PROC. INTERNAT. CONF. SCI. ENGIN. ISSN 2597-5250
Volume 3, April 2020 | Pages: 461-465 E-ISSN 2598-232X

Development and Quality Analysis of Laboratory Management Information System Based on CodeIgniter Framework

Rahmawati Nafi'ah[1,*], Adi Dewanto[2], Bambang Sugiantoro[3]
[1,3]Informatics Department, Faculty of Science and Technology, UIN Sunan Kalijaga,
[2]Informatics Education Department, Faculty of Technology, Universitas Negeri Yogyakarta
Email*: rahmawati.nafiah@gmail.com

Abstract. The objectives of the research are designing and create a laboratory information management system (SIMLAB) based on codeIgniter framework, and ensure the software quality based on Web-QEM standarts. It was built to help facilitate the process of laboratory management in SMK X in Yogyakarta City. The problems that occur in SMK X are the recording of inventory, borrowing and returning equipment is still processed manually on books that have not been able to support service flexibility and data security. The type of this research is Research and Development (R&D) with waterfall development model. The phases of this development model include analysis, design, coding, and testing. The analysis stage include literature study, field studies, user analysis, software analysis, and hardware analysis. Planning stages include database design using ERD, interface design, and modeling with UML. Coding stage uses the Code Igniter framework for back-end, Bootstrap framework as a supporting front-end framework, and My SQL relational database. Testing stage uses the quality standards of Web-QEM. The results of this research are (1) laboratory management information system developed by some features: laboratory information, scheduling, guest books, inventory, loan, return, and maintenance equipment. (2) The quality test result of functionality characteristic gave 100% (very suitable), reliability gave 100% (satisfy), usability gave 83.4% (very suitable), efficiency characteristic using YSlow gave 95.2% (very suitable), and using Page Speed gave 95.7% (very suitable) with 0.6 seconds for load time (accepted). Base on the test could be concluded that the laboratory information management system meets the quality standards of Web-QEM.

Keywords: Software Quality, Laboratory Information Management System, codeIgniter, Web-QEM.

INTRODUCTION

SMK X in Yogyakarta City is a vocational school for technology groups that already have ISO 9001: 2008 certificate. ISO 9001: 2008 is one of the quality standards that is currently developing. In this quality standard discusses school management planning. Whereas in the quality standard at SMK X in Yogyakarta City discussed about quality management planning which in the future leads to managerial database-based institutions. Educational institutions see IT as a very interesting tool to make organizational operations more efficient. IT is one of the facilities of educational institutions that are more appropriate in serving customers and satisfying the owners of these educational institutions (share holders). (Rochaety, 2006).

Laboratory management of the Computer and Informatics Engineering Study Program of SMK X in Yogyakarta City is quite good and the laboratory already has sufficient equipment and supporting components. In addition, there is already a schedule for laboratory use, rules of use, borrowing and returning laboratory equipment, and a visitor's guest book.

The recording of inventory, borrowing and returning equipment is still processed manually on books. Tool maintenance and repair programs are not documented. The existing guest book system is still conventional. The weakness of this system is the number of books needed to record and the length of the search process if you want to find information from guests who come. In addition there is no complete documentation regarding laboratory information and equipment for visiting guests. The system have not been able to support service flexibility and data security.

Based on the description above, we need an information system that supports quality management based on database technology in SMK X in Yogyakarta City, especially in the laboratory of Computer and Informatics Engineering Study Programs. The information system is expected to make it easier to manage laboratories digitally, no longer conventionally.

According to Sutabri (2012), a system is a group of elements that are closely related to one another, which functions together to achieve certain goals. In general, information can be defined as the result of managing data in a form that is more useful and more meaningful for the recipient who describes real events that are actually used for decision making (Irmawati and Indrihapsari, 2014).

According to Hariyanto (2008), an information system is a system in an organization that is a combination of people, facilities, technology, media, procedures and controls to get important communication lines, process certain types of routine transactions, give signals to management and others for important internal

and external events and provides a basis for information for decision making.

Ramadhina (2015) explained that management is a process or activity carried out by a person or leader or manager in an organization to achieve a common goal. According to Kristanto (2008) management information systems are "a system that is usually applied in an organization to support decision making and the information produced is needed by all levels of management or in other words information management techniques in an organization".

MATERIALS AND METHODS

Types of Research

This research method uses a research and development approach. According to Borg & Gall (1983) quoted by Emzir (2012), Research and development in education (R & D) is a process used to develop and certify education products. Illustration of stages according to Borg & Gall (Figure 1).

