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Designing A Web Based E-Rapor Information System Using SDLC Method

Wahyuni[1], Faiza Rini[1], Adlia Alfiriani[1]

[1]Universitas PGRI Sumatera Barat, Padang, Indonesia

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Correspondence

E-mail: ayu.putri.ita@gmail.com*

A B S T R A C T

In the context of present educational challenges, the significance of computer technology is growing, aiming to improve administrative efficiency and communication among schools, teachers, and parents. Thus, it is essential to assess its influence on shaping a more contemporary and efficient education system, specifically in handling student grades through the adoption of web-based e-rapor systems. This research aims to simplify the teacher's task in administering student grades, reducing the time burden required in this process. The development method used is SDLC with a waterfall model. Data was obtained through field research, through observation and interviews. The research results show that this system is considered very good, with an average percentage of assessments by experts reaching 84.17%. Component assessment also shows good performance, such as functionality (87.5%), reliability (79.17%), usability (82.14%), efficiency (81.25%), maintainability (100%), and portability (75%). System users also gave very good ratings, with an average rating percentage reaching 86.36%. User component assessments include website appearance (85%), website menu (87.5%), website content (86%), user friendliness (83.33%), and usefulness (90%). The results of this research indicate that the web-based e-rapor information system is very suitable for use with excellent performance, responding to the demands of current educational needs.

1. Introduction

As time progresses, technology is advancing rapidly and has permeated all aspects of life, including the field of education. Schools that aim to continuously improve the quality of education are now implementing computer technology to enable users to quickly access information, especially in the processing of student grades. According to Brunch and Gary Grundnifshi [1] Information is data placed in a more meaningful and useful context that is communicated to recipients for use in decision making. Currently, inputting student grades on report cards at Tamansiswa Padang Vocational School has used a web-based information system in the form of an online report card system that is integrated with the Ministry of Education and Culture. However, there are still shortcomings in this system in the form of incomplete features in it. Where this system only provides a place to input exam grades and does not provide a place for teachers to input daily grades. This is a problem for teachers because the score register book that has been prepared in such a way is lost.

Processing student grades is one of the teaching and learning activities in schools which is the most important part because it will be a measuring tool for student learning outcomes and achievements [2] one of these value processing systems is a web-based e-rapor information system, where this system can be accessed online anytime and anywhere, as for the definition of report cards, according to Dimyati and Mudjiomo [3] namely the results obtained in the form of numbers or scores after being given a test at the end of each lesson. Meanwhile, according to Wasty, e-rapors [4] is The concept of manipulating student grade data via electronic media networks is aimed at aiding teachers in the grading process and facilitating the calculation of grades through the established system. This system can be defined through two approaches: the procedural approach and the component approach [5].

The e-rapor research itself has been carried out previously by previous researchers, including the following: (1) Research by [6], the research concluded that e-rapors are a system that can support improvements in work so that the value input process is more effective and efficient; (2) Research by [7], concluded that an e-rapor is a website-based information system that can help users with academic activities at school; (3) Research by [8], Concluding that e-rapor is an information system that can assist and facilitate users in receiving quickly updated learning outcomes information; (4) Research by [9] concluded that the e-report information system is suitable to be implemented to facilitate the process of processing student learning outcomes. This research uses the Extreme Programing (XP) research method; (5) Research by Concluding that the e-rapor information system, based on the application, simplifies data input and student grading for teachers and staff, thus enhancing the productivity and effectiveness of teacher performance. This system is designed using the SDLC development system with the waterfall method (6) Research by [4] Concluding that the development process of the student daily grade management information system was constructed using a website, resulting in the processing of daily grade data The system development method used is extreme programming. The system that has been built by previous researchers only provides a form for filling in daily grades and printing report cards and the system that will be built next will be equipped with a student card printing form.

Considering the mentioned challenges and research findings, there's a necessity for an independent school-based system capable of managing grades, starting from classroom teaching to report card generation. Hence, this research aims to create a distinct web-based e-rapor information system different from its predecessors. While previous systems solely allowed teachers to enter final grades, this new system will enable teachers to input daily grades, produce reports, and generate student ID cards. The novel aspect compared to prior systems developed by researchers is the addition of a feature to print student ID cards. This enhancement empowers teachers to issue ID cards to students for their identification outside school hours during regular class schedules.

2. Method

The research method used to design a Web-Based E-rapor Information System at Tamansiswa Padang Vocational School is the System Development Life Cycle (SDLC) method with a waterfall model [11] which consists of several stages, including: (1) Planning is the stage for determining the scope that needs to be carried out in system development; (2) Analysis, is the stage of analyzing the system's functional requirements; (3) Design, is the stage for creating a system design plan; (4) Implementation is the stage taken to complete the system design that has been created previously; (5) Testing is the stage of testing whether the system functions as expected, and (6) Maintenance is the stage of maintaining system functions so that they continue to work according to their function.

2.1. System Planning

The web-based e-rapor information system planned for SMK Tamansiswa Padang is intended to assist teachers in managing student grades efficiently and allow students to track their learning progress conveniently from any location and at any time. The research employs the data collection method of field

studies to conduct: (1) Observation involves collecting data by directly observing the object under study, which in this case is SMK Tamansiswa Padang; (2) Interviewing is a data collection process that involves asking questions to relevant parties (informants) to support conflicts and generate data or information that will be used as support for the design of the information system.

2.2. Systems Analysis

System analysis is the process of comprehending and detailing what needs to be achieved by the web-based e-rapor information system at SMK Tamansiswa Padang. Its purpose is to identify all issues occurring within the system to enable improvements. There are two types of information system analyses designed: the analysis of the current system, conducted to understand the constraints experienced by users, and the proposed system analysis, aimed at addressing the issues in the existing system by constructing a new system to fulfill the system's requirements [11].

2.2.1 Current System Analysis

This phase is conducted to identify the constraints within the existing system so that researchers can understand how to improve the system and design new objectives for the improved system. Based on the observations and assessments carried out at SMK Tamansiswa Padang, it was found that the available information system lacks a form for teachers to input daily student grades, such as practical scores, quizzes, final exams, mid-term exams, and other grades, or the daily student grade list is still manually written (not computerized). Consequently, it is common for teachers to maintain grade records in paper-based grade sheets. To address this issue, it is time to update and renovate the system to resolve the existing problems in the school.

First, users analysis. In the design of this web-based e-rapor information system, the aim is to address the issues experienced by users. Several users involved in this information system are as follows: (1) Admin: Responsible for managing all information within the e-rapor information system, including teacher and student data; (2) Teachers: Users who can access the website to input the grades obtained from students' learning outcomes; and (3) Students: Users who can access the website to track and observe their academic progress and development.

Second, program analysis. In broad terms, the system's operations include entering, showcasing, storing, deleting, and altering data. Within the upcoming system design, there will be data input procedures concerning teachers and students linked to the e-rapor system.

Third, procedure analysis. During this phase, there are several procedures established to enable the system's utilization and access by the respective users. These include processes for inputting data, displaying data, storing data, deleting data, and modifying data.

