The Acceptance of Primary Health Centre Information System Among Health Staff: An extended TAM Model

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Abstract. Ngaglik I Public Health Center in Sleman is one of the health centers that have already applied SIMPUS (an application of management information system for public health center). The implementation of clinical information systems could potentially improve the performance of health care facilities, save operational costs, and increase patient satisfaction. In fact, the clinical information systems applied by public health center vary. One of them is SIMPUS. However until present, there have not been any assessments of the acceptance of the clinical information system, especially SIMPUS, at Ngaglik I Public Health Center. To describe the use of SIMPUS at Ngaglik I Public Health Center and evaluate user understanding in accepting SIMPUS application based on the Technology Acceptance Model (TAM). This was a quantitative study which used a survey method and a cross-sectional design. The research sample consisted of 50 respondents who were selected using a simple random sampling method. The data analysis technique was the SEM-PLS analysis with the TAM model and SmartPLS software. Statistically, the relationship between the Job Relevance and Perceived Ease of Use variables was weak (p-value = 0.818). There was a weak relationship between Output Quality and Perceived Ease of Use (p-value = 0.208). There was a strong relationship between Result Demonstrability and Perceived Ease of Use (0.000). There was a strong relationship between Result Demonstrability and Intention to Use (p-value = 0.011). There was a weak relationship between Screen Design and Intention to Use (p-value = 0.870). There was a weak relationship between Perceived Ease of Use and intention to use. Users’ job relevance to SIMPUS did not have any effect on perceived ease of use. Output quality did not have any effect on perceived ease of use. The screen design of SIMPUS display had no effect on intention to use. Intention to use did not affect system use. Facilitating condition did not have any effect on system use. System use was influenced by perceived ease of use and intention to use. Perceived ease of use and intention to use were influenced by result demonstrability.

Keywords: Acceptance, information system, public health center, TAM

1. Introduction

This study measured SIMPUS acceptance model at Ngaglik I Public Health Center. The researcher evaluated the acceptance using several variables, including Job Relevance, Output
Quality, Result Demonstrability, Screen Design, Perceived Ease of Use, Intention To Use, Facilitating Conditions, and System Use. SIMPUS acceptance was measured using the TAM model. This theory was originally developed by Davis [1] This conceptual concept will continue to be developed in line with the needs and findings of previous studies. The utilization of information systems in the clinical sector is very useful to improve service performances [2], accelerate performance, and support decision making [3] Primary health centers certainly require regional health records because this health center provides basic health services, one of which is related to coverage or needs for monitoring data [4]. Information technology really helps all aspects of activities. One of which is in the health sector, i.e. to create integration with the social security system, one of which is BPJS (Healthcare and Social Security Agency). Ngaglik I Health Center has applied SIMPUS since 2014, but until now, not all units at this health center have had good acceptance of SIMPUS. Several previous studies showed that the acceptance of an integrated clinical information system accelerates services and significantly supports policymakers in making decisions [5][6]. The TAM theory significantly explains that the key to the success of system implementation is human factors [7], but other studies explain that the key to success is due to the display of the information system and integrated system [8].

2. Application of Clinical Information System
Assessment of the benefits of information system implementation was first developed by McLean and Delon. This model, which comprises of six components, is the key concept that is important for measuring, analyzing, and reporting the success of IS since the development of the system, containing various features and quality of IS. Further, the theoretical framework was adopted [1] using the Macro, Meso, and Micro level analysis. The following figure is the evaluation model developed by Delon and McLean. In fact, several previous studies have focused on the application and evaluations of information systems. Several other studies have also developed similar terms [9], while other studies focused on the evaluation of end users [2] and studies which measured the effect of the application on electronic medical records [3], other researchers explained that the results of EMR data to be reviewed are 1) quality, i.e. the data contained in the records could provide useful and meaningful information; 2) complete, i.e. all items that must be made available are meaningful and able to provide information for other users; 3) by following what has been done, so the data could provide useful information when a user reads the data which have been recorded.

In the above theoretical framework, McLean and Delon revealed that MIS successfully brings positive effects on organizations, thus bringing effects on individuals as well. In order to ensure that management information systems have an effect on individuals, user satisfaction is also measured, so the achievement of both covers the achievement of system quality and information quantity [4]. The above theoretical framework shows that there are six key components, including system quality components and information quality of the system. Both system quality and information quality influence users and user satisfaction, so hopefully IS will bring a positive effect not only on individuals but also on organizations.

