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Development and Quality Analysis of Web-Based Information Systems

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ABSTRACT

With theThis study aims to develop a web-based seminar management information system and determine the quality level of the developed web-based seminar management information system, while the research method used in this study is Research and Development (R&D) with a waterfall development model that refers to software engineering principles. The stages that are passed are communication (communication), planning (planning), modeling (modeling), construction (construction), and distribution (deployment). Software quality analysis is carried out by adopting the ISO 25010 standard, namely aspects of functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability. The results of this study are 1) the seminar management information system was built using the PHP programming language and the Postgre database. The frameworks used are CodeIgniter and Admin LTE (Bootstrap). This information system has 7 user levels, namely administrator, committee (committee), reviewer, main speaker (presenter), second speaker (non-presenter), participant (audience), and visitor (guest). 2) the results of the analysis of software quality by adopting the ISO 25010 standard are as follows (1) function suitability aspects with 100% success; (2) the aspect of performance efficiency obtained a Yslow score of 92.97 (grade A); (3) the compatibility aspect can run well on the 4 tested web mails (4) the usability aspect obtained a raw SUS score of 73.00, acceptability ranges with acceptable results, grade scale with C results, and adjective ratings with good results (5) reliability aspects with 100% result; (6) security aspect with the result that the security vulnerability is at level 1 (low); (7) the maintainability aspect with the results of the maintainability index 90.81 (high category) (8) the portability aspect can run well on the 5 web browsers tested.

1. Introduction

The Department of Electronics and Informatics Engineering Education (JPTEI) is one of the majors in the Faculty of Engineering, Yogyakarta State University. One of the work programs in the Department of Electronics and Informatics Engineering Education is a national seminar called ELINVO (Electronic Informatic and Vocational Education). ELINVO seminar activities are held every year and have been started since 2015. The purpose of the ELINVO seminar is to develop electronic and informatics knowledge for Academics of Electronic Engineering Education and Information Engineering Education. This seminar activity

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is intended for S1/D3 students, Masters students, and the general public who want to add insight into electronics and informatics (Purba & Panday, 2015; Alomari et al., 2019; Achmad, 2021).

Before the ELINVO seminar was held, administrative processes were carried out, such as registration of participants and presenters, payment of seminar tickets, delivery of papers, and assessment of papers. The registration process for seminar participants is as follows (1) participants make payments through bank accounts (2) participants confirm payment by sending proof of payment via email (3) participants register via sms. As for the registration flow for presenters, it is carried out in several stages including (1) presenters send papers by email (2) papers assessed by reviewers (3) announcement of papers received (4) making payments through bank accounts for presenters whose papers accepted (5) the presenter confirms the payment by sending proof of payment. via email and lastly (6) the presenters send revised papers via email (Alhendawi & Baharudin, 2014; Salam & Farooq, 2020).

There are several obstacles experienced during the seminar administration process, namely, administrative procedure errors often occur due to using different paths, data discrepancies caused by participants and presenters who register repeatedly, and the length of the paper assessment process because it is still using the manual method, so it is necessary to check the data repeatedly to determine the right paper for the seminar.

So to minimize some of the obstacles and problems in these activities, the committee made an alternative by issuing a program in the form of a web-based seminar management information system, where this program is a system that is responsible for processing data to produce information that can be used in planning and controlling activities. In seminars, the resulting information is displayed in a web page so that it can be accessed by anyone who is looking for or needs that information. What is meant by planning and controlling in a web-based seminar management information system are administrative activities that involve participants, presenters, and seminar organizers. These administrative activities include registration, payment, collection of papers, and others related to seminar activities (Wahyuni & Irawan, 2020; Komenda et al., 2020; Jeong & Gonzales, 2020).

The Seminar Management Information System was developed using several software including Nginx as a web server, Postgre as a database server, PHP as a server-side programming language, CodeIgniter as an application framework, Admin LTE (Bootstrap) as a display framework, Web-based applications can run well if supported by web servers. Web-based applications run using the HTTP (Hypertext Transfer Protocol) protocol. HTTP is a communication standard that manages requests and responses between web browsers running from the user's side and the web server. A web browser is a software or program that displays web information in the form of a page, while a web server is a program that is responsible for receiving HTTP requests from clients, who usually use a web browser and serve in the form of web pages, which are usually HTML documents. This Seminar Management Information System is used to facilitate access to information and management related to ELINVO Seminar activities in the Department of Electronics and Informatics Engineering Education. This information system was developed through several stages, namely, communication (communication), planning (planning), modeling (modeling), construction (construction), and distribution (deployment) (Rakhmadian et al., 2017; Rahardja et al., 2020; Korotun et al., 2020).