Fourth, system requirements analysis. Consists of functional requirements and non functional requirements. Functional requirements refer to the services provided by the system, how the system should respond to specific inputs, and its behavior in particular situations. The analysis of the system's functional requirements is outlined as follows: (1) The system can be accessed by users when they wish to log in; (2) Users can access the dashboard page and its corresponding menus based on their respective access rights. Non functional requirements focus on the behavioral characteristics of the system.

2.2.2 Analysis of the Proposed System

During this phase, efforts are undertaken to resolve existing system issues by designing a new system that caters to the system's requirements. The introduction of this new system aims to streamline teachers' management of student grade data and enable students to access their grades and academic progress via the internet. The proposed functionalities for the new system include: (1) Administrator: Responsible for managing all information within the e-rapor system; (2) Teachers: Granted individual accounts to input

students' learning outcomes via the website; and (3) Students: Given individual accounts to access the website, view their academic progress, track their learning outcomes, and independently generate and print their report cards.

2.3. System Design

System design focuses on structuring, building the system's architecture, and designing the interface. This phase transforms the system requirements from the system requirement analysis stage into a visualized design to be implemented as a program in the subsequent phase [12].

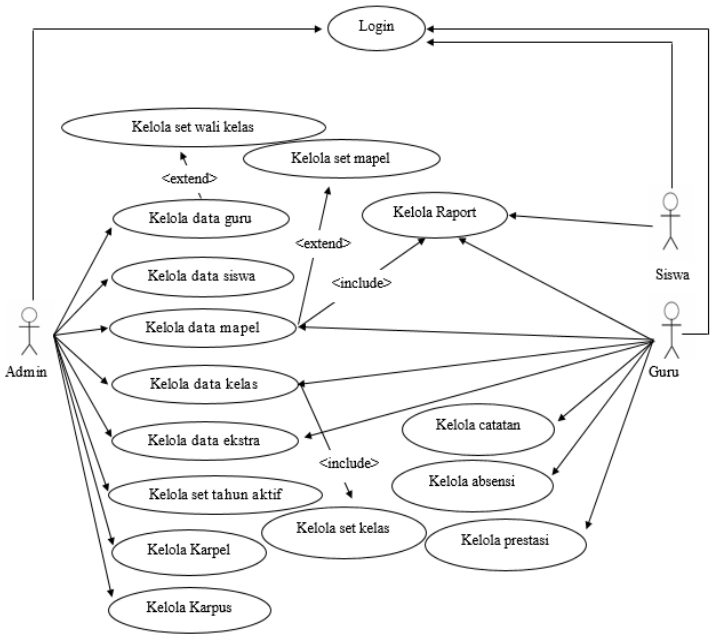

Figure 1. Use Case Diagram

In Figure 1, the use case diagram for the e-rapor information system describes that there are 3 actors who play a role in the system, namely: admin, teacher and students. The admin has all access rights contained in the e-rapor information system, while teachers and students can only have certain access to the system according to what is determined by the admin.

2.4. System Testing

2.4.1 Alpha Testing

Alpha testing is testing carried out on applications towards the end of the product development process when the product is almost usable. Alpha testing consists of blackbox testing and whitebox testing.

Black Box Testing is a black box carried out by creating test cases that try out all functions using the software to see if it meets the required specifications [13]. Blackbox Testing refers to a type of testing that treats software as a closed box, without knowledge of its internal workings. Testers view the software as a black box where the internal structure isn't crucial to examine; rather, the focus remains on evaluating its external functionalities and behavior [14].

White-box testing is a method of testing an application that involves examining the internal structure, control flow, and logic of the software. Test cases are designed based on this knowledge of the internal code to ensure thorough testing of various components and paths within the application [12].

2.4.2 Beta Testing

Beta testing is a direct real-world testing method aimed at assessing the quality and suitability of a developed product. It involves evaluating whether the product meets the required standards and the

system's feasibility based on criteria. This testing phase directly engages system users by distributing questionnaires consisting of 5 criteria (website appearance, website menu, website content, user-friendliness, and benefits) to gather feedback[11].

Meanwhile, testing to system experts was also carried out directly by distributing questionnaires consisting of 6 criteria [11] : (1) Functionality is the software's ability to provide functions that meet user needs; (2) Reliability refers to a product's ability to maintain performance under specified conditions for a predetermined period; (3) Usability is an attribute measuring the system's satisfaction perception for a set of users; (4) Efficiency is the software's ability to deliver proper performance using the necessary amount of resources; (5) Maintainability is the measure of a system's ability to be maintained and repaired; and (6) Portability is a product's capability to be moved from one environment to another.

To assess the test results, a validation sheet with a Likert scale is used, offering four levels of feasibility: Very Good, Good, Not Good, Very Not Good. Below is the formula used to calculate the questionnaire [15] :

$$Y = \frac{\sum (N.R)}{Skor\ Ideal}\ x\ 100\%$$

Information:

Y = Percentage Value sought

N = Value of each answer

R = Ideal Score Frequency = number of questions or assessments

3. Results and Discussion

Following the analysis and design phase discussed in the previous chapter, the subsequent step is implementing the system. This phase involves finalizing a previously created task or program using approved tools to test a new system and achieve the desired end result. System implementation marks the last stage of preparing a well-designed system to be operational and simplify data input based on predefined procedures. The implementation process necessitates interface design and utilizing pre-planned program codes. System implementation encompasses system requirement specifications, including software implementation, hardware implementation, and programming implementation.

Software implementation, software constitutes digitally stored information comprising computer programs and associated documentation, utilized to manage hardware. In particular, the necessary software essential for facilitating the operation of the web-based e-rapor information system at SMK Tamansiswa Padang includes: browser application (google chrome, mozilla firefox, opera, uc browser, and others), operating system (windows, linux, macos, dan android).

Hardware implementation, hardware is a component that has a physical form that can be held and seen to build a computer system that allows it to carry out its tasks. The hardware used to support the web-based e-rapor information system at SMK Tamansiswa Padang includes: laptop and PC (Personal Computer), smartphone (android, iOS).

Programming implementation, program implementation is the stage carried out to carry out the program that has been created to find out the expected design results. Figure 2 is the login page.

