 indicators on

TAM and DeLone Mclean models. Recommendations for improvements provided are, improving system response time, improving system functionality that does not work properly, improving ease of use of Nganjuk Smart City, conducting structured training or socialization related to application usage procedures, providing Nganjuk Smart City applications on iOS and desktop versions, held evaluation usability, improving application display, conducting application usage campaigns through online and offline media, performing periodic maintenance, provide help and documentation features, perform server backups, update existing information and add new information that is useful for users, present information by paying attention to legibility, readability, and comprehension guidelines, adding call center or customer service, providing services that meet elements in utility and warranty, improving system quality and service quality, providing instant response to user requests when users apply for public services, and simplification of public service submission flow and process.

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