Reliability and usability analysis of the implementation ERP in host to host payment system: A case study

Fitriani¹, R Wahjoe Witjaksono², and Muhardi Saputra³

¹,²,³Information System Department, School of Industrial Engineering and Information System, Telkom University, Bandung, Indonesia

E-mail: itifitriani31@gmail.com

Abstract. The telecommunication industry in Indonesia built a system of direct payment transactions to vendors. The level of quality that exists in the host to host the payment system is currently the goal of the research. Identifying the quality system is important in the quality assurance process to prove the system is fit to apply in industry. Quality system measurement can use the ISO 9126 model. This model has measurement standards that are valid and reliable in measuring quality system. The variables analyzed in this study are the reliability and usability of the system. The reliability system is often interpreted as the resilience of a system or component to function properly if operated in certain environmental conditions and supported by the usability of the system. The usefulness of the system is the ability of software to be understood, studied, used, and appealed to users. This variable can be a measure of quality system measurement. The results of this study are recommendations based on the lowest scores obtained from the measurement test. The lowest value in this study is system recovery which includes system reliability. The proposed recommendation is to replace the Oracle 12 database with SAP HANA because it has a faster response time so that it can support the development of the company going forward.

1. Introduction

Business developments in the past two decades have rapid technological advancements accompanied by the development of world globalization [1]. Companies need technology to control and store data, manage finance, network management and become the basis of operating systems. Competition in the business world increasingly competitive that requires companies to provide the best service. One way to achieve success is the integrated information system and handling information flows to produce more effective and efficient company management. According to Montazemi, the implementation of integration system within a company is faced with two things: the company gets the success of implementing the system or failure, which can be based on a quality system [2]. The quality system is a measurement that focuses on the results of the interaction between users and systems [3]. According to Delone and McLean, the quality of the system is a characteristic of the information inherent in the application system itself, which refers to how well the capabilities of hardware, software, and procedure policies of the information application system can provide information on user needs [2]. Factors that affect the quality of the system consist of different points of view, namely the operation of the product (using it), revision of the product (changing it), and product transition (modifying it) in order to work in different environments [4]. With the increase in technological requirements accompanied by good system quality, the right technology to
support integrating information systems is Enterprise Resource Planning (ERP), which is a technology that give companies a benefits in integrating operational processes to improve information flow, reduce costs incurred, shorten business processes, building relationships with business partners and reducing the time needed [1].

The telecommunications industry has implemented an ERP system with SAP software into its business functions since 2002. In the middle of 2011, the telecommunications industry provided innovation in providing banking services (host to host) used for payments to vendors through real-time online transactions from the ERP system company to the Bank's ERP system. The purpose of the host to the host system is to meet the company's needs for automated payment processes to partners/third parties from the Bank's ERP system. The host to host system has been established since 2011 but until now there has been no checking of the quality of the system, therefore it is necessary to analyze the quality of the system that focuses on reliability and usability of the system. The analyzed of the system is needed to be measured whether the system is feasible to be developed, maintained, or stopped. According to industry, reliability and usability have relevance because if the system has good reliability, it will affect the use of the system which will be increased. The reliability system itself is often interpreted as the resilience of a system or component to function properly if operated in certain environmental conditions and supported by the usability of the system. Whether the usefulness of the system is the ability of software to be understood, studied, used, and appealed to users.

Quality system measurement is often carried out which refers to certain models [4]. One model for measuring system quality that can be used is the ISO 9126 model. The main strengths of the ISO 9126 model are that it can provide a general framework for evaluating the quality of software products although it does not provide specific quality requirements but can be used in various institutional systems in including ERP systems [5]. The ISO 9126 model performs a system analysis based on general quality variables that have the purpose of testing or analyzing how well the quality of ERP implementation in the payment transaction system to vendors. Comparing with the previous research that analyzed the usability of a mobile application is needs to know to control the quality assurance of application which will be done based on ISO 9126 model. The usability has a big influence in determining performance in quality system whether users will tend to leave the application or tend to use it [6]. The results of this study are to know the measurement of quality system based on the ISO 9126 model and to know the characteristics that are lacking so that it can be used by the company as an evaluation material in system development and proposed recommendations that need to be given to improve quality system.