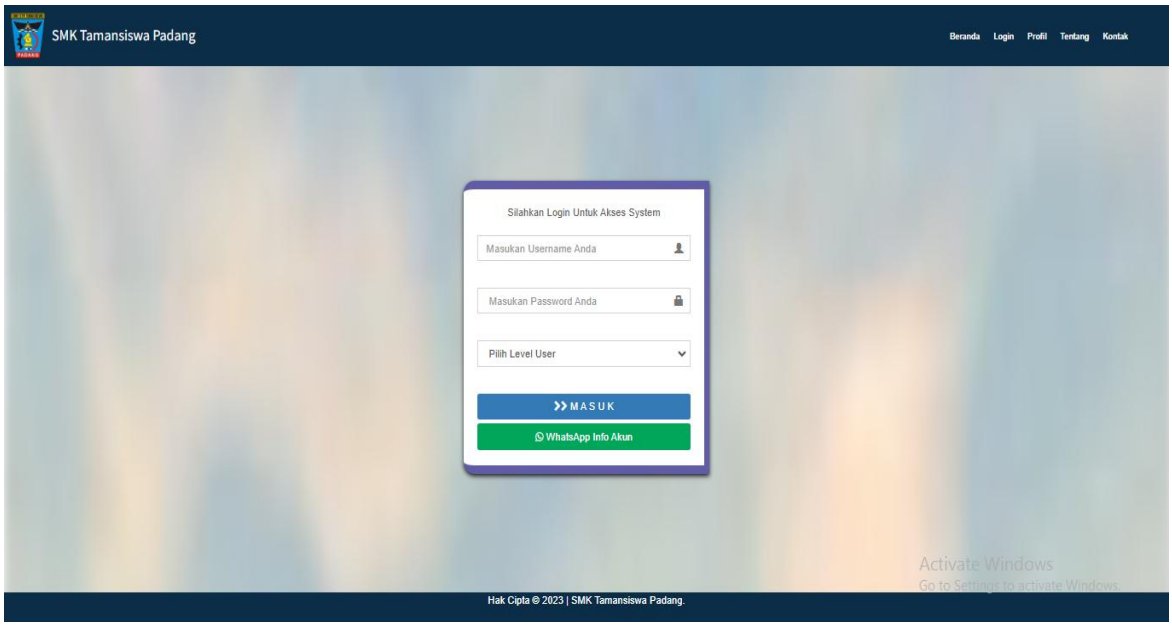

Figure 2. Login Page

In figure 2 there are menu options, namely: (1) Username column: a place to enter user usernames; (2) Password column: a place to enter the password that was created previously; (3) Level column: a place to determine the level of each user who wants to log in to the system; (4) Login button: the button used by the user to enter the next page; and, (5) Whatsapp account info button: button used to enter the Whatsapp admin URL page.

Figure 3 is the dashboard display in the admin. The dashboard display on the teacher and student forms is almost the same, only there are differences in the menus in it.

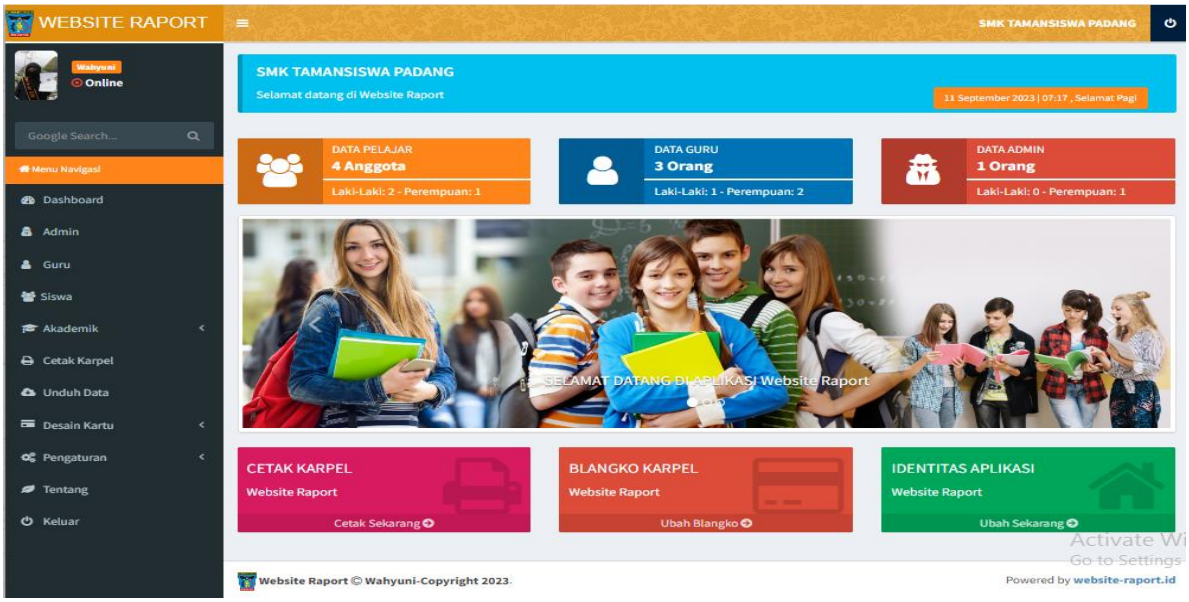

Figure 3. Admin Dashboard

Figure 4 is a page where admins can add, edit and delete student data at the school.

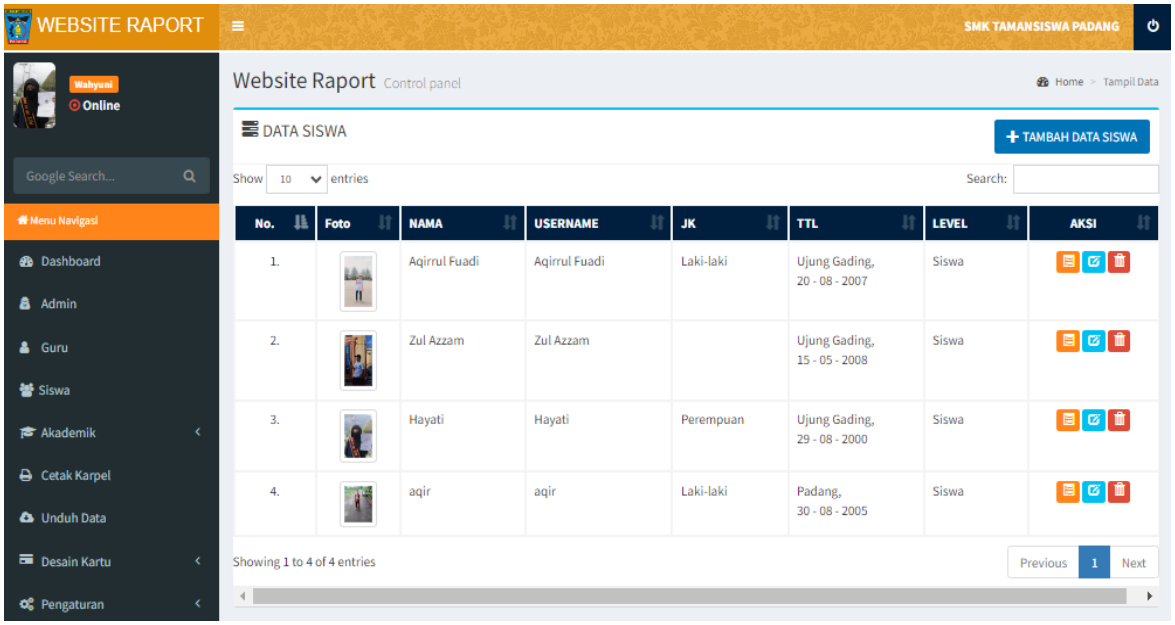

Figure 4. Manage Student Data

Figure 5 is a display of all teacher data where the admin can add, edit and delete teacher data in the school.