Further, the above theoretical framework was developed into three dimensions including the macro, meso, and micro dimensions [5]. The macro dimension consists of four main variables, namely a) the objectives of evaluating health standards used in the information system, b) the financing or incentives earned, c) bridging profit regulation, d) policies, the legal aspect used to implement the system. The meso dimension is used to evaluate the extent to which the capacity is adopted. This dimension consists of three main components, namely a) individuals or groups; b) organization, i.e. how it is implemented in accordance with the organization's strategy, culture, and socio-economy, and c) the implementation has an effect on every level. In addition, the micro dimension is used to evaluate the quality of both information and system being used. The micro dimension consists of three main components, namely: a) the quality of the clinical information system to measure the accuracy of clinical data, the completeness of clinical data, and the availability of clinical information, display, system security and responses which support system, b) the quality
of users’ intensity in using the information system, ease of system, user satisfaction with the ease of
information system, and user competence, c) benefits or net benefits obtained from service quality;
access, i.e. ease of access to services provided by service providers and productivity of users or
service providers to exchange patient medical records with coworkers to improve patient safety.

Technology Acceptance Model (TAM) theory was developed by Davis (1989). This theory
comprises of two main constructions, namely: a) Perceived usefulness is the level of belief that using
technology will improve performance. If someone believes that an information system is useful, s/he
will use it, and the opposite. Perceived usefulness can be defined as making work easier, useful,
productivity, effectiveness, and work performance [3]; and b). Perceived ease of use is one’s level of
confidence that using technology is easy. Davis (1989) provided some indicators for perceived ease
of use, including systems that are easy to learn, easy to use and easy to control, and the systems
make it easy for users to become skillful in using the system.

![Technology Acceptance Model (TAM)](image)

Figure 1. Theory Technology Acceptance Model (TAM)

3. Method
This was a quantitative research using a survey method and analytical correlational research
design. The sample consisted of 50 respondents who were selected by using a simple
random sampling method. The data analysis technique was the SEM-PLS analysis
technique with the TAM model and SmartPLS software. The objective of this study was to
measure SIMPUS acceptance by the health workers at Ngaglik I Health Center. From the
50 respondents, only 32 of them could be proceeded because the remaining 18 were neither
returned nor completed. The data processing was carried out in four stages. First, the
validity and reliability of the questionnaire results were tested, in addition to measuring the
characteristics of the respondents to be presented in tabulations (Table 1). Second, the
measured variables were then entered into the SmartPLS software to analyze the TAM
model. The data analysis was carried out in two stages: analysis using model testing to
calculate its validity and reliability and analysis using structural measurement to test the
hypothesis/relationship between variables. Third, testing the measurement between
variables. Fourth, structural measurement between variables.
4. Results

4.1 Characteristics of Respondents

Table 1 shows the characteristics of respondents.

| Item                      | Frec | (%)  |
|---------------------------|------|------|
| Sex                       |      |      |
| Male                      | 5    | 15.63|
| Female                    | 27   | 84.38|
| Education                 |      |      |
| Senior high school        | 5    | 15.63|
| Vocational school         | 5    | 15.63|
| Undergraduate             | 22   | 68.75|
| Job description           |      |      |
| Administration staffs     | 5    | 15.63|
| Doctors                   | 3    | 9.38 |
| Pharmacist                | 1    | 3.13 |
| Laboratory technician     | 1    | 3.13 |
| Medical record technicians| 2    | 6.25 |
| Midwives                  | 8    | 25.00|
| Nurses                    | 6    | 18.75|
| Nutritionist              | 1    | 3.13 |
| Admission staffs          | 4    | 13.51|

4.2 Analysis of outer model

The questionnaires were analyzed using the SmartPLS 3.2.3. The data analysis was carried out in two stages: first, analysis using model testing to calculate its validity and reliability, second, analysis using structural measurement to test the hypothesis/relationship between variables. The questionnaires adopted from Delon and McLean's theoretical framework were distributed to the health worker respondents who used electronic medical records to measure their perceptions (the questionnaires are shown in appendix). The questionnaires were filled out by 32 health worker respondents who were willing, including doctors, nurses, medical record technicians, laboratory technician, radiology technicians, and pharmacists. The results of the validity and reliability assay are shown in Table 2.