This research began with communication with the organizers of the ELINVO Seminar and obtained several problems, namely: (1) frequent administrative procedure errors; (2) frequent data discrepancies; (3) the length of the assessment process for papers; (4) the absence of a Web-based Seminar Management Information System (5) the system created needs to be tested to determine the level of quality of the system, as a web-based software application, the Seminar Management Information System is expected to meet software quality standards by adopting the ISO 25010 standard, namely aspects of functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability (Tulodo & Solichin, 2019; Nobakht et al., 2020; Meade & Dreyer, 2020).

Quality testing is carried out using predetermined instruments for each aspect tested. Therefore, through the seminar management information system program, it is hoped that seminar activities can run properly and can avoid various problems that often occur. After obtaining alternative solutions, then planning is done by making a schedule to estimate the time of making software. Then do the modeling by analyzing the software requirements and designing the characteristics of the software. The next stage of construction, namely by changing the design that has been made previously into the final form of the system in the form of a web page. Making the application at the construction stage using the Codeigniter framework. At the construction stage, tests were also carried out in the form of blackbox testing and whitebox testing, this test was carried out to

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ensure that the program was in accordance with the design that had been made. The last stage is the distribution or submission of applications to users so that they can be used to manage seminars.

2. Method

The research method used in this research is research and development. Research and Development is a research method used to produce certain products, and test the effectiveness of these products (Maturidi, 2014). The results of the research are in the form of an analysis of functional requirements, an analysis of the need for development tools and an analysis of the quality of the ISO 25010 software which includes aspects of functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability. While the results of the development in the form of a Web-Based Seminar Management Information System. The product development procedure in this study uses the waterfall model which refers to the rules of software engineering. in which there are stages through which communication (communication), planning (planning), modeling (modeling), construction (construction), and distribution (deployment). The communication stage is the stage that aims to collect data. The data is in the form of problems that occur related to the implementation of the seminar.

The data collection was carried out using a literature study. This literature study is carried out to collect research results and other information from books, journals, articles, internet and other documents related to the product to be developed. After getting enough data, the next step is to analyze the data to get the specific needs and functionality requirements of the software to be developed. while the data collection methods in this study were obtained from observations, interviews, questionnaires (questionnaires), and software measurement (software testing). While the data collection tool consists of software testing instruments by adopting the ISO 25010 standard which includes aspects of functional suitability, performance efficiency, compatibility, usability, security, reliability, maintainability and portability.

3. Results and Analysis

3.1 Web-based Seminar Management Using Interface Design

The function of the interface design is used to describe the design of the web page interface to be created, besides that the interface design is made to determine the layout or position of each element on a web page (Wijaya & Christian, 2019).

a. Home Page Design

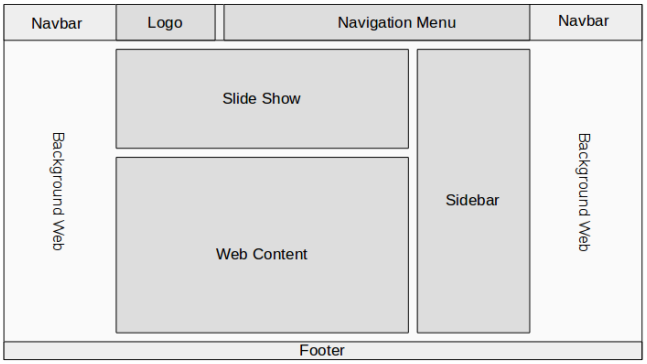

Fig 1. Home Page Interface Design

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b. Registration Page Design

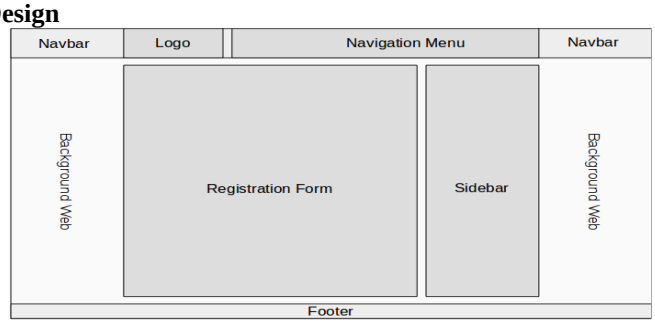

Fig 2. Registration Page Interface Design

3. Design of Participants and Presenter Pages

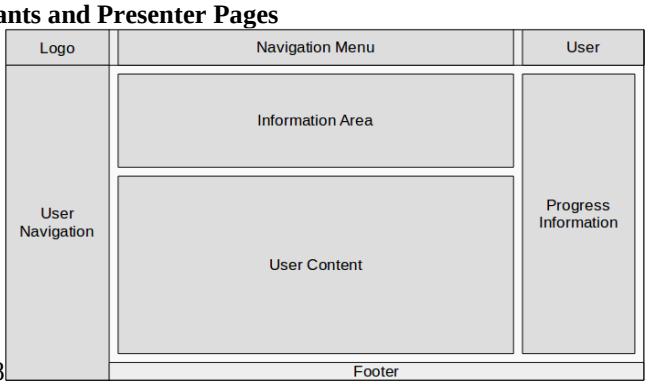

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Fig 3. Interface Design of Presenter Participants