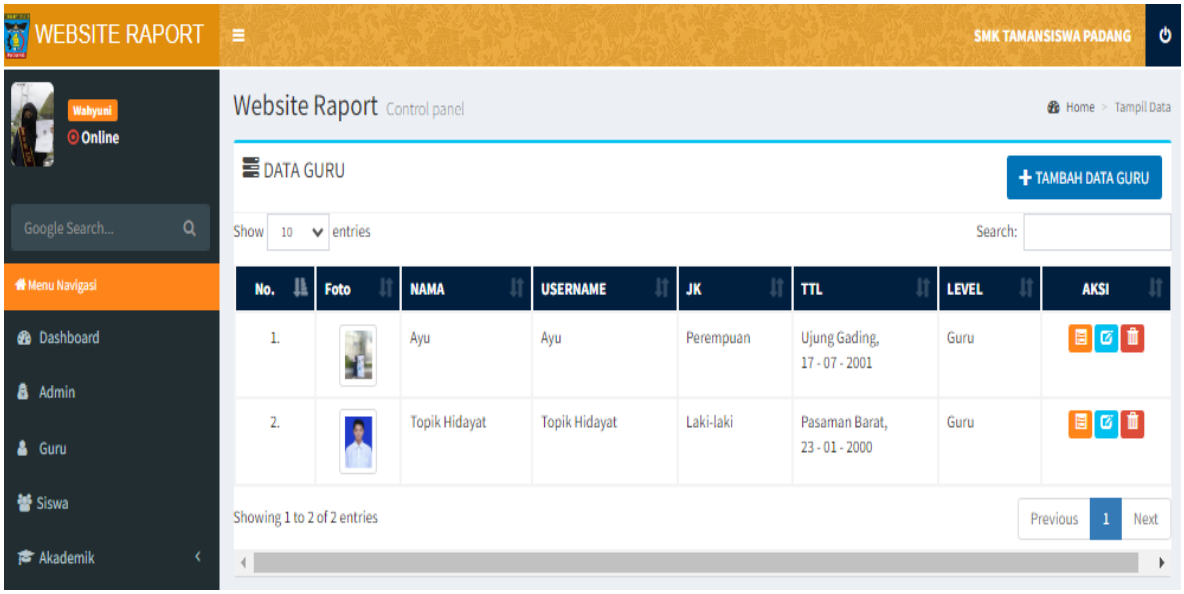

Figure 5. Manage Teacher Data

Figure 6 is a display for adding data, be it admin, teacher or student data.

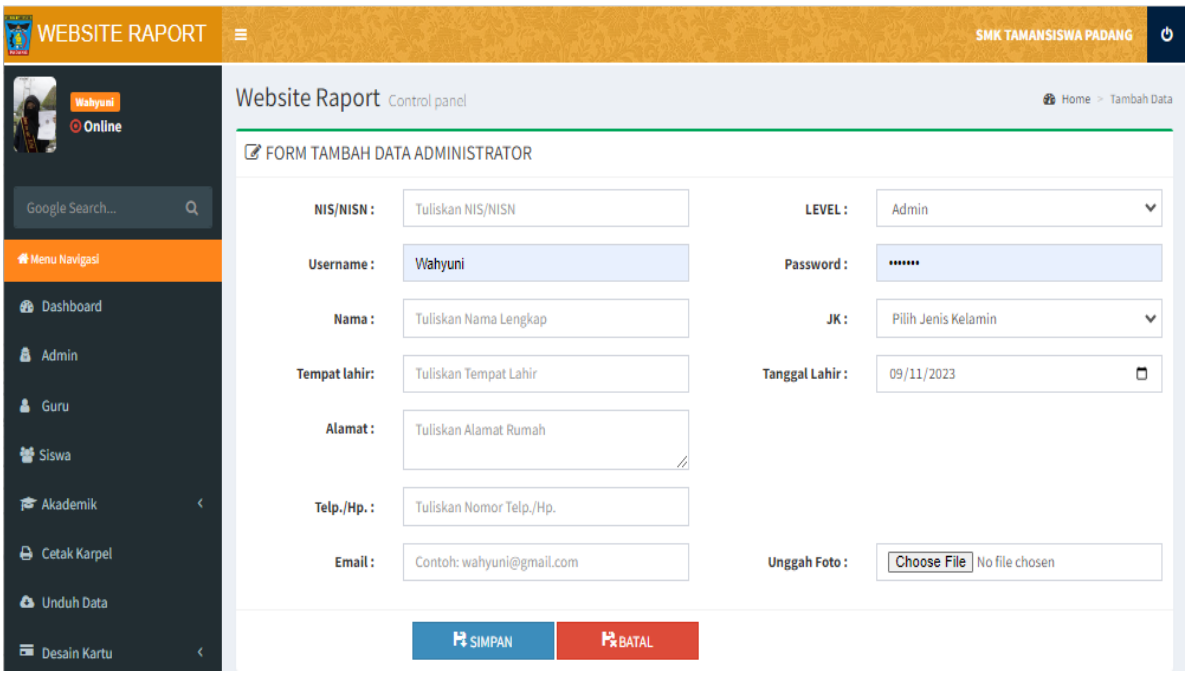

Figure 6. Add Data Page

Figure 7 depicts a document that allows the administrator to input school-related class information, including the student's name and their respective class enrollment.

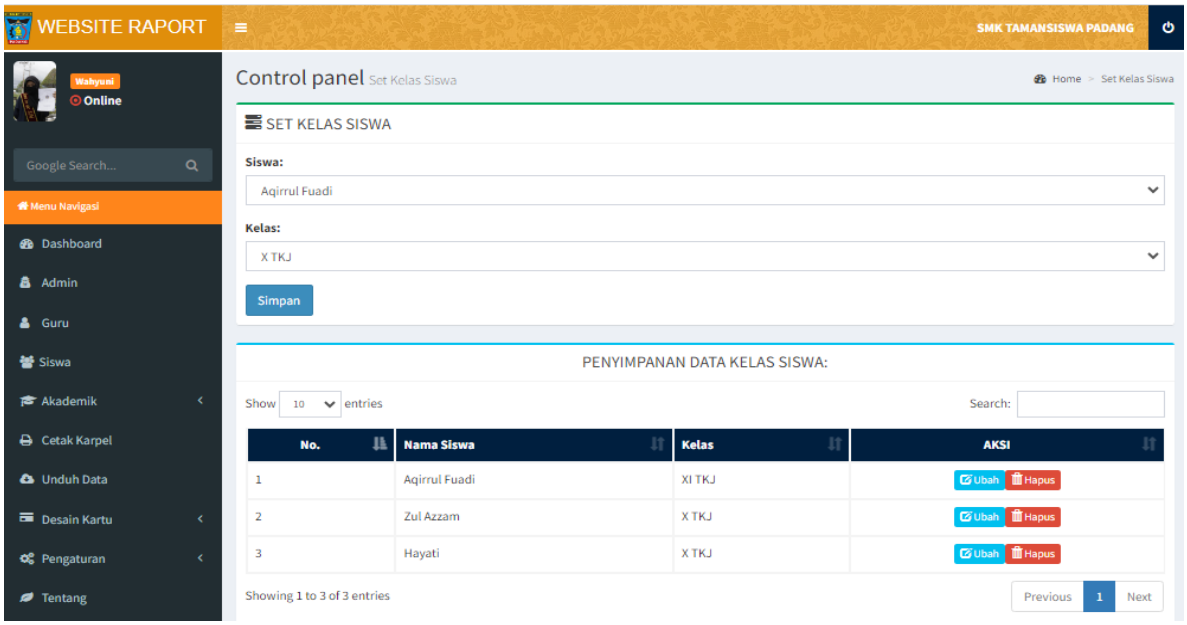

Figure 7. Manage Class Data Page

Figure 8 is a form where admins can add, delete and change subjects.