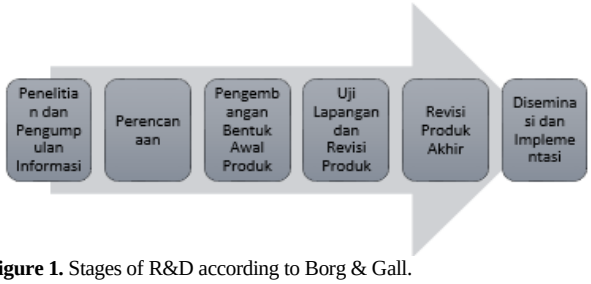

Figure 1. Stages of R&D according to Borg & Gall.

This research uses a software development method with a waterfall process model (Figure 2).

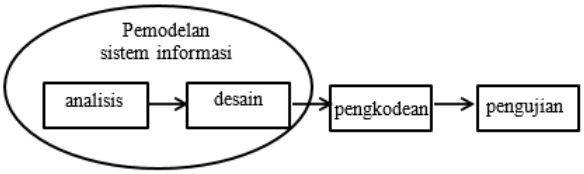

Figure 2. Waterfall model according to pressman.

Research Targets / Subjects

The research subject for testing the aspects of reliability and efficiency is the Laboratory Management Information System developed. The functionality aspect consists of two research subjects, namely the Laboratory Management Information System and expert respondents in software development, while the usability aspect of the research subject is students and teachers.

Procedures

Development procedures include the research and information gathering stage, the planning stage, the initial product development stage, the field testing and product revision stage, the final product revision stage, and dissemination and implementation. The research phase and information gathering are carried out in several analyzes such as literature studies, field studies, user analyzes, software analysis, hardware analysis. Planning stages include database design using ERD, interface design, and modeling with UML.

Stages of developing the initial form of the product is the manufacture of information systems in accordance with the analysis and design that was designed in the previous stages to become the web. ERD that is made is implemented into a database using mysql. Field Test Stages and Product Revision, namely testing information systems so that the quality can be in accordance with existing standards. Testing the information system under study is on the aspects of functionality, reliability, usability and efficiency. Data obtained from the previous stage is then processed and then corrected. After completion, conclusions can be drawn from the research and a report is made. The final stage is disseminating the product / model developed.

Data, Instruments and Data Collection Techniques

Data collection techniques using observation and cookies. Observations were made to determine the quality of the software on aspects of reliability and efficiency. Questionnaires are used for aspects of functionality and usability that are tested by involving software development experts and users. Then the data is analyzed according to the Web-QEM standard.

Data analysis technique

Analysis techniques in the aspect of functionality using descriptive analysis techniques, namely analyzing the percentage of test results for each function performed by experts. The percentage is obtained with the following calculation:

$$Percentage\ of\ Eligibility\ (\%) = \frac{Observation\ score}{Expected\ score}\ x\ 100\%$$

After getting the presentation results from the previous calculation, then the data is converted into a statement using the linkert scale. Percentage conversion to statements as in Table 1 (Riduwan, 2011).

Table 1. Likert percentage conversion scale.

Percentage	Interpretation
0% - 20%	Very Weak
21% - 40%	Weak
41% - 60%	Enough
61% - 80%	Strong
81% - 100%	Very Strong

In order to convert percentage into statement form more in line with the research conducted, the percentage conversion scale above is adjusted according to interpretation. Adjustment of the interpretation is due to this research conducting the feasibility test of the

software being developed. The percentage conversion scale is adjusted to as in Table 2.

Table 2. Adjusting for Linkert Interpretation.

Percentage	Interpretation
0% - 20%	Very Inadequate
21% - 40%	Not feasible
41% - 60%	Decent enough
61% - 80%	Worthy
81% - 100%	Very decent

The reliability analysis technique was tested using WAPT 8.1 software (load, stress and performance testing of web sites). The results of testing using this tool will produce success rate and failure rate values. The success rate is then analyzed using descriptive analysis techniques adjusted to the Telcordia standard of the percentage of eligibility obtained. According to Asthana & Olivieri (2009: 3) in Telcordia Standards, software reliability is said to pass if a minimum of 95% or 0.95 applications can run well when stress tested using WAPT.

The usability aspect analysis technique is carried out using a questionnaire method (questionnaire) referring to the Computer System Usability Questionnare (CSUQ) or Post-Study System Usability Questionnare (PSUQ) developed by J.R.Lewis (Lewis: 1992). The results were then analyzed using descriptive analysis techniques adjusted to the Likert scale interpretation (Table 2). The efficiency aspect analysis technique is done with Yslow and PageSpeed tools, both tools will calculate the load time for each web page. According to Nielsen (2010), a good load time is less than 10 seconds

RESULTS AND DISCUSSION

Based on the RnD research model and the waterfall development model that has been done using the following results are obtained:

Result-1 Design

Database design using ERD, interface design, and modeling with UML. The design of the software model used is class diagram, use case diagram, activity diagram, and sequence diagram. Use case diagrams in the Laboratory Management Information System can be seen in Figure 3.

