Analysis of user acceptance, service quality, and customer satisfaction of hospital management information system

P Y Lenny, S Kridanto
School of Electrical Engineering and Informatics, Institut Teknologi Bandung, Bandung, Indonesia
E-mail: lennypyulianti@gmail.com

Abstract. Nowadays, the utilization of Hospital Management Information System (SIMRS) was needed to increase the effectiveness and efficiencies of business in hospitals. Unfortunately, the implementation of SIMRS had been maximal because of the lack of user acceptance, system quality, and user satisfaction to the system. The purpose of this paper is to examine user acceptance, service quality, and user satisfaction of SIMRS through TAM, SERVQUAL, and EUCS approach as research model. Research data were obtained by using questionnaire given to 144 respondents as SIMRS’s users of a hospital and conducting interview with four informants. SEM using PLS will be used as the method of analysis data. The tools or software used to analyze data is SmartPLS 3.0. According to the assessment and test results, it can be concluded that eight hypotheses were accepted and two hypotheses were rejected.

Keyword: User Acceptance, Service Quality, Customer Satisfaction, Hospital Management Information System.

1. Introduction
Nowadays, the utilization of Information Technology (IT) is important and needed in business sector to increase the effectiveness and efficiencies of business [1]. Hospital is one of the institutions that have applied IT, which is ordinarily called Hospital Management Information System (SIMRS). SIMRS is one of software services in the world of health as a support for health services and performance of hospital management [2].

SIMRS has great influence to hospitals so that its implementation has to be conducted well. Unfortunately, today, the implementation of this information system in many hospitals in Indonesia is still not running well [2]. There are many problems occur, such as lack of integration of programs in IS as a whole, limited infrastructures for development hospital information systems, limited ability and willingness of human resources to manage and develop IS, lack of trust in decision-making based on data/information, and lack of IT investment in hospitals in development and maintenance of SIMRS (when compared to other sectors).

This problem can be caused by lack of user acceptance SIMRS, SIMRS quality, and user satisfaction to SIMRS. Therefore, this study aims to analyze these factors on SIMRS implementation in hospital. With this analysis, hopefully, hospitals are able to improve their IT in long term period.
2. Literature
2.1. Hospitals and SIMRS
Hospitals are health service institution for the communities with their own characteristics which must still be able to improve the service quality and be affordable by communities to materialize health as high as possible [3]. In hospital activities, each hospital is ordinarily required to record and report all activities in the form of SIMRS. SIMRS aims to improve efficiency, effectiveness, professionalism, performance, access and service of hospital [4].

2.2. TAM, SERVQUAL, and User Satisfaction
There are 3 main methods as foundation to construct model, i.e. Technology Acceptance Model (TAM), Service Quality (SERVQUAL), and user satisfaction with EUCS measure. TAM model refers to [5], SERVQUAL model refers to [6], and user satisfaction refers to [7, 8]. These methods were adopted and integrated to form a research model.

3. Methodology
3.1. Research Model
Research model formulation is shown in Figure 1.

The result of forming this research model was shown in Figure 2. Arrows that connect constructs (latent variables) showed hypotheses of causal relationships with the aim of arrows. The arrows between constructs and indicators (observed variables) showed measurement validity. In general, this model had seven variables (constructs), with two independent variables and five dependent variables. Those variables had 56 indicators based on previous relevant research and the needs or objectives of study as shown in Figure 2.

3.2. Population and Sample
The population of this study was all of departments in a hospital related to the use of SIMRS, consisting of 165 people. Sampling was conducted using proportionate stratified random sampling because the population under study was heterogeneous in the field of work. Therefore, the sample size in each group was taken proportionately to obtain a representative result. The details of sample number using Slovin formula and the hypotheses of this study were shown in Table 1 and Table 2.
Table 1. Detailed Number of Sample

| No   | Work Units                     | Total Population | Minimum Sample | Obtained Samples |
|------|--------------------------------|------------------|----------------|------------------|
| 1    | Back office                    | 41 people        | 29 people      | 41 people        |
| 2    | UGD medical record             | 10 people        | 7 people       | 8 people         |
| 3    | Hospitalized medical record    | 21 people        | 15 people      | 18 people        |
| 4    | Outpatient medical record and administration | 43 people   | 30 people      | 35 people        |
| 5    | Support unit                   | 50 people        | 35 people      | 42 people        |
|      | **Total**                      | **165 people**   | **116 people** | **144 people**   |