3.2 Code Testing Based on whitebox testing

The tests carried out during construction are unit testing, integration testing, functional testing, and acceptance testing. Unit testing and integration testing are carried out using the whitebox testing method, which is testing the parts and control structure of the program to ensure that all statements in the program have been executed at least once during testing with logical conditions.

Fig 4. Is an example of whitebox testing results

Functional testing is carried out using the blackbox testing method, which is to test all the functions that exist in the system

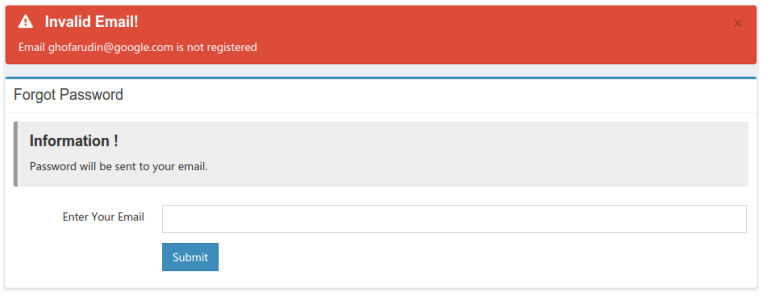

Fig 5. Above is an example of the results of blackbox testing for the login function.

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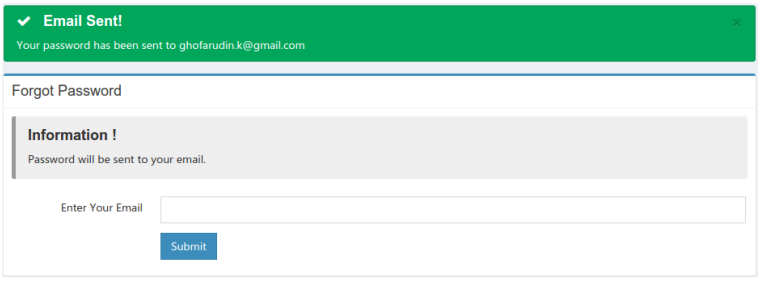

Fig 6. Blackbox Test Results Using Valid Email

Acceptance testing is carried out by adopting the ISO 25010 testing standard which consists of 8 aspects, namely: functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability.

3.3 Functional Suitability Test Results on Web-based Seminar Management

Functional suitability testing was carried out by 3 experts (expert judgment) using a questionnaire in the form of a checklist of functions contained in the seminar management information system that had been developed. The results of the functional susability test that have been carried out by the expert are as follows:

Table 1
Functional Suitability Test Results

No	Tested Functions	Test result
1	Registration Function	Success
2	Login Function	Success
3	Function Forgot Password	Success
4	Profile Function	Success
5	Upload payment proof function	Success
6	My Ticket Function	Success
7	Logout Function	Success
8	Fullpaper Upload Function	Success
9	Revised Paper Upload Function	Success
10	Slide Manager Function	Success
11	Functions of Manage Administrator	Success
12	Manage Committee Function	Success
13	Manage Participant Function	Success
14	User Functions	Success
15	Deadline Setting Function	Success

Based on the results of the percentage of eligibility for functional suitability testing, it can be calculated as follows: $=Skoryangdidapatkan Skor Maksimal \times 100\%$

=156156×100%=100%. Based on the results of the above calculations, the percentage of eligibility is obtained at 100%. The percentage results after being converted to a Likert scale obtained a very good category for the functional suitability aspect (Bilgic et al., 2020; Chen et al., 2020).

3.4 Performance Efficiency Test Results

Testing the performance efficiency aspect is done by using the YSlow application. The results of the YSlow measurement are grades from A to F and performance scores from 1-100.