Members can manage profiles and borrow equipment through use case logins. Operators can manage profiles, items, reports and contacts by logging in first. Similarly, the admin, can manage the entire system data by logging in. Admin can manage users, members, goods, static pages, lending goods, goods maintenance, reports and contacts. The implementation phase is divided into three parts: database implementation, program implementation, and interface implementation. The database implementation in the form of a table is shown in Figure 4.

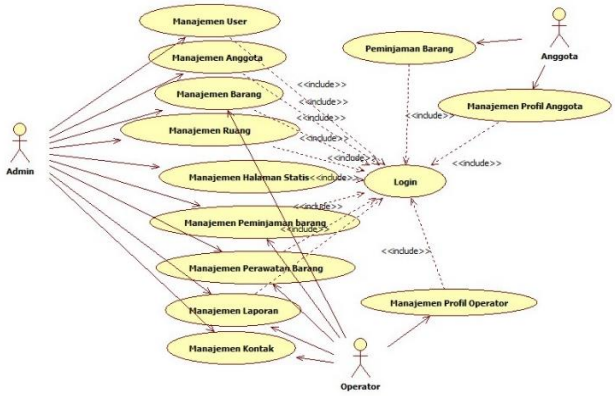

Figure 3. Use case diagram.

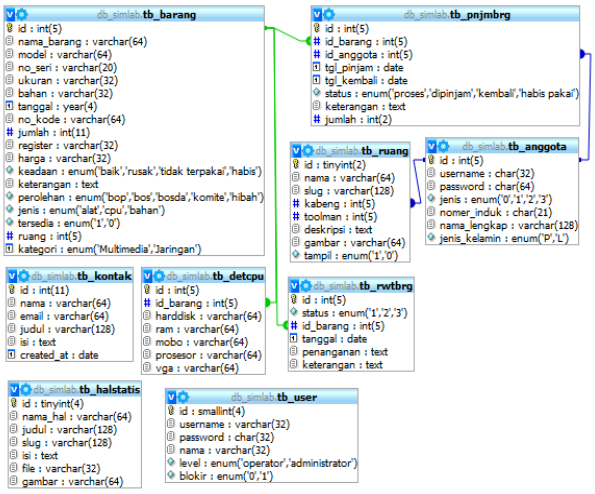

Figure 4. Database Implementation.

This database consists of 9 tables, namely the items table, space, guest book, static pages, members, users, care items, CPU details and loan items. The program and interface implementation uses the Sublime Text 2. Text editor. The system was developed with the CodeIgniter and bootstrap frameworks. The interface implementation can be seen in Figure 5 through Figure 7.

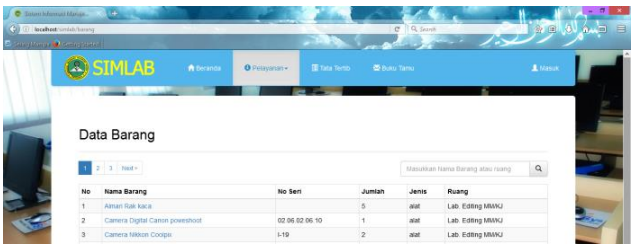

Figure 5. Equipment page.

On the main page of the web there are several pages such as the homepage, data items, laboratories, tool maintenance, ordering and guest book.

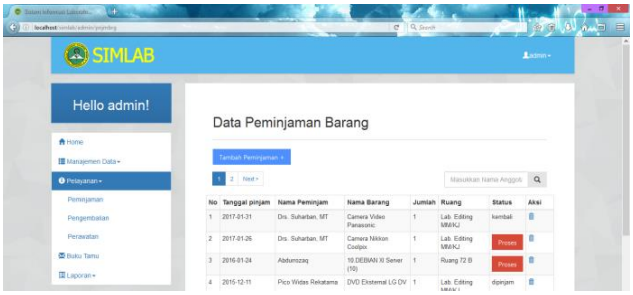

Figure 6. Borrowing menu page.

After logging in for the admin user there is a data management menu for users, students, teachers, items, static pages, borrowing and returning equipment, tool maintenance, guest books and reports.