Table 2. Hypotheses

| Hypothesis                                                      |
|----------------------------------------------------------------|
| H1: Perceived ease of use has a significant influence on perceived usefulness of SIMRS |
| H2: Perceived usefulness has a significant influence on perceived usefulness of SIMRS |
| H3: Perceived ease of use has a significant influence on attitudes toward using technology using SIMRS |
| H4: Perceived ease of use has a significant influence on attitudes toward using technology using SIMRS |
| H5: Attitude toward using technology has a significant influence on behavioral intention when using SIMRS |
| H6: Service quality has a significant influence on user satisfaction when using SIMRS |
| H7: User satisfaction has a significant influence on behavioral intention when using SIMRS |
| H8: Service quality has a significant influence on behavioral intention when using SIMRS |
| H9: Perceived usefulness has a significant influence on actual technology use of SIMRS |
| H10: Attitude toward using technology has a significant influence on actual technology use of SIMRS |

3.3. Instrumentation and Data Analysis Procedures

This study used questionnaire and interview to obtain data needed. The questionnaire instrument was measured by using Likert scale from 1 (very unsatisfied) to 5 (very satisfied). Interview was conducted to stakeholders in management and implementation of SIMRS to understand the condition of execution of SIMRS in a hospital. Data analysis was conducted through Partial Least Square (PLS) analysis using SmartPLS 3.0 software.

4. Results

4.1. Outer Model Analysis (Measurement Model)

Outer model analysis specifies relationship between latent variables and their indicators through testing of construct validity and reliability of research instruments.

a. Convergent validity

Convergent validity value is the value of loading factor in latent variable with its indicators which must be above 0.7. The loading factor results of all indicators in model research were valid. Moreover, indicator was also declared as convergent validity if AVE value is $[\lambda]>0.5$. The result of validity test based on AVE value was shown in Table 3.

| Variable                      | AVE | Variable                      | AVE |
|-------------------------------|-----|-------------------------------|-----|
| Perceived Usefulness          | 0.881| Actual Technology Use         | 0.826|
| Perceived Ease of Use         | 0.817| End-User Satisfaction         | 0.826|
| Attitude toward Using Technology| 0.897| Service Quality               | 0.757|
| Behavioral Intention          | 0.933|                               |     |

b. Discriminant validity

Discriminant validity value is determined by comparing loading value on intended variable that must be greater than loading value with other variables. Initial results obtained four indicators that did not meet discriminant validity requirements so it had to be retested (by removing indicators one by one to find best results). After four retries, final validity test eliminated four indicators, i.e. PE6, T1, T2, and AS4 indicators.
c. Reliability
Reliability test is conducted to find out whether the distributed questionnaire will be able to produce same results when it is conducted repeatedly. Reliability tests can be seen from Cronbach’s alpha value (which must be greater than 0.6) and composite reliability value (which must be greater than 0.7). The reliability test results were shown in Table 4.

| Variable                              | Cronbach’s Alpha | Composite Reliability |
|---------------------------------------|------------------|-----------------------|
| Perceived usefulness                  | 0.975            | 0.980                 |
| Perceived ease of use                 | 0.955            | 0.964                 |
| Attitude toward using technology      | 0.962            | 0.972                 |
| Behavioral intention                  | 0.964            | 0.977                 |
| Actual technology use                 | 0.895            | 0.934                 |
| End-user satisfaction                 | 0.981            | 0.983                 |
| Service quality                       | 0.983            | 0.984                 |

4.2. Inner Model Analysis (Structural Model)
Inner model analysis predicts causality relationship between latent variables.

a. Determination coefficient ($R^2$)
$R^2$ indicates the extent to which a construct can explain model to find out magnitude of the effect of particular independent latent variable on dependent latent variable. $R^2$ value must be greater than 0.7 to categorize variables as strong variable. $R^2$ value was shown in Table 5.

| Variable                              | $R^2$ Value |
|---------------------------------------|-------------|
| Perceived usefulness                  | 0.758       |
| Attitude toward using technology      | 0.738       |
| Behavioral intention                  | 0.896       |
| Actual technology use                 | 0.790       |
| End-user satisfaction                 | 0.858       |

b. Predictive relevance ($Q^2$)
$Q^2$ value was obtained by formula:

$$Q^2 = 1 - (1-R_1^2)(1-R_2^2)\ldots(1-R_p^2) = 0.999803$$

From this result, the large diversity of research data that could be explained by structural model was 99.98% and this model had predictive relevance.

c. Goodness of Fit
GoF is measured to test model matches. GoF value must be equal or greater than 0.38 to declare that model is robust. Value of GoF was obtained by formula:

$$GoF = \sqrt{(AVE \times R^2)} = 0.830334$$

4.3. Hypotheses Testing
Hypotheses testing was conducted on a research model consisting 7 variables and 52 indicators. It was done by looking at t-statistics and path coefficient to 144 research samples. In this study, t-test was used with significance level of 5%. This result was shown in Table 6.