Table 2 showed that the outer model values were all valid based on the loading factors. The reliability was also good. Based on these results, it can be concluded that the questionnaires were valid and reliable to make a model. The following stage was to model the perceived effect of information system implementation and information quality on customer satisfaction at Ngaglik I Health Center. The modeling aimed to support qualitative data to determine user understanding in accepting the SIMPUS application based on the Technology Acceptance Model (TAM).
Table 2. Item Loading, Composite Reliability, Cronbach Alpha and AVE

| Factor | Item | Loading | Composite reliability | Cronbach Alpha | AVE  |
|--------|------|---------|-----------------------|----------------|------|
| FC     | FC1  | 0.963   |                       |                |      |
|        | FC2  | 0.944   |                       |                |      |
|        | FC3  | 0.620   |                       |                |      |
| ITU    | ITU1 | 0.927   |                       | 0.966          | 0.947|
|        | ITU2 | 0.934   |                       | 0.947          | 0.904|
|        | ITU3 | 0.990   |                       |                |      |
| JR     | JR1  | 0.803   |                       | 0.873          | 0.736|
|        | JR2  | 0.952   |                       | 0.736          | 0.776|
| OQ     | OQ1  | 0.952   |                       | 0.945          | 0.828|
|        | OQ2  |         |                       | 0.828          | 0.895|
| PEOE   | PEOE 1  | 0.894 |                       | 0.884          | 0.737|
|        | PEOE 2 | 0.885 |                       |                | 0.792|
| RD     | RD1  | 0.914   |                       | 0.920          | 0.828|
|        | RD2  | 0.933   |                       | 0.828          | 0.853|
| SD     | SD1  | 0.945   |                       | 0.893          | 0.773|
|        | SD2  | 0.849   |                       | 0.773          | 0.807|
| SU     | SU1  | 0.877   |                       | 0.981          | 0.964|
|        | SU2  | 0.916   |                       | 0.984          | 0.965|

JR = Job Relevance  PEOE = Perceived Ease of Use
OQ = Output Quality  ITU = Intention to Use
RD = Result Demonstrability  SU = System Use
SD = Screen Design  FC = Facilitating Condition

4.3 Analysis results of the effects between variables
To test the effect of variables was based on the results of calculations through the bootstrapping method on the SmartPLS 3.2.3. The data were analyzed with a significance level (α) = 5% using a two-tailed test with degrees of freedom (df) = (n-k) = (100-5) = 95. The analysis results are as follows.

This study had eight hypotheses (Table 3), namely:
1) There is a significant relationship between Job Relevance (JR) and Perceived Ease of Use (PEOU).
2) There is a significant relationship between Output Quality (OQ) and Perceived Ease of Use (PEOU).
3) There is a significant relationship between Result Demonstrability (RD) and Perceived Ease of Use (PEOU).
4) There is a significant relationship between Result Demonstrability (RD) and Intention to Use (ITU).
5) There is a significant relationship between Screen Design (SD) and Intention to Use (ITU).
6) There is a significant relationship between Perceived Ease of Use (PEOU) and System Use (SU).
7) There is a significant relationship between Intention to Use (ITU) and System Use (SU).
8) There is a significant relationship between Facilitating Condition (FC) and System Use (SU).
Figure 2. Results of Data Influence between Variables

**Table 3. Test results for the structure model between variables**

| Hypothesis | Path | Standard Deviation (STDEV) | Path Coefficient | T Statistic (|O/STDEV|) | P Value | R square |
|------------|------|---------------------------|------------------|----------------------|---------|----------|
| H1         | JR → PEOE | 0.189                    | -0.038           | 0.230                | 0.818   | Rejected |
| H2         | OQ → PEOE | 0.164                    | 0.220            | 1.260                | 0.208   | Rejected |
| H3         | RD → PEOE | 0.214                    | 0.725            | 3.504                | 0.000   | Accepted |
| H4         | RD → ITU  | 0.399                    | 0.399            | 0.307                | 0.011   | Accepted |
| H5         | SD → ITU  | 0.144                    | 0.015            | 0.163                | 0.870   | Rejected |
| H6         | PEOE → SU | 0.124                    | -0.073           | 0.461                | 0.645   | Rejected |
| H7         | ITU → SU  | 0.212                    | 0.391            | 0.641                | 0.063   | Rejected |
| H8         | FC → SU   | 0.229                    | 0.411            | 1.656                | 0.098   | Rejected |

The correlation coefficient for a valid hypothesis was the correlation between Result Demonstrability (RD) and Perceived Ease of Use (PEOU), i.e. 0.725, meaning that there was a very strong relationship between the two variables. The correlation coefficient between Facilitating Conditions (FC) and System Use (SU) was 0.411, meaning that there was a quite strong relationship between the two variables. On the other hand, the correlation coefficient between Job Relevance (JR) and Perceived Ease of Use (PEOU) was -0.038, meaning that there was a weak relationship between the two variables.
5. Discussion

