Refinement and User Acceptance Test of Accounting Information System for Restaurants SMEs

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Abstract

This study seeks to improve accounting information system (AIS) application specially built for restaurants small and medium-sized enterprises (SMEs) that have been developed and tested to the user, as well as demonstrate the feasibility of the applications that have been enhanced when viewed in terms of functionality, performance, and usability. Enhanced AIS is the result of system development that have been developed, that requires three years to complete all the stages involving 179 restaurants in JABODETABEK for the user requirements analysis phase and processed using Quality Function Deployment (QFD). The research model used is a model of Research Development. The study focused on the study of designing, developing, and evaluating AIS applications for restaurant SMEs and improving it. Feasibility of restaurant AIS quality was measured in terms of functionality using TOFTS and FETs, in terms of performance measured using paired sample t-test test, and Importance Performance Analysis (IPA), and in terms of usability measured using Computer System Usability Questionnaire (CSUQ). The research showed that enhanced AIS applications for restaurant SMEs can be used to perform restaurants data processing ranging from Point of Sales (POS) transaction to accounting reporting and has a very good percentage of functionality quality. The AIS application had a very good appearance and value of the application performance is very satisfying, and also has an

excellent value of usability.

INTRODUCTION

Recent research by Qraved.com, noted a shift in the trend where more and more Indonesian people have a habit of eating at the restaurant in 2013, they recorded the visit to the restaurant reached 380 million times and spent a total of USD 1.5 billion. The growth of the middle and upper class restaurant reached 250 percent in the last five years (Qraved.com). Only big restaurant that already use information technology in their operations, and only a small proportion of restaurants SMEs are already using information technology. This is because of the many barriers to the use of ICT by SMEs [1] and that the SMEs were still at the early stages of electronic business adoption [2]. Even though ICT should be used more in SMEs within the sector of services [3]. For SMEs, accounting software available on the market today is still considered to be too complicated application, and not specifically suited to their needs [4-6]. Especially for restaurants, the most important part of accounting applications is the cashier application (Point of Sales), because consumers will soon pay after finished or before meal. The most preferred method of payment by the consumer is by cash [7]. Therefore, it is in general, the restaurant uses a cash register in the form of a cash register, but the weakness of traditional cash register machine is not connected with the computer, so it must be entered back to the computer for accounting purposes. This re-entry becomes complicated because of the limited print out output from the cash register, so it shows inefficiency. Therefore, the availability of accounting software integrated with point of sales is needed, because it will help in the management of their businesses, the need for fund management and financial reporting will be easily obtained. Accounting information systems development for restaurant SMEs is a response to the needs of applications that suit their needs. Once the AIS application had been developed, it is necessary to test its quality.

According to the International Organization for Standardization (ISO) in ISO/IEC 9126:1991(E), software quality is the overall features and characteristics of a software product that is worn on its ability to meet the needs expressed [8]. Software quality is the degree of fulfillment of functional and performance of the software to the requirements specified. Software quality based on ISO/IEC 9126:1991(E) can be evaluated with the following characteristics: Functionality, Reliability, Usability, Efficiency, Maintainability, and Portability. Casteleyn, et al. [9] states that in relation to ISO 9126, the quality of Web applications in some of the work so far developed a different set of characteristics as the main driver for the evaluation of the quality of Web applications. Web practitioners view that the functionality, performance, and usability

are the factors that are relevant to the quality of Web-based application domain [10].

Functionality directing the assessment of truth (correctness) and sufficiency (adequacy) a function of an application. Functionality using special scenarios to examine each of the functional requirements in applications that have previously been determined. The possibility of failure or incompatibility can be revealed so that the application can be corrected [9]. According to Nguyen [11], functional testing is a broad category and covers testing several methods of testing.

Testing methods included in functional testing include: 1) Task-Oriented Functional Tests (TOFTs) to check whether an application can run each task correctly. TOFTs consist of a positive test cases designed to verify the feature/functionality of the applications by examining each shown task of each feature/function on applications requirements. TOFTs compiled based on list of features/functions of the application to be tested on its functionality. 2) Forced-Error Tests (FETs) that runs the features/functions of the application on the condition that intentionally wrong. FETs have the objective to find incorrect conditions that are undetected or untreated. FETs consist of a negative test case designed to force the application into the wrong conditions. List of error messages that may occur are the basis in preparing the test case in the FETs. According to Lewis [12], usability can be assessed using a subjective measurement that is used to examine the level of user satisfaction. Subjective data is the size of the opinions and attitudes of users on usability perceptions.