| Original Sample | T-Statistics | Results         | Original Sample | T-Statistics | Results         |
|----------------|--------------|-----------------|----------------|--------------|----------------|
| PEOU→PE        | 0.843        | 33,553          | (H1) accepted  | SQ→EUS       | 0.916          | 46,606         | (H6) accepted |
| PE→AT          | 0.601        | 8,282           | (H2) accepted  | EUS→BI       | -0.141         | 1,398          | (H7) rejected |
| PEOU→AT        | 0.253        | 2,734           | (H3) accepted  | SQ→BI        | 0.467          | 3,648          | (H8) accepted |
| PE→BI          | 0.431        | 4,667           | (H4) accepted  | PE→ATU       | 0.292          | 2,226          | (H9) accepted |
| AT→BI          | 0.184        | 1,927           | (H5) rejected  | BI→ATU       | 0.558          | 4,401          | (H10) accepted |
5. Discussion

Research model purposed on section 3.1 Research Model has been examined on section 4 Results. This section explained the analysis and detail of hypotheses testing results.

5.1. Effect of PEOU on PE

The results show that construct of perceived ease of use has significant positive effect on perceived usefulness of SIMRS (it supports reference [5]). This perceived ease of use will make the employees complete their daily work easier so that the use of SIMRS will be increasingly perceived by them.

5.2. Effect of PE on AT

The results show that construct of perceived usefulness has significant positive effect on attitudes toward using technology (it supports references [5] and [9]). Moreover, this usability will improve performance of employees to complete their daily work to increase positive attitude for using SIMRS.

5.3. Effect of PEOU on AT

The results show that construct of perceived ease of use has significant positive effect on attitudes toward using technology of SIMRS (it supports references [5] and [9]). This perceived ease of use will make the employees complete their daily work easier to increase positive attitude using SIMRS.

5.4. Effect of PE on BI

The results show that construct of perceived usefulness has significant positive effect on behavioral intention when using SIMRS (it supports references [5] and [9]). This usability will improve performance of the employees to complete their daily work to increase their intention using SIMRS.

5.5. Effect of AT on BI

The results show that attitude towards using technology has no significant effect on behavioral intention when using SIMRS (it doesn’t support references [5] and [9]). These results indicate that user’s intention in SIMRS is not necessarily influenced by positive attitude when using SIMRS. This can be due to the fact that employees have no choice to system provided by hospitals. Employees have a lot of work demands when done with manual processes. Consequently, employees give high positive attitude to SIMRS and require SIMRS to be used in the future. However, these employees do not always recommend current SIMRS in the future because there is a previous development of SIMRS which is preferred and desired by employees. Therefore, it can be concluded that both variables have high value, but they do not have a significant effect on each other.

5.6. Effect of SQ on EUS

The results show that construct of service quality has significant positive effect on user satisfaction when using SIMRS (it supports reference [10]). Good quality of SIMRS service can meet or exceed employee expectations so that their satisfaction of SIMRS technology will be increased.

5.7. Effect of EUS on BI

The results show that construct of user satisfaction has no significant effect on behavioral intention when using SIMRS (it doesn’t support reference [10]). This result indicates that user’s intention in SIMRS is not necessarily influenced by user satisfaction. This refers to condition of employees who still do not feel quite satisfied with SIMRS because in general, SIMRS has not met the employee’s needs to ease and improve their work performance. However, employees still need SIMRS to be used in the future because employee’s work becomes easier by using SIMRS rather than using manual procedure for reports or control cards. Employees do not recommend the current development of SIMRS as preferred technology due to development of the previous SIMRS is more desirable for future use. Therefore, it can be concluded that both variables do not give any significant effect.
5.8. Effect of SQ on BI
The results show that construct of service quality has significant positive effect on behavioral intention when using SIMRS (it supports reference [5]). Good service quality can meet or exceed employee expectations so that intention of employees to use SIMRS in the future will be increased.

5.9. Effect of PE on ATU
The results show that construct of perceived usefulness has significant positive effect on actual technology use of SIMRS (it supports reference [5]). This usability will improve performance of the employees to complete their daily work to increase the frequency of these employees in using SIMRS.

5.10. Effect of BI on ATU
The results show that construct of behavioral intention has significant positive effect on actual technology use of SIMRS (it supports reference [5]). This intention of employees will provide motivations to increase the frequency of employees in using SIMRS actually.

6. Conclusion
Based on analysis result, there are correlations between user acceptance, service quality, and user satisfaction on SIMRS implementation. These correlations are the results from examining process of research model proposed. Moreover, based on 10 hypotheses proposed in model, there are two rejected hypotheses, which is hypotheses 5 and 7. To improve SIMRS implementation in the future, it is necessary to improve these three factors in accordance with indicators through model.

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