2. Literature Review

2.1. Enterprise Resource Planning

Enterprise Resource Planning (ERP) is a software system that supports logistics, planning, finance, manufacturing, procurement, human resources, project management, distribution, accounting, service maintenance, and transpiration. [7]. An ERP system is software that must integrate and coordinate the activities of organizational units [8]. ERP systems help various parts of an organization to share data and knowledge, reduce costs, improve business process management, and between function can use each other’s data in the company. Thus, the information received can be immediately recognized (real-time) [9].

2.2. SAP

SAP (System Application and Processing) is one of the largest ERP software vendors in the world headquartered in Germany. SAP helps companies plan and carry out their operational activities more efficiently and effectively and provides business insight for companies to stay ahead of business competition. SAP introduces Big Data processing as a new technological innovation. SAP designed the SAP Sybase IQ server to analyze, and as a structured and unstructured data processor in large volumes [10]. SAP consists of a number of modules that have the ability to support all transactions that need to be done by a company and each module work in an integrated/connected way with each other. The benefits
of SAP are updating data automatically with other modules that are interconnected (real-time), users who have access to the system will be able to see all the latest information at any time needed even though information is entered by other users (called data transparency), and improve the consistency of business processes by ensuring that the SOP is run properly [11].

2.3. Quality System
The quality system means the quality of software and hardware in information systems. According to Heizer and Render, quality is the ability of a product or service to meet customer and company needs [12]. Usual performance measures include system flexibility, integration, response time, and reliability [13]. According to Davis, the quality of the system is defined as perceived ease of use which is the level of how much computer technology is felt to be relatively easy to understand and use. System quality shows that if system users feel that using the system is easy, users don't need much effort to use, so they will spend more time doing other things that will likely improve their overall performance [14].

2.4. ISO 9126 Model
ISO 9126 is an international standard published by International Organizational Standardization (ISO) in 1991 as a model for evaluating software quality. In 2001 the second version of ISO 9126 was published and divided into four parts, namely [15]: ISO 9126-1 Quality Model, ISO 9126-2 External Quality, ISO 9126-3 Internal Quality, and ISO 9126-4 Quality in use. According to Fahmy, the main advantage of this model is that the model can be applied to the quality of software products that provide consistent terminology [16]. The major advantage of ISO 9126 according to Djouab & Bari are unified and quantify different views of quality requirements, having a single universal model that makes it easier to compare one product to another, the characteristics defined are applicable to any kind of software while providing consistent terminology for software product quality, ISO 9126 model covers simple and accurate definitions and support strategic decision-making activities [15].

The ISO 9126 model basically consists of two main parts as seen in Figure 1, which are 1) internal and external quality attributes and 2) quality attributes used (quality in use). The relationship between the parts in this model has a sequential relationship which means that product quality has a contribution to improving quality in use in software. So, quality in use evaluation can have an effect to improve software quality, while software evaluation will have an effect on improving the quality of external and internal software processes [17]. This study focuses on the variables of reliability and usability, and the variable quality in use that is used is productivity. If the system has good reliability, it will affect the use of the system which will be increased. Whether the productivity assesses resources related to achieved effectiveness.

![Figure 1. ISO 9126 Model](image-url)
In connection with this research which discusses the variable reliability and usability of ISO 9126, this has meanings and sub-variables as follows:

1. Reliability is the ability of the software to maintain the level of performance (reliability) under the conditions set for the time period specified. Reliability has sub-variables, namely:
   1. Maturity is the ability of software to avoid failures and errors in software.
   2. Fault Tolerance is the ability of software to maintain performance in the event of a software error.
   3. Recoverability is the ability of software to rebuild performance levels when a system failure occurs and recover data affected by a failure.

2. Usability is the ability of software to be understood, studied, used, and appealed to users. Usability has sub-variables, namely:
   1. Understandability is the ability of software to be easily understood and allows users to understand the suitability of software.
   2. Learnability is the ability of software to be easy to learn.
   3. Operability is the ability of software to be easily operated and controlled.
   4. Attractiveness is the ability of software to attract users in terms of the appearance of the UI (User Interface).

![Figure 2. Quality in Use ISO 9126 Model](image)

![Figure 3. Systematic Research](image)
The ISO quality in use model has 4 factors but in this study, researchers only used quality in use productivity as seen in figure 2. Productivity assesses resources related to achieved effectiveness. The resource means the time when using the system. Productivity is related to how productive software is to its users. According to Herjanto productivity is a measure that states how well resources are managed and utilized to achieve optimal results [18]. And according to the Internal Labor Office (ILO) productivity is not just hard work, it is supported by teamwork, humanity. Thus, productivity is used to measure how productive resources and software are used for the reliability and usability of the systems owned by the telecommunications industry.