This study seeks improve AIS application specially built for restaurants SMEs that have been developed and tested to the user, as well as demonstrate the feasibility of enhanced AIS application for restaurant SMEs when viewed in terms of functionality, performance, and usability.

MATERIALS AND METHODS

Research Model

The research model used in the improvement of the AIS application for restaurants SMEs is a model of Research Development. The research focused on the study of designing, developing, and evaluating AIS applications for restaurant SMEs. AIS application development model using the waterfall model. The reason of using waterfall method in the development of this AIS is due to the waterfall method has a structured development stages, gradually between the first sub development with the subsequent covering systems analysis, followed by design which includes database design, process design and work procedures design, implementation of the design results, testing and maintenance. Waterfall also possible to do a review of the steps that have been done. Other reason is because of this AIS development project requires the development time of between one to three years. In addition, this study also aims to demonstrate the feasibility of application quality for the enhanced AIS application for restaurant SMEs in terms of functionality, performance, and usability.

Research Procedure

Improvement of the AIS application specifically built for restaurants SMEs: AIS applications refinement process begins with Metaphor practices used in communication sessions to facilitate an understanding of the shortcomings AIS application that has been developed and its perfected process. Use of the term/language in the process of application development for AIS was adjusted with the terms/language that was understood by SMEs, especially in restaurants. On-site customer involved in the process of application development is the restaurant owner/cashier. On-site customer must have a deep knowledge of the whole process of restaurant management activities organized, have the ability to make decisions, and committed to the improvement of AIS application for restaurants SMEs in this study. The information obtained will be used as a basis for improvement of the AIS application for restaurant SMEs. The information obtained was processed using *Importance Performance Analysis (IPA)* methods.

AIS application specially built for restaurants SMEs requires a total of three years (from the year 2013 to 2015) to complete all phases of system development. User requirements is obtained by involving 179 restaurants in Jakarta, Bogor, Depok, Tangerang and Bekasi region (Jabodetabek). This region is the big five city in West Java Indonesia. Jakarta is Indonesia's capital city with the largest population in Indonesia resulting great restaurant's needs, Jakarta also has the largest percentage of the number of restaurants in Indonesia at 46.6 percent with the number of restaurants as many as 3.958 in 2014 [13]. As for the implementation and evaluation phase involving 20 selected restaurant SMEs.

Stages that have been implemented in accordance with the System Development Life Cycle [14], consist of the define system goals and scope, requirements analysis, design system components, system implementation and system maintenance. In the phase of defining system goals and scope, limited development of simple accounting information systems for restaurant SMEs, and building a small team to develop the systems. At the phase of Requirements analysis, analysis that has been carried out include analysis of procedures, document analysis, and analysis of the report output. In this phase, started by learning the restaurant applications available on the market and carried out questionnaires to identify the user requirements. Data from the questionnaires were processed using descriptive statistics and Quality Function Deployment [15]. At the system components design stage, detailed specifications of the solution chosen in the process of system analysis carried out using Unified Modeling Language (UML).

AIS Application for Restaurants SMEs Quality Analysis

a. **Functionality:** Process of AIS application quality analysis for restaurants SMEs in terms of functionality performed formative. Functionality Quality Analysis is done by testing the functions of the AIS application for restaurant SMEs. This test is used to check whether the application is able to work as expected or not. Special scenarios used in examining each application's functional requirements that have previously

been determined at the stage of planning and analysis. Functional failure or discrepancy was revealed on the application will be fixed soon. The functionality testing used in this research is the Task-Oriented Functional Tests (TOFTs) and Forced-Error Tests (FETs) method. Task-Oriented Functional Tests (TOFTs) is used to verify the feature/functionality of the enhanced AIS applications for restaurant SMEs. Verification is done by checking tasks that shown of each feature/function of the application requirements. Forced-Error Method Tests (FETs) are used to find any undetected or untreated conditions. Forced-Error Method Tests (FETs) is done by forcing the enhanced AIS application for restaurants SMEs to perform tasks in a wrong conditions scenario. Forced-Error Method Tests (FETs) done on the application pages that has an input form. The scale of measurement on this instrument is a Guttman scale (the ratio of the dichotomy/two alternatives). The collection of data for the functionality variable is only done by the AIS internal application development team. The data collection is not performed until the user level (end-user).