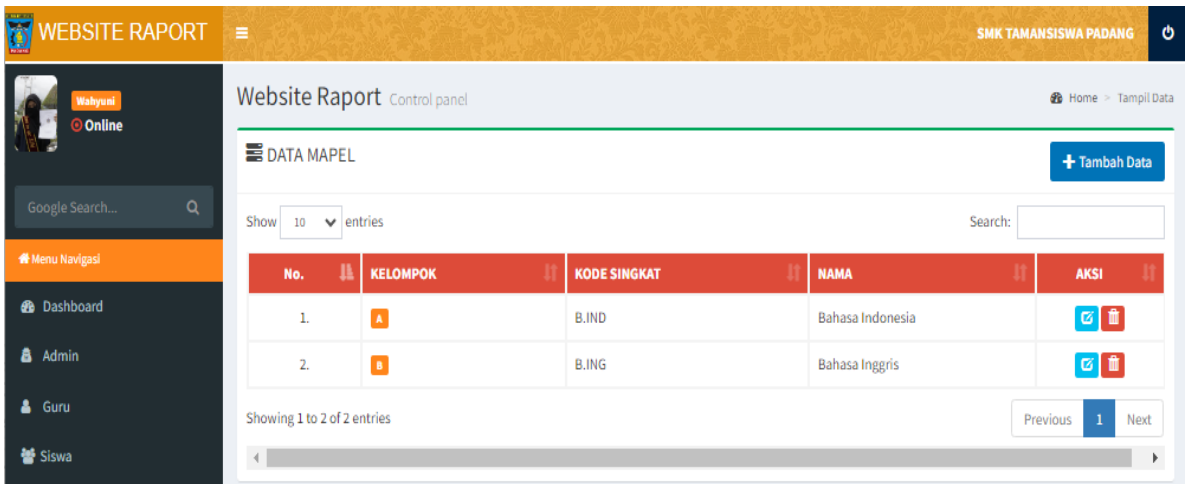

Figure 8. Manage subjects page

Figure 9 is a form to display the school year at school.

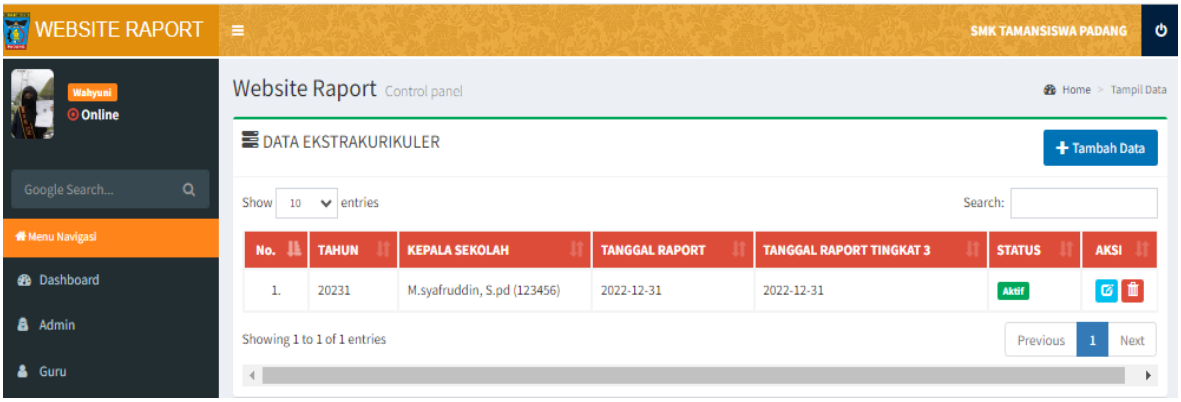

Figure 9. Manage School Year Page

Figure 10 is a form where admin can print student cards.

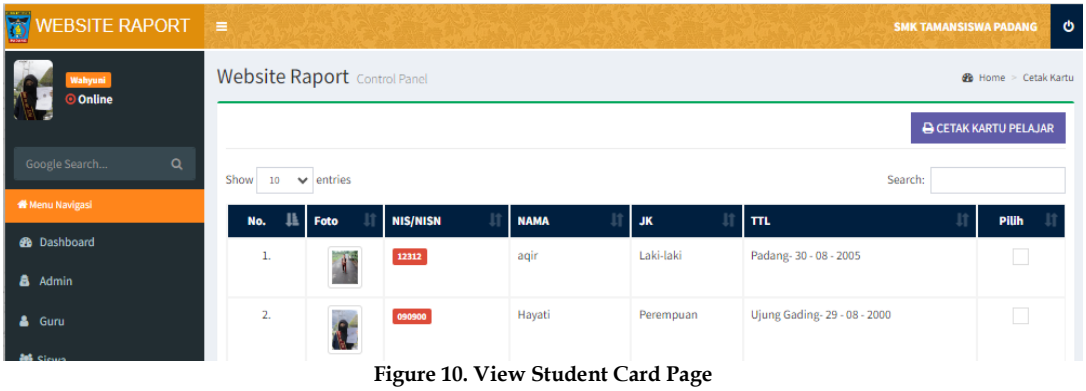

Figure 10. View Student Card Page

Figure 11 is the form for printing student cards.

Figure 11. View Student Card Page

Figure 12 is a display of printed student report cards.

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HASIL PENCAPAIAN KOMPETENSI PESERTA DIDIK

SMK Tamansiswa Padang | Jl. Taman Siswa No. 9 Padang

Nama : Hayati

Nis/Nisn : 23654

Kelas : 10 X TKJ

Semester : satu
Tahun Pelajaran : 20231

A. Sikap Sosial

No	Selalu Dilakukan	Mulai Meningkat
1	TOLERANSI	DISIPLIN
2	GOTONG ROYONG	TOLERANSI

B. Pengetahuan dan Keterampilan

Mata Pelajaran	Pengetahuan			Keterampilan		
	Angka	Predikat	Deskripsi	Angka	Predikat	Deskripsi
Pendidikan Agama Islam	-	-	-	-	-	-
Pendidikan Pancasila dan Kewarganegaraan	-	-	-	-	-	-
Bahasa Indonesia	-	-	-	-	-	-
Matematika	-	-	-	-	-	-
Ilmu Pengetahuan Alam	-	-	-	-	-	-
Ilmu Pengetahuan Sosial	-	-	-	-	-	-
Bahasa Inggris	-	-	-	-	-	-

C. Ekstrakurikuler

No	Jenis Ekstrakurikuler	Nilai	Deskripsi
1	Tahfidz	A	Memuaskan, aktif mengikuti kegiatan Pramuka mingguan

Figure 12. View Student Card Page

Testing of the web-based e-rapor information system at SMK Tamansiswa Padang involved alpha testing techniques (utilizing whitebox and blackbox testing) along with beta testing. Each of the 5 users conducted the test once, resulting in a total of 5 test sessions. Tabel 1 is alpha testing.