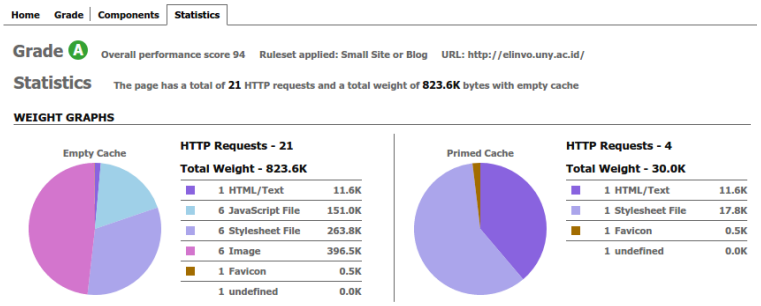

Fig 7. YSlow Test Results Home Page

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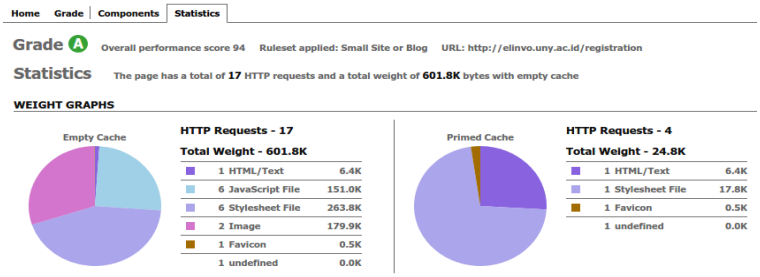

Fig 8. YSlow Test Results Registration Page

3.5 Compatibility Test Results

Testing the compatibility aspect is done by using various kinds of web mail which are usually used by users to send emails. Testing is done by registering to the system using email services provided by web mail such as Google Mail, Yahoo Mail, Microsoft Mail, and UNY Mail. The test is said to be successful if it successfully registers and gets a verification email from the system to activate the account.

The test results for each tested web mail can be seen in the following table:

Table 2

Registration Test Results with Web Mail

No	Web Mail	Registration Results
1	Google Mail	Success
2	Yahoo Mail	Success
3	Microsoft Mail	Success

Based on the test results in the table above, the seminar management information system has met the compatibility aspect for web mail Google Mail, Yahoo Mail, Microsoft Mail, and UNY Mail (Widiyanto, 2018). So that seminar participants and speakers can register for the seminar using the email account provided by the web mail.

3.6 Portability Test Results on Web-based Seminar Management System

Portability testing is done using the CrossBrowserTesting application. The Cross Browser Testing application is a cross-browser testing tool that facilitates viewing of different versions of web browsers.

Table 3.

CrossBrowserTesting . Test Results

No	**Web Browser**	**Test Results**	**Information**
1	Google Chrome		Success
2	Mozila Firefox		**Success**

No	Web Browser	Test Results	Information
3	Internet Explorer		**Success**
4	Opera		**Success**
5	Sapari		**Success**

Based on the test results using the Cross Browser Testing tool for the Web-based seminar management system for the Web-based seminar management system, the test results can run well as well as on the Google Chrome, Mozilla Firefox, Internet Explorer, Opera, and Safari web browsers.

4. Conclusion

Based on the results of research and discussion on the development and analysis of the quality of the seminar management information system in the Department of Electronics and Informatics Engineering Education, it can be concluded as follows, the seminar management information system was developed to manage seminar activities in the Department of Electronics and Informatics Engineering Education (2) Information system seminar management is built with the PHP programming language and Postgre database, while the framework used is CodeIgniter and AdminLTE (Bootstrap). This information system has 7 user levels, namely administrator, committee (committee), reviewer, main speaker (presenter), second speaker (non-presenter), participant (audience), and visitor (guest).

As for the quality of the seminar management information system at the Department of Electronic and Informatics Engineering Education, it was tested by adopting the ISO 25010 standard which consists of 8 aspects with the following results (1) Testing the function suitability aspect with 3 experts obtaining a success percentage of 100% in the very good category. (2) The performance efficiency test using the Yslow application got a score of 92.97 with grade A. (3) The compatibility test using Google Mail, Yahoo Mail, Microsoft Mail, and UNY Mail worked well. (4) Usability testing with 20 respondents using the SUS standard resulted in a raw SUS score of 73.00 with the category of acceptability ranges in the acceptable range, grade scale obtaining C results and adjective ratings getting good results. (5) Testing reliability using the WAPT application obtained 100% results. (6) Security testing using the Acunetix application obtained the result that the security vulnerability level was at level 1 low (low). (7) Testing the maintainability using the PHPMetrics application obtained a maintainability index of 90.81 with a high category and the last one (8) Testing the portability aspect

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using the CrossBrowserTesing application with the results that the system can run well on web browsers Google Chrome, Mozilla Firefox, Internet Explorer, Opera and Safaris.

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