b. **Performance:** Process of AIS application quality analysis for restaurants SMEs in terms of performance carried summative. Performance quality analysis carried out after the completion of the development process and the applications are developed. Performance measurement using Likert-type questionnaires that assess the attitude of users regarding the performance of the application. The findings are presented using *sample paired t-test*, and *Importance Performance Analysis (IPA)* methods*.

c. **Usability:** Process of AIS application quality analysis for restaurants SMEs in terms of usability done summative. Usability quality analysis carried out after the development process completed and the applications are developed. Subjective usability measurements using a Likert-type questionnaire that assess the attitude of users regarding attributes such as ease of use and good interface. Usability subjectively assessed by the application of psychometric methods on questionnaires to produce psychological quality measurement. Questionnaire used to measure usability variables of enhanced AIS application. Questionnaires used adapted from Computer System Usability Questionnaire (CSUQ) developed by James R. Lewis in IBM Computer Usability Satisfaction Questionnaire: Psychometric Evaluation and Instructions for Use (1993). This questionnaire consists of 19 items with the answer score between 1 (the highest satisfaction) to 7 (lowest satisfaction). A lower score indicates a higher degree of satisfaction. Therefore, the researchers reversed the score of answers to be between 1 (the lowest satisfaction) to 7 (highest satisfaction) so that a higher score indicates a higher degree of satisfaction. The answer score reversed to facilitate interpretation of the score results. The scale of measurement on this instrument is the Semantic Differential.

Here is a complete list of statements contained in Computer System Usability - Questionnaire (CSUQ):

1) Overall, I am satisfied with the ease of use of this application.
2) Using this application is simple.
3) I can finish the job or meet my needs effectively by using this application.
4) I can finish the job or meet my needs quickly by using this application.
5) I can finish the job or meet my needs efficiently by using this application.
6) I feel comfortable in using this application.
7) Using this application is easy to learn.
8) I believe I can become quickly productive by using this application.
9) Application provides a clear error message to troubleshoot errors that occur.
10) When I made the mistake of using the application, I can fix it quickly and easily.
11) The information provided by this application is quite clear.
12) The information I need on this application can be found easily.
13) The information provided by this application is easy to understand.
14) The information provided is effective in completing the work or meet my needs.
15) Information organization is displayed clearly on the application.
16) Interface/display given on this application is convenient.
17) I love the use of this application interface/display.
18) This app has functionality and the ability that match what I expected.
19) Overall, I am satisfied with this application.

Population and Sample

Population and sample in this study is used to analyze the quality of AIS application for restaurants SMEs developed in terms of usability. The population in this study is the owner/manager/cashier restaurants SMEs in Jakarta, Bogor, Depok, Tangerang and Bekasi area. The sampling technique used is purposive sampling. Purposive sampling is one of nonprobability sampling technique in which samples are taken with a certain considerations [16]. The sample in this study is the owner/manager/cashier SME restaurants who have been involved in the implementation phase AIS application for restaurant SMEs before enheanced. Nielsen [17] recommends the number of users to determine the usability is 20 people. The samples taken are 20 samples consisting of owners, managers and restaurant cashier SMEs.

DISCUSSION

Refinement of AIS Application for Restaurants SMEs

Stages that have been implemented in accordance with the System Development Life Cycle [14], consist of the define system goals and scope, requirements analysis, design system components, system implementation and system maintenance. In the phase of defining system goals and scope, we limited development of simple accounting information systems for restaurant SMEs only, which consists of two integrated applications, namely Point of Sales and Simple Accounting System. A small project team of 3 systems analysts and 4 programmers have been formed in this stage to

develop the systems. Project plans have also been set out in this stage.