Table 1. System Testing (Alpha)

No	Test class	Testing Details	Testing Type
1	Login menu testing	Confirm login data by entering username, password and level	Blackbox Testing and White Box Tesitng
2	Testing the dashboard system menu	The system displays all menus for admin, namely: manage users, academics, print student cards, card design, settings, and information.	Blackbox Testing and White Box Tesitng
3	Testing the user management menu	Add, delete, edit, and search.	Blackbox Testing dan White Box Tesitng
4	Testing the academic management menu (class data, subject data, academic year data)	Add, delete and edit.	Blackbox Testing and White Box Tesitng
5	Testing the student card print menu	Select and print	Blackbox Testing and White Box Tesitng
6	Card design menu testing	The system displays a choose file button.	Blackbox and White Box Tesitng

Whitebox testing consists of the following parts. Login page, determine the flowchart and base path on the login button as in the Figure 13.

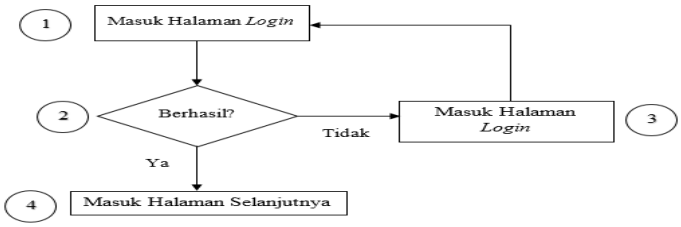

Figure 13. Flowchart and Basic Path of the Login Button

Cyclomatic Complexity Calculation (CC):

CC = e – n + 2

CC = 4 – 4 + 2 = 2

Thus, the CC sum results obtained from the flowchart and base path can be concluded that the Independent paths found to test the login button are 2 Independent paths, namely:

Path 1 : 1 – 2 – 4

Path 2 : 1 – 2 – 3 – 4

Based on these paths, it can be concluded that there are 2 paths that need to be tested. Create a login test case as in Table 2.

Table 2. Test Case Login

Path	Scenario	Test result
1	1. Start	Succeed
1-2-4	2. Enter username and password	
	4. The main user menu appears	
2	Start	Succeed
1-2-3-4	Input username and password	
	An error message appears. Enter the correct username and password again.	
	he main user menu appears	

Manage user consist of add user button, edit user button, delete user button, and create a delete button test case.

Add user button, Figure 14 determine the flowchart and base path on the add user button.

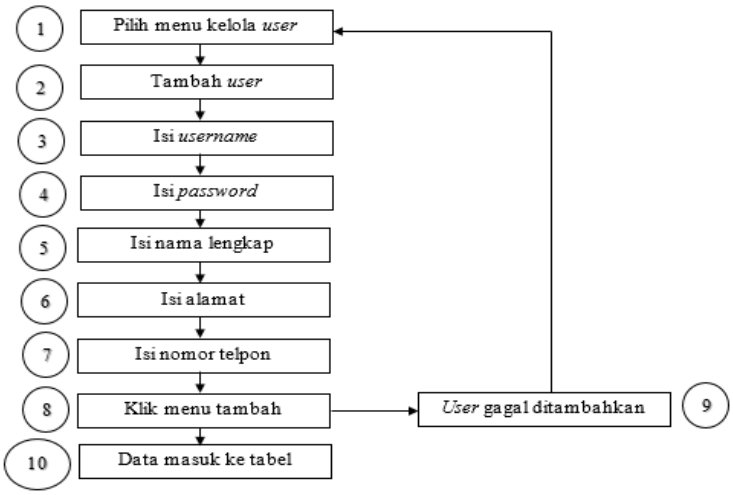

Figure 14. Flowchart and Base Path on the Add User Button

Cyclomatic Complexity (CC) Calculation

CC = e – n + 2

CC = 10 – 10 + 2 = 2

Thus, the CC sum results obtained from the flowchart and base path can be concluded that the Independent paths found to test the login button are 2 Independent paths, namely:

Path 1 : 1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 10

Path 2 : 1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9 - 10

Based on these paths, it can be concluded that there are 2 paths that need to be tested. Create a test case add user as in Table 3.

Table 3. Test Case Add User

Path	Scenario	Test result
1 1-2-3-4-5-6-7-8-10	1. Click the manage user menu 2. Add users 3. Fill in your username 4. Fill in the password 5. Full name 6. Address 7. Telephone number 8. Click the add button 10. The user has been successfully added and the data has been entered into the table	Succeed
2 1-2-3-4-5-6-7-8-9-10	1. Click the manage user menu 2. Add users 3. Fill in your username 4. Fill in the password 5. Full name 6. Address 7. Telephone number 8. click the add button 9. User failed to add. Fill in the data again 10. Data entered into the table	Succeed

Edit user button, Figure 15 determine the flowchart and base path on the edit user button.

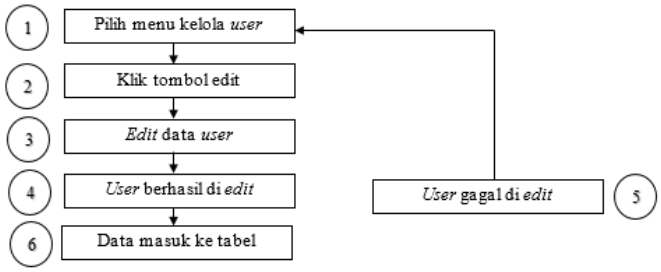

Figure 15. Flowchart and Base Path on the User Edit Button

Cyclomatic Complexity (CC) Calculation

CC = e – n + 2

CC = 6 – 6 + 2 = 2

Thus, the CC sum results obtained from the flowchart and base path can be concluded that the Independent paths found to test the login button are 2 Independent paths, namely:

Path 1 : 1 – 2 – 3 – 4 – 6

Path 2 : 1 – 2 – 3 – 4 – 5 – 6

Based on these paths, it can be concluded that there are 2 paths that need to be tested. Create a test case edit button as in Table 4.

Table 4. Test Case Edit Button

Path	Scenario	Test result
1	1. Click the manage user menu	Succeed
1-2-3-4-6	2. Edit user	
	3. Edit the data you want to edit	
	4. User has been successfully edited	
	6. User data is entered into the table	
2	1. Click the manage user menu	Succeed
1-2-3-4-5-6	2. Edit users	
	3. Edit the data you want to edit	
	4. Press the edit button	
	5. Data failed to edit, edit user again.	
	6. Data entered into the table	

Delete user button, Figure 16 determine the flowchart and base path on the delete button.