3. Systematic Research
The research systematics is the part that contains the stages carried out in this study. Figure 3 is the flow of research conducted.

4. Analysis and Discussion
This study collected primary data to analyze reliability and usability of the system through the distribution of questionnaires to 86 respondents. To processing data, validity and reliability tests, analysis outer and inner model are performed.

4.1. Validity and Reliability
Validity is the similarity between the data collected and the actual data that occurs in the object under study. A valid instrument means that the measuring instrument used to obtain the data (measure) is valid. The validity test is a step of testing carried out on the content of an instrument, with the aim of measuring the accuracy of the instruments used in a study [19]. Whereas according to Arifin, reliability is an instrument test that said to be reliable if it always gives the same results when tested on the same group at different times or opportunities (consistency). Reliability testing is done on items that are declared valid. This test is intended to ensure that the instrument used is an instrument that is reliable, consistent and stable. So that if used multiple times it can produce the same data which can be seen from the value of Cronbach’s Alpha [20]. The validity and reliability test using SPSS 25 software. The number of respondents to this questionnaire is 86 people. To measure rtabel follows the degree of freedom. The formula df is df = N-2 which means df = 86 - 2 which is df = 84 (with a significance of 5%). Which means the value of rtable = N = 84 = 0.2120. The results of the validity test on all variables in this study are valid. Whereas for the minimum reliability test the value of Cronbach’s Alpha (α) is 0.6 [21]. The reliability test results for all variables are reliable.

4.2. Analysis of Outer Model
Based on the basis of PLS theory, a flow diagram of causality relationships between constructs and indicators can be made. This study will examine the relationship between variables with indicators or on the outer model explaining how each indicator relates to the variable. The measurement model or outer model serves to ascertain whether the indicators used in measuring latent variables are reliable and valid. The test results seen include convergent validity and composite reliability.

4.2.1. Convergent Validity
Convergent validity is used to measure whether the two instruments are highly correlated in measuring a concept. The value of convergent validity is the value of outer loading on latent variables with the indicators. The expected value is \(> 0.7\) so a value below 0.7 indicates that the indicator is invalid. Indicators FT1, OP1, and PR4 have values below 0.7 so that the indicator is deleted.

4.2.2. Composite Reliability
Composite reliability is used to measure a construct that can be evaluated by internal consistency or internal consistency reliability. For measurement of composite reliability on smart pls use composite reliability value. The recommended value is \(> 0.7\) [22].

5
### Table 1. Composite Reliability Value

| Variable | Composite Reliability | Status  |
|----------|-----------------------|---------|
| AT       | 0.878                 | Reliable|
| FT       | 0.849                 | Reliable|
| LN       | 0.880                 | Reliable|
| MT       | 0.889                 | Reliable|
| OP       | 0.889                 | Reliable|
| PR       | 0.857                 | Reliable|
| QS       | 0.912                 | Reliable|
| RL       | 0.876                 | Reliable|
| RV       | 0.847                 | Reliable|
| UD       | 0.865                 | Reliable|
| US       | 0.877                 | Reliable|