The next stage in the overall stages is to study the restaurant application available on the market. The results then used to construct a questionnaire to identify the user requirements. Results data from questionnaires then processed using descriptive statistics and Quality Function Deployment method. *Quality Function Deployment* analysis with *House of Quality* that has been done has been through the stage of determining the product attributes by arranging product attributes based on priority (measured by assigning interests weights) that reflects what is expected by consumers/users of the product. The next stage is the product evaluation stage, in this stage software prototype built then compared with the opinion of the respondents who belong to a group of adopters (process benchmarking). The third stage is the Project Objective stage which is done by taking into account comparisons data performance and relatives importance index (weight factor) of product attributes; then we will be able to see the opportunities for improvement that could be done and set it as a goal to be met in product design modification project (project objective). The next stage after the calculations obtained from the above table is the stage of Engineering Characteristics (Technical Parameters). This phase is done by outlining the design of accounting applications in terms of characteristics/technical parameters. The next stage is the Interaction Matrix stage which is the core of QFD. This stage is done by connecting the attributes of a product with technical parameters. The relationship then be evaluated for each cell matrix to know what kind of relationships that happen: a strong-tight (strong), weak (weak) or not related to. From the calculation from the Interaction Matrix, found the technical characteristics that have a priority value less than 1 to be eliminated they are: the use of tablets and some types of reports. QFD analysis also generate User Requirements namely the POS for the customer's order eating at the restaurant, take away, and orders, POS to print the transaction with the cash register printer, POS for payments with credit cards, accounting for all transactions, including the purchase and use of raw materials, as well as accounting for daily routine expenditures, monthly, and yearly in addition to raw materials [18,19].

System design using the Unified Modeling Language (UML) diagrams which consists of 3 diagrams: Use Case diagrams, Activity Diagrams, and Class Diagrams, also there are three actors, namely admin, cashier and waitress. This stage has also produced a draft of accounting information system database for restaurant SMEs. Accounting Information Systems designed according to the results of the previous analysis is the application of Point of Sales (POS) and accounting for restaurant SMEs [4,20,21].

The design afterwards built by a small team with two people build a Windows-based system and two other people build web-based system. Windows-based system is using Microsoft Access 2007 because of the ease and speed in the development of the system and also easy to modify each time there is a demand improvement from user. While web-based system is using PHP with MySQL as the database. This system is devoted to restaurants SMEs that do not use Windows as operating system of their computer. Each system can be directly connected to the POS printer and a regular printer. In summary views of each application that has been built can be seen in Figure

1.

Figure 1: Windows-based application (left) and web-based (right).

Both applications have been implemented to 20 restaurant SMEs. After two to four months using the applications we build, afterwards we distributed evaluation questionnaires for them. The result form questionnaire data processing showed that based on the analysis of IPA (*Importance Performance Analysis)* as follows (Table 1).

Table 1: Performance analysis.

Corrected	Maintained	Ignored	Redundant
• Output of the transaction reports the income statement • Security features of the application	• Point Of Sales Menu • accounting records facilities, • Balance sheet report • Statement of cash flows	• Other report • Maintenance facilities • Other ancillary facilities	• Raw materials reports • Daily reports

Furthermore, the AIS application for restaurant SMEs improved based on the IPA analysis.

Quality Analysis of AIS Application for Restaurants SMEs

Functionality: Based on formative functionality testing by the development team at each literation of AIS application development for restaurants SMEs, functionality test data are summarized into the following Table 2.

Table 2: Functionality testing data summary for TOFTs main function.

Release	Iteration	Past	Fail
A - Administrator	A.1	9	0
	A.2	22	0
	A.3	7	0
B - Cashier	B.1	5	0
	B.2	4	0
C - Accouting	C.1	6	0
	C.2	5	0
D - Staff	D.1	5	0
	Total	**63**	**0**