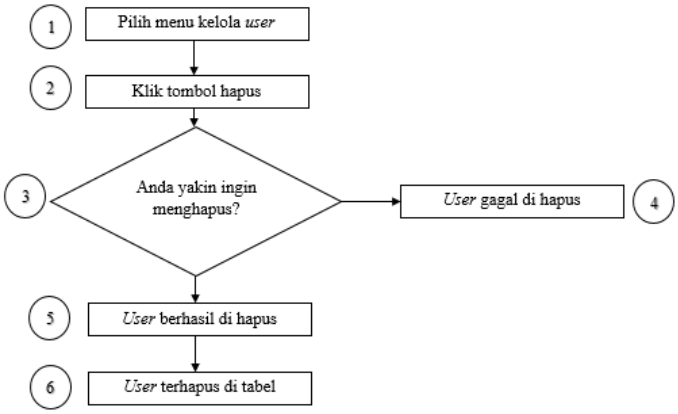

Figure 16. Flowchart and Base Path on the Delete Button

Cyclomatic Complexity (CC) Calculation

CC = e – n + 2

CC = 6 – 6 + 2 = 2

Thus, the CC sum results obtained from the flowchart and base path can be concluded that the Independent paths found to test the login button are 2 Independent paths, namely:

Path 1 : 1 – 2 – 3 – 5 – 6

Path 2 : 1 – 2 – 3 – 4 – 5 – 6

Based on these paths, it can be concluded that there are 2 paths that need to be tested. Create a delete button test case as in Table 5.

Table 5. Delete Button Test Case

Path	Scenario	Test Result
1 1-2-3-5-6	1. Click the manage user menu 2. Click the delete button 3. A notification appears whether you want to delete? if yes, press ok 5. User has been successfully deleted 6. User data is deleted in the table	Succeed
2 1-2-3-4-5-6	1. Click the manage user menu 2. Click the delete button 3. A notification appears whether you want to delete? If not then 4. User failed to delete. Click the delete button again 5. Data has been successfully deleted 6. User data is deleted in the table	Succeed

Manage Academics (Class Data, Subject Data, Academic Year) consist of Add Academic Button (Class Data, Subject Data, Academic Year), Academic Edit Button (Class Data, Subject Data, Academic Year), Delete Academic Button (Class Data, Subject Data, Academic Year).

Add academic button (Class Data, Subject Data, Academic Year), Figure 17 determining the flowchart and basis path for adding academics (Class Data, Subject Data, Academic Year).

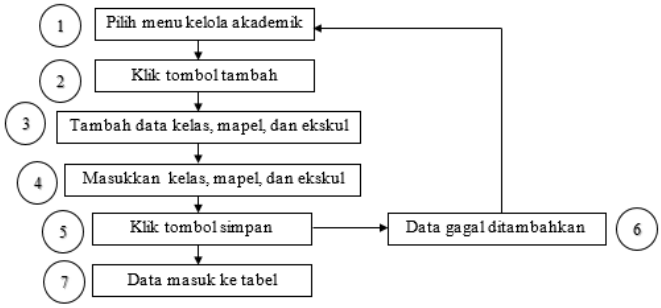

Figure 17. Flowchart and Basic Path for Academic Addition (Class Data, Subject Data, Academic Year)

Cyclomatic Complexity (CC) Calculation :

CC = e – n + 2

CC = 7 – 7 + 2 = 2

Thus, the CC sum results obtained from the flowchart and base path can be concluded that the Independent paths found to test the login button are 2 Independent paths, namely:

Path 1 : 1 – 2 – 3 – 5 – 7

Path 2 : 1 – 2 – 3 – 4 – 5 – 6 - 7

Based on these paths, it can be concluded that there are 2 paths that need to be tested. Create added academic test cases (Class Data, Subject Data, Academic Year) as in Table 6.

Table 6. Add Academic Test Case (Class Data, Subject Data, Academic Year)

Path	Scenario	Test Result
1 1-2-3-4-5-7	1. Click the academic management menu 2. Press the add button 3. Add class, subject and extracurricular data 4. Enter classes, subjects, and extracurriculars 5. Click the save button 7. Data entered into the table	Succeed
2 1-2-3-4-5-6-7	1. Click the academic management menu 2. Press the add button 3. Add class, subject and extracurricular data 4. Enter classes, subjects, and extracurriculars 5. Click the save button 6. Data failed to add, fill in data again 7. Data entered into the table	Succeed

Academic edit button (Class Data, Subject Data, Academic Year), Figure 18 determine the flowchart and base path on the academic edit button (Class Data, Subject Data, Academic Year).

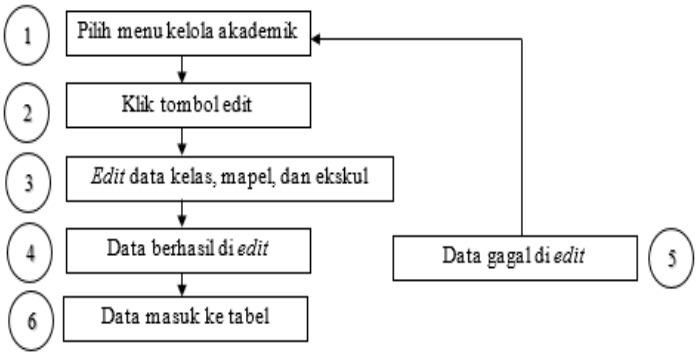

Figure 18. Flowchart and Base Path on the Academic Edit Button (Class Data, Subject Data, Academic Year)

Cyclomatic Complexity (CC) Calculation:

CC = e – n + 2

CC = 6 – 6 + 2 = 2

Thus, the CC sum results obtained from the flowchart and base path can be concluded that the Independent paths found to test the login button are 2 Independent paths, namely:

Path 1 : 1 – 2 – 3 – 4 – 6

Path 2 : 1 – 2 – 3 – 4 – 5 – 6

Based on these paths, it can be concluded that there are 2 paths that need to be tested. Create an academic edit test case (Class Data, atSubject Da, Academic Year) as in Table 7.

Table 7. Academic Edit Test Case (Class Data, Subject Data, Academic Year)

Path	Scenario	Test Result
1 1-2-3-4-6	1. Select the academic management menu 2. Click the edit button 3. Edit class, subject and extracurricular data 4. Data has been edited successfully 6. Data entered into the table	Succeed
2 1-2-3-4-5-6	1. Select the academic management menu 2. Click the edit button 3. Edit class, subject and extracurricular data 4. Press the save button 5. Data failed to save, edit data again. 6. Data entered into the table	Succeed

Delete academic button (Class Data, Subject Data, Academic Year), Figure 19 determine the flowchart and base path for academic delete (Class Data, Subject Data, Academic Year).