### Figure 4. Output Convergent Validity

4.3. Analysis of Inner Model

The inner model analysis is carried out to ensure that the structural models are built accurately. In other words, the results of testing structural models can be used to see whether the empirical data on the research supports the relationship of the research hypotheses. To see the hypothesis accepted or rejected can see the value of the T-statistic and P-Values with the provisions of alpha 5% = 0.05. Provisions so that the hypothesis is accepted, namely the value of T-Statistics used is the 5% significance level so that the minimum T-Statistics limit is 1.96 [23]. The probability value, p-value with alpha 5% p-value ≤ 0.05. Whereas to see positive and negative influences can be observed from the original sample value. The closer the +1 value is, the stronger the two constructs. Relationships that are closer to -1 indicate that the relationship is negative [24]. So if there is a T-statistic and P-Values value under these conditions, the hypothesis is rejected.
| Original Sample (O) | T Statistics (|O/STDEV|) | P-Values | Hypothesis | Inference | Status          |
|---------------------|--------------------------|----------|------------|-----------|----------------|
| AT -> US            | 0.088                    | 0.885    | 0.376      | H16       | Positive but not significant | Rejected   |
| FT -> MT            | 0.511                    | 6.209    | 0.000      | H1        | Positive and significant | Accepted   |
| FT -> RL            | 0.013                    | 0.223    | 0.824      | H4        | Positive but not significant | Rejected   |
| FT -> RV            | 0.442                    | 5.130    | 0.000      | H2        | Positive and significant | Accepted   |
| LN -> AT            | 0.230                    | 1.694    | 0.091      | H11       | Positive but not significant | Rejected   |
| LN -> OP            | 0.540                    | 4.199    | 0.000      | H10       | Positive and significant | Accepted   |
| LN -> US            | 0.319                    | 3.629    | 0.000      | H14       | Positive and significant | Accepted   |
| MT -> RL            | 0.509                    | 6.662    | 0.000      | H5        | Positive and significant | Accepted   |
| MT -> RV            | 0.363                    | 4.066    | 0.000      | H3        | Positive and significant | Accepted   |
| OP -> AT            | 0.589                    | 5.947    | 0.000      | H12       | Positive and significant | Accepted   |
| OP -> US            | 0.225                    | 2.613    | 0.009      | H15       | Positive and significant | Accepted   |
| PR -> QS            | 0.413                    | 3.900    | 0.000      | H20       | Positive and significant | Accepted   |
| RL -> PR            | 0.438                    | 3.646    | 0.000      | H18       | Positive and significant | Accepted   |
| RL -> QS            | 0.161                    | 1.398    | 0.163      | H21       | Positive but not significant | Rejected   |
| RL -> US            | 0.162                    | 2.110    | 0.035      | H17       | Positive and significant | Accepted   |
| RV -> RL            | 0.476                    | 6.009    | 0.000      | H6        | Positive but not significant | Accepted   |
| UD -> AT            | 0.078                    | 0.723    | 0.470      | H9        | Positive but not significant | Rejected   |
| UD -> LN            | 0.771                    | 19.352   | 0.000      | H7        | Positive and significant | Accepted   |
| UD -> OP            | 0.241                    | 1.600    | 0.110      | H8        | Positive but not significant | Rejected   |
| UD -> US            | 0.269                    | 3.592    | 0.000      | H13       | Positive and significant | Accepted   |
| US -> PR            | 0.376                    | 3.050    | 0.002      | H19       | Positive and significant | Accepted   |
| US -> QS            | 0.344                    | 3.184    | 0.002      | H22       | Positive and significant | Accepted   |
The results of hypothesis testing can be seen in Figure 5, the red line which means the hypothesis is rejected and the blue line means the hypothesis is accepted. So that it can be concluded that from the 22 hypotheses in the study have 16 hypothesis variables that have positive and significant values.

4.4. Measurement Test
Measurement test is a test in making a decision whether a system can be developed, continued, or stopped. The measurement test is carried out to ensure the value of the hypothesis test in order to obtain the overall value of the system quality with the ISO model which is poured into a continual percentage assessment. The following calculation formula (equation 1) can be used to determine the feasibility test of a system:

\[
\text{Measurement Percentage} = \frac{\text{Actual Score} (f)}{\text{Ideal Score} (n)} \times 100\% \quad \text{.......................... (1)}
\]

Description:
Actual score \((f)\) = number of answer scores from respondents
Ideal score \((n)\) = highest score if the respondent chooses the answer with the highest score
After getting the results of the calculation, then compared to the scale of conversion to be stated as very good, good, sufficient, lacking, and very lacking.

| Table 3. Likert Scale Interpretation |
|-------------------------------|-----------------|
| Percentage (%) | Interpretation    |
| 0% - 20%            | Very Lacking    |
| 21% - 40%           | Lacking         |
| 41% - 60%           | Sufficient      |
| 61% - 80%           | Good            |
| 81% - 100%          | Very Good       |
Based on the measurement test, the results obtained are fault tolerance variables with a percentage of 76.8%, maturity variables having a percentage of 81.6%, recoverability variables having a percentage of 74%, reliability variables having a percentage of 82%, understandability variables having a percentage of 84%, variables learnability has a percentage of 83.7%, operability variable has a percentage of 81.7%, attractiveness variable has a percentage of 83%, productivity variable has a percentage of 83% and quality system variable has a percentage of 85.5%.

4.5. Recommendations

Based on the results of the study, the results of the measurement test obtained concluded that the recoverability variable has the lowest value in the reliability of the host to host the telecommunications industry with a percentage of 74%. Thus, the results of general recommendations for recoverability variables are:

a. Improve documentation as a guideline in implementing the system.

b. Prioritize recovery (recovery) so that it can minimize incidents that occur too often.

c. Maintain the hardware, software, and network components needed for fast system recovery.

d. Improving the Disaster Recovery Plan owned by industry includes scenario analysis to identify and overcome various failures that will occur.

e. Evaluate recovery plans and incident response procedures at least annually and update them to strengthen recovery measures related to large-scale disruption.