Based on the summary of the functionality test data for TOFTs main function, total score that passed the TOFTs main function test results obtained in this study was 63. Total score of TOFTs that expected to passed the test in this study is the total score of TOFTs that passed the test plus the total score of TOFTs that fails, i.e. 63 + 0=63. Percentage of AIS applications quality for restaurant SMEs developed in terms of functionality as measured using the instrument of Task-Oriented Functional tests (TOFTs) test case methods, especially for the main functions are:

$$Percentage = \frac{Total\ score\ of\ TOFTs\ that\ passed\ the\ Test}{Total\ score\ of\ TOFTs\ that\ expected\ to\ passed\ the\ test} \times 100$$

$$Percentage = \frac{63}{63} \times 100$$

$$Percentage = 100\%$$

Percentage of AIS applications for restaurant SMEs quality for the main function expressed in numbers is a quantitative measure. Therefore, the percentage interpreted in the form of predicate which refers to the declaration of a state measure of quality. AIS application for restaurants SMEs quality developed in terms of functionality as measured using the Task-Oriented Functional Tests (TOFTs) instrument test case methods, especially for the main functions have a percentage of 100% which means it has a very good predicate(Table 3).

Table 3: Functionality testing data summary for TOFTs support function.

Release	Iteration	Past	Fail
A – Administrator	A.1	8	0
	A.2	20	0
	A.3	6	0
B – Cashier	B.1	5	0
	B.2	5	0
C – Accouting	C.1	4	0
	C.2	4	0
D – Staff	D.1	3	0
	Total	**53**	**0**

Based on the summary of the functionality test data for TOFTs support function, total score that passed the TOFTs support function test results obtained in this study was 53. Total score of TOFTs that expected to passed the test in this study is the total score of TOFTs that passed the test plus the total score of TOFTs that fails, i.e. 53 + 0=53. Percentage of AIS applications quality for restaurant SMEs developed in terms of functionality as measured using the instrument of Task-Oriented Functional tests (TOFTs) test case methods, especially for the support functions are:

$$Percentage = \frac{Total\ score\ of\ TOFTs\ that\ passed\ the\ Test}{Total\ score\ of\ TOFTs\ that\ expected\ to\ passed\ the\ test} \times 100$$

$$Percentage = \frac{53}{53} \times 100$$

$$Percentage = 100\%$$

Percentage of AIS applications for restaurant SMEs quality for the support function expressed in numbers is a quantitative measure. Therefore, the percentage interpreted in the form of predicate which refers to the declaration of a state measure of quality. AIS application for restaurants SMEs quality developed in terms of functionality as measured using the Task-Oriented Functional Tests (TOFTs) instrument test case methods, especially for the support functions have a percentage of 100% which means it has a very good predicate (Table 4).

Table 4: FETs functionality testing data summary.

Release	Iteration	Past	Fail
A - Administrator	A.1	11	0
	A.2	25	0
	A.3	9	0
B – Cashier	B.1	7	0
	B.2	6	0
C – Accouting	C.1	7	0
	C.2	5	0
D – Staff	D.1	6	0
	Total	**76**	**0**

Based on the summary of the FETs functionality test data, total score that passed the FETs test results obtained in this study was 76. Total score of FETs that expected to passed the test in this study is the total score of FETs that passed the test plus the total score of FETs that fails, i.e. 76 + 0=76. Percentage of AIS applications quality for restaurant SMEs developed in terms of functionality as measured using the instrument of Force-Error Tests (FETs) test case methods are:

$$Percentage = \frac{Total\ score\ of\ FETs\ that\ passed\ the\ Test}{Total\ score\ of\ FETs\ that\ expected\ to\ passed\ the\ test} \times 100$$

$$Percentage = \frac{76}{76} \times 100$$

$$Percentage = 100\%$$

Percentage of AIS applications for restaurant SMEs quality for the FETs test expressed in numbers is a quantitative measure. Therefore, the percentage interpreted in the form of predicate which refers to the declaration of a state measure of quality. AIS application for restaurants SMEs quality developed in terms of functionality as measured using the Force-Error Tests (FETs) instrument test case methods, have a percentage of 100% which means it has a very good predicate.

Performance: From the analysis of IPA also known that the performance of AIS on average has exceeded the expectations of consumers with scores of average performance compared to expectations=4.42>4.09. Results of two different test average of two pairs of observation group (t-test: Paired Two Sample for Means), show that there is no average difference between expectations and reality. The survey results further indicate that the AIS had a very good appearance and value of the application performance is very satisfying according to the user.