Validity assay is carried out to test the accuracy of a measuring instrument towards any objectives to be achieved. A measurement result is said to be valid if it matches the objectives, and vice versa. The indicators for the level of validity generally use a rule of thumb to assess convergent validity and discriminant validity of measurement instruments. A convergent validity parameter is loading factor greater than 0.7 for confirmatory studies and loading factor ranging from 0.6 to 0.7 for exploratory studies. Another parameter is that the Average Variance Extracted (AVE) has to be greater than 0.7. Nevertheless, a loading factor of 0.5-0.6 is still sufficient for the early stage of measurement scale development research [4]. The results of the validity assay using the SmartPLS 3.2.3 software indicated that the measurement model met the aspects of both convergent validity and discriminant validity. This means that the measurement model was valid, evident from the correlation coefficient between variables and constructs (question items in the questionnaire) and the Average Variance Extracted (AVE) for each variable greater than 0.5.

In the derivative of the Job Relevance variable as shown in the figure 2, it can be seen that the correlation coefficient between Job Relevance and JR1 is 0.803 and JR2 is 0.952. This means that the respondents perceived that SIMPUS was used in accordance with the jobs, where staffs and technicians could easily fill in administrative data and/or clinical data into the system. This way, ease of use can improve service performance and employee performance. This is in line with a research conducted by [1] that using clinical information systems in primary health center helps speed up the registration process and makes it easier for administrative staffs to fill in data as well as exchange information within the units [6].

As seen in the figure 2, the Output Quality variable comprises of OQ1 and OQ2, and it can be seen that the correlation coefficient between OQ and OQ1 is 0.952 and OQ2 is 0.941. The respondents perceived that using SIMPUS could help them satisfactorily complete their works with a good quality. This is in line with a research conducted by [7] showing that the use of clinical information systems speeds up works, improves service quality, saves time, and speeds up services to users compared to paper-based services. In addition, the use of clinical information technology improves the speed and quality of health service provision, as well as lowers operational costs [8].

The derivatives of the Result Demonstrability variable are RD1 and RD2 and as seen in the figure 2, it can be seen that the correlation coefficient between RD with RD1 is 0.914 and with RD2 is 0.933. The respondents perceived that the results obtained by using SIMPUS were highly accurate and SIMPUS made it easy for them to exchange information with other users. This is in line with another research showing that adopting a clinical information system is very useful because it facilitates the exchange of information [9]. The Screen Design variable has two constructs namely SD1 and SD2. In the Perceived Ease of Use variable, there are PEOE1 and PEOE2. Based on the figure 2, it can be seen that the correlation coefficient between PEOE with PEOE1 is 0.894 and with PEOE2 is 0.885. The respondents perceived that using SIMPUS made it easy for them to obtain data due to integrated database within their service units. This is in line with a research conducted by [8] explaining that the data inputted into the clinical information system greatly enhances accuracy, facilitates the process of reading data related to medical history including treatment history. 6. In the Intention to Use variable, there are ITU1, ITU2, and ITU3. Based on the figure 2, it can be seen that the correlation coefficient between ITU with ITU1 is 0.927, with ITU2 is 0.934 and with ITU3 is 0.990. The respondents perceived that since SIMPUS application started to be used, the health workers were very enthusiastic about using it and planned to use it regularly. The results of some previous studies showed that human resources, who regularly use clinical information systems to work on their jobs, experience an increased work productivity [9]. Besides, the use of the system could accelerate work completion, facilitate each job, help minimize cost and save time [10]. 7. In the Facilitating Condition variable, there are FC1, FC2, and FC3. Based on the figure 2, it can be seen that the correlation coefficient between FC with FC1 is 0.963, with FC2 is 0.944 and with FC3 is 0.001. The respondents perceived that using SIMPUS has made it easier for them to complete patient data and the systems were easy to use. Hopefully SIMPUS will improve not only the performance of
users in the registration unit, but also ease in information exchange, accuracy in data completion to allow for the data to be used as comprehensive information [9].

6. Conclusion
From the system using derivatives SU1 and SU2, it can be seen that the correlation coefficient between Su and SU1 is 0.981 and SU2 is 0.984. The respondents perceived that they consciously used SIMPUS to work on their daily works, thus improving user performance. A research by [10] showed that the effects of implementing clinical information systems for health care providers are: speed up work, allow the process of inputting data to be more effective and efficient, and help data processing and support decision making.

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