The following is a comparison of the response time chart between the Oracle and the HANA SAP, namely:

1) Response time chart oracle

![Figure 6. Response time chart oracle](image)

2) Response time chart SAP HANA

![Figure 7. Response time chart SAP HANA](image)

Based on the results of interviews with sources, information was obtained that the system currently uses the Oracle 12 database. So, the recommendations are focused on the scope of data backup and recovery. Oracle 12 is a database issued by the Oracle company. Oracle 12 provides convenience in standardization, data consolidation, and service database automation, but the database requires a lot of storage space. Thus, the researcher recommends replacing the Oracle 12 database to SAP HANA. Because with the change of database to SAP HANA it will store all data in the cloud, not on external drives. Unlike Oracle, some data is stored in the database server and partly in the cloud. SAP HANA is designed to support modern hardware as a multi-core system that has a large main memory. In addition,
SAP HANA can handle larger amounts of data by integrating information from various external and internal sources. SAP HANA has real-time analytical capabilities because all data is in the cloud so it won't waste time to load data from one location to another and can process data up to 10 times faster.

Based on this picture, it can be seen that SAP HANA has a response time chart that faster and higher than Oracle 12. This is an advantage of the SAP HANA database compared to Oracle 12. So, this recommendation is expected to support the development of the company going forward.

5. Conclusion
This study aims to analyze the reliability and usability of the quality of the host to the host system in the telecommunications industry. In this study, the following conclusions can be drawn. Based on testing using the ISO 9126 model it was found that:

Relations between variables that have been done can be concluded that:

a. Effect of reliability on system quality
   Based on the results of hypothesis testing obtained the original sample value of 0.161 which means it has a positive influence. The value of T-statistics obtained is 1.398 where the value is smaller than the minimum limit of T-statistics with a 5% significance level of 1.96 and has a P-values of 0.163 where the value is smaller than the provisions of alpha 0.05. So that reliability has a positive but not significant effect on the quality of the system.

b. Effect of reliability on productivity
   Based on the results of hypothesis testing obtained the original sample value of 0.438 which means it has a positive influence. The value of T-statistics obtained is 3.646 where the value is greater than the minimum limit of T-statistics with a 5% significance level of 1.96 and has a P-value of 0.000 with the provision of alpha 0.05. So that reliability has a positive and significant effect on productivity.

c. Effect of usability on system quality
   Based on the results of hypothesis testing obtained the original sample value of 0.344 which means it has a positive influence. The value of T-statistics obtained is 3.184 where the value is greater than the minimum limit of T-statistics with a 5% significance level of 1.96 and has a P-value of 0.002 with the provision of alpha 0.05. So that usability has a positive and significant influence on the quality of the system.

d. Effect of usability on productivity
   Based on the results of hypothesis testing obtained the original sample value of 0.376 which means it has a positive influence. The value of T-statistics obtained is 3.050 where the value is greater than the minimum limit of T-statistics with a 5% significance level of 1.96 and has a P-value of 0.002 with the provision of alpha 0.05. So that usability has a positive and significant effect on productivity.

e. Effect of reliability on usability
   Based on the results of hypothesis testing obtained the original sample value of 0.162 which means it has a positive influence. The value of T-statistics obtained is 2.110 where the value is greater than the minimum limit of T-statistics with a 5% significance level of 1.96 and has a 0.035 P-values with the provisions of alpha 0.05. So that reliability has a positive and significant influence on the usability of the system.

f. Effect of productivity on system quality
   Based on the results of hypothesis testing obtained the original sample value of 0.413 which means it has a positive influence. The value of T-statistics obtained is 3.900 where the value is greater than the minimum limit of T-statistics with a 5% significance level of 1.96 and has a P-value of 0.000 with the provision of alpha 0.05. So that productivity has a positive and significant influence on the quality of the system.

Then for the proposed recommendations based on the lowest value of the feasibility test that can affect the development of system quality. The results of the research obtained are recoverability variables which have the lowest value with a percentage of 74.3%. The recommendations submitted are
proposed replacement Oracle 12 to SAP HANA because SAP HANA has a response time chart that is faster than Oracle Database 12. With these recommendations, it is expected to support the development of the company in the future.

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