Usability: Recapitulation of usability assessment given by respondents was conducted using a table to determine the score results of the study as the first step of application quality measurement in terms of usability. The recapitulation results of usability score were calculated using the table, i.e. the number of usability assessment multiplied by the value itself. Scores of research findings in this study was obtained through the calculation in the table, i.e. 2252. The highest expected scores obtained on the assumption that all participants/respondents gave a score of 7 on every statement in Computer System Usability Questionnaire (CSUQ). The highest score is expected is the number of respondents multiplied by seven and the number of statements in the Computer System Usability Questionnaire, namely: the highest expected scores=20x7x 19=2660 (Tables 5 and 6).

Table 5: Summary of total usability ratings provided by respondents.

Statement	Assessment Given							Total
	1	2	3	4	5	6	7	
Statement 1	0	0	0	2	4	9	5	20
Statement 2	0	0	0	0	6	8	6	20
Statement 3	0	0	0	1	7	7	5	20
Statement 4	0	0	0	2	4	8	6	20
Statement 5	0	0	0	1	5	6	8	20
Statement 6	0	0	0	1	7	7	5	20
Statement 7	0	0	0	0	4	5	11	20
Statement 8	0	1	0	2	6	6	6	20
Statement 9	0	0	0	3	4	8	5	20
Statement 10	0	0	1	0	7	8	5	20
Statement 11	0	0	0	2	5	9	4	20
Statement 12	0	0	0	3	4	6	7	20
Statement 13	0	0	0	2	2	8	8	20
Statement 14	0	0	0	1	5	8	6	20
Statement 15	0	0	0	1	5	8	6	20
Statement 16	0	0	0	2	6	9	3	20
Statement 17	0	0	0	1	4	11	4	20
Statement 18	0	0	0	2	3	12	3	20
Statement 19	0	0	0	1	1	11	7	20
Total	0	1	1	27	89	154	110	380

Table 6: Score calculation table of usability research results.

Mark	Number of Vote	Score
1	0	0
2	1	2
3	1	3
4	27	108

5	89	445
6	154	924
7	110	770
Total	**380**	**2252**

The value of usability (x) on the quality measurement of AIS application for restaurant SMEs:

$$X = \frac{Score\ that\ passes\ the\ test\ results}{Highest\ expected\ score} \times 100\%$$

$$X = \frac{2252}{2660} \times 100\%$$

X=0,85

Usability value (x) expressed in numbers is a quantitative measure. Therefore, the usability value (x) interpreted in the form of predicate which refers to the declaration of a state measure of quality. AIS application for restaurants SMEs quality developed in terms of usability as measured using the Computer System Usability Questionnaire (CSUQ) instrument, has a value of usability (x) of 0,85 which means it has a very good predicate.

RESULTS

Based on the results of research and discussion that has been described, it can be concluded as follows:

AIS application for restaurants SMEs developed in this study can be used to perform data processing transactions that occurred in the restaurant, starting from point of sales transactions (POS), as well as the accounting transactions recording which AIS and POS applications already integrated. The result form questionnaire data processing showed that based on the analysis of IPA (*Importance Performance Analysis),* known indicators that must be corrected (the output of the transaction reports and the income statement, as well as the security features of the application), maintained indicators (Point Of Sales Menu, accounting records facilities, the output in the form of balance sheet report and statement of cash flows), ignored indicators (the output of other report, facilities for maintenance and other ancillary facilities) and redundant indicators (output in the form of raw materials reports and daily reports). The corrected, ignored and redundant indicators have improved.

AIS applications for restaurants SMEs developed in this study feasible in solving the problem of financial transactions data processing for restaurant SMEs, supported by the

results of functionality testing by 100% with very good predicate at each Task-Oriented Functional Tests (TOFTs) testing methods against main functions and support functions, as well as methods of Force-Error Tests (FETs). The performance based test results from the analysis of IPA also known that the performance of AIS on average has exceeded the expectations of consumers with scores of average performance compared to expectations=4.42>4.09. Results of two different test average of two pairs of observation group (t-test: Paired Two Sample for Means), show that there is no average difference between expectations and reality. Hasil pengujian usability memiliki nilai usability sebesar 0,85 dengan predikat sangat baik.

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