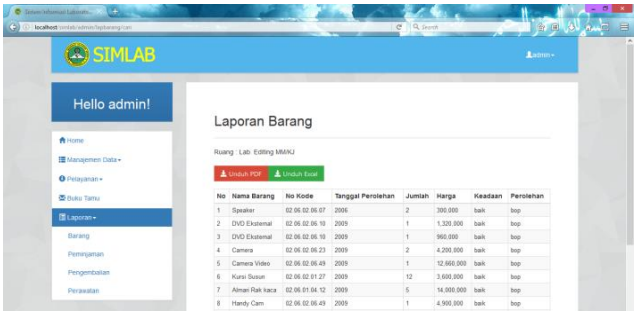

Figure 7. Item report menu page.

Result-2

Software testing is tested using Web-QEM software quality standards which include aspects of functionality, reliability, usability, and efficiency. In the aspect of functionality get 100% value. By using a Likert scale (table 2), the percentage of eligibility of 100% in the Laboratory Management Information System is included in the Very Eligible category.

The recapitulation results of the efficiency aspect testing using Gtmetric based on Yslow produced an average of 95.2%, PageSpeed produced an average of 95.7% and a total average response time of 0.6 s. Based on an assessment of Nielsen's response time, the web is said to be good if it can be received in less than 10 seconds. So it can be concluded that the system has a good performance.

The results of a score of 95.5% based on table 2, the efficiency aspects of the Laboratory Management Information System are included in the category Very Eligible. The results of the score 83.4% based on table 2, aspects of usability included in the category Very Eligible.

The results of testing aspects of reliability using WAPT 8.1 software are 100%. The Telcordia standard states that software meets the reliability aspect if it produces a success percentage of ≥95% or 0.95. The results of a score of 100% based on telcordia standards, then the reliability aspect has been fulfilled.

Discussion

Laboratory management of the Computer and Informatics Engineering Study Program at SMK X in Yogyakarta City was developed using the CodeIgniter framework with the R&D research method and the waterfall development model. This laboratory management information system has features: Laboratory information, scheduling, guest books, inventory, loans, returns and equipment maintenance. With these features it is expected that this information system can make management more efficient and effective.

The quality of the software is tested based on Web-QEM, namely the aspects of functionality, efficiency, reliability, and usability. The percentage results on the functionality aspect are 100% (Very Eligible), the reliability aspect is 100% (Fulfilled), the usability aspect is 83.4% (Very Eligible), the efficiency aspect with YSlow is 95.7% and with a Page Speed of 95, 2% (Very Eligible) and a waiting time of 0.6 seconds (Accepted). From the test results it can be concluded that the laboratory management information system meets the Web-QEM quality standards.

ACKNOWLEDGEMENTS

The author would like to thank the management of the Computer and Informatics Engineering Study Program, Informatics Education and Informatics Department for guidance during research and in writing papers.

REFERENCES

A Asthana., & J.Olivieri. 2009. Quantifying Software Reliability and Readiness. Communications Quality and Reliability. CQR 2009. IEEE International Workshop Technical Committee on Westford: IEEE.

Andri Kristanto. 2008. Perancangan Sistem Informasi dan Aplikasinya. Yogyakarta: Gava Media.

Dessy Irmawati dan Yuniar Indrihapsari. 2014. Sistem Informasi Kearsipan untuk Meningkatkan Kualitas Pelayanan. Jurnal Pendidikan Teknologi dan Kejuruan Vol 22, No 2 : 136-147.

Didik Hariyanto. 2008. Pengembangan Sistem Informasi Akademik Mahasiswa Berbasis Teknologi WAP (Wireless Application Protocol) di Jurusan Pendidikan Teknik Elektro FT UNY. Jurnal Pendidikan Teknologi dan Kejuruan Vol 17, No 2 : 139-166.

Dr. Riduwan, M.B.A. 2011. Belajar Mudah Penelitian untuk Guru-Karyawan dan Peneliti Pemula. Bandung: Penerbit Alfabeta.

E. Rochaety, P Rahayuningsih., & P. G. Yanti. 2006. Sistem Informasi Manajemen Pendidikan. Jakarta: Bumi Aksara.

Jakob Nielsen. 2010. Website Respose Time. www.nngroup.com/articles/website-response-times/.

M. Martin, & L. Olsina. 2003. Towards an Ontology for Software Metrics and Indicators as the Foundation for a Cataloging

Web System. Proceedings of the First Latin American Web Congress. America: IEEE Computer Society.

Syahrina Ramadhina. 2015. Pembuatan Sistem Informasi Manajemen Bengkel di Sekolah Menengah Kejuruan Negeri 3 Yogyakarta. Jurnal Pendidikan Teknologi dan Kejuruan Vol 22, No 3: 324-338.

Tata Sutabri. 2008. Analisis Sistem Informasi. Yogyakarta : Andi Offset.

THIS PAGE INTENTIONALLY LEFT BLANK