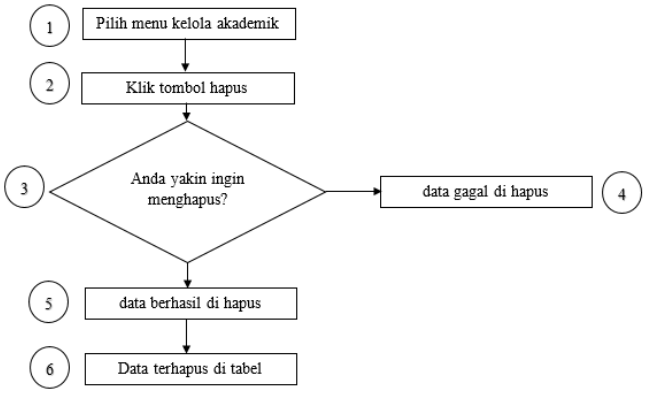

Figure 19. Flowchart and Basis Path for Academic Delete (Class Data, Subject Data, Academic Year)

Cyclomatic Complexity (CC) Calculation:

CC = e – n + 2

CC = 6 – 6 + 2 = 2

Thus, the CC sum results obtained from the flowchart and base path can be concluded that the Independent paths found to test the login button are 2 Independent paths, namely:

Path 1 : 1 – 2 – 3 – 5 – 6

Path 2 : 1 – 2 – 3 – 4 – 5 – 6

Based on these paths, it can be concluded that there are 2 paths that need to be tested. Create a test case delete academic (Class Data, Subject Data, Academic Year) as in Table 8.

Table 8. Academic Delete Test Case (Class Data, Subject Data, Academic Year)

Path	Scenario	Test Result
1 1-2-3-5-6	1. Select the academic management menu 2. Click the delete button 3. A notification appears. Are you sure you want to delete it? If yes 4. Data has been successfully deleted 6. Data is deleted from the table	Succeed
2 1-2-3-4-5-6	1. Select the academic management menu 2. Click the delete button 3. A notification appears. Are you sure you want to delete it? If not 4. Data failed to delete 5. Press the delete button again 6. Data is deleted from the table	Succeed

The E-rapor information system has been developed using the white-box method, ensuring that the logical flow within the information system aligns with the website's flow. This was achieved through the use of flowcharts, determining cyclomatic complexity, and establishing system test cases. To ensure the Cash Flow application operates without errors, a trial will be conducted using the basis path technique, commencing with the creation of a Flow Graph, determining Cyclomatic Complexity (CC), and executing unit testing cases.

Blackbox testing consists of the following parts. Login menu testing as in the Table 9.

Table 9. Login Menu Testing

Cases and Test Results				
No	**Description**	**Test procedure**	**Expected results**	**Result**
1	Login	Select levels	Displays user level	Valid
		If the user enters the username and password correctly	The user successfully logs in and displays the next page	Valid
		If the user enters the username and password incorrectly	The user cannot log in and the next page will not be displayed	Valid

Dashboard menu testing as in Table 10.

Table 10. Dashboard Menu Testing

Cases and Test Results				
No	**Description**	**Test procedure**	**Expected results**	**Result**
1	Dashboard	The user enters the username and password, if correct, the next page appears	The system displays a dashboard display admin along with the existing menu functions in the dashboard menu	Valid

Testing the user manage menu as in Table 11.

Table 11. Testing The User Manage Menu

Cases and Test Results				
No	**Description**	**Test procedure**	**Expected results**	**Result**
1	Manage Users	Click the add button Appears	The add user form display appears	Valid
		Click the edit button	The user edit display form appears	Valid
		Click the delete button	The entered data was successfully deleted in the table	Valid
		Search	The data you are looking for appears	Valid

Academic menu testing (Class Data, Subject Data, and Extracurricular Data) as in Table 12.

Table 12. Academic Menu Testing (Class Data, Subject Data, and Extracurricular Data)

Cases and Test Results				
No	**Description**	**Test procedure**	**Expected results**	**Result**
1	Manage academic menu	Click the add button Appears	A form will appear to add class, subject and extracurricular data.	Valid
		Click the edit button	A display form for editing class, subject and extracurricular data appears.	Valid
		Click the edit button	The entered data has been successfully deleted from the table	Valid

Testing the Student Card Print Menu as in Table 13.

Table 13. Testing the Student Card Print Menu

Cases and Test Results				
No	**Description**	**Test procedure**	**Expected results**	**Result**
1	Manage student card print menu	Check the box in the action section	The box has been successfully checked	Valid
		Click the print button	The student card display form appears	Valid

Testing the Student Card Design Menu (Student Card Blank and Student Card Signature) as in Table 14.

Table 14. Testing the Student Card Design Menu (Student Card Blank and Student Card Signature)

Cases and Test Results				
No	**Description**	**Test procedure**	**Expected results**	**Result**
1	Manage card design menu	Click the choose file button	Select a new image and the newly selected image will appear	Valid

Testing the Report Report Print Menu as in Table 15.

Table 15. Testing the Report Report Print Menu

Cases and Test Results				
No	**Description**	**Test procedure**	**Expected results**	**Result**
1	Manage report print menu	Click print report	The student report form display appears	Valid

To find out the test results, a validation sheet with a Likert scale is used with answers to 4 levels of suitability, namely Very Good, Good, Not Good, Very Bad as in Table 16.

Table 16. Questionnaire Calculation Percentages

Eligibility Category	Description
Very Good (4)	76% - 100%
Good (3)	51% - 75%
Not Good (2)	26% - 50%
Very Bad (1)	0% - 25%

Table 16 presents the outcomes of the evaluation in percentage terms for the assessment system. It reveals that the web-based e-raporing system at SMK Tamasiswa Padang has been excellently developed, achieving an overall evaluation score of 84.17%. Notably, the average percentages per criterion are: 100% for maintainability, highlighting the utmost importance of system maintenance to prevent unforeseen damages; 75% for portability due to limited data transfer capabilities; 87.5% for functionality, 79.17% for reliability, 82.14% for usability, and 81.25% for efficiency.

In the Black Box testing, the developer has conducted 31 test scenarios encompassing 37 expected outcomes, all of which have produced valid results. This indicates that the testing scenarios within the information system align with the anticipated outcomes, and the tested menus have yielded valid results. The Black Box testing demonstrates that the application is capable of handling data—both valid and invalid—with a successful percentage rate. Moreover, testers do not need specific programming language knowledge to conduct these tests.

Based on the results of expert beta testing, the percentage results obtained as in Table 17.

Table 17. Percentage of expert validation

Criteria	Rating Percentage (%)	Information
Fungsionality	87,5%	Very Good
Reability	79,17%	Very Good
Usability	82,14%	Very Good
Effeciency	81,25%	Very Good
Maintainability	100%	Very Good
Portability	75%	Good
Average	84,17%	Very Good

Table 17 depicts the outcomes of the system's percentage-based evaluation, indicating an excellent performance of the developed web-based e-rapor information system at SMK Tamasiswa Padang, with an average evaluation score of 86.36%. The average percentage ratings for each component are as follows: 90% for usefulness criteria, which holds the highest rating due to its significance in ensuring the system functions as intended; 83.33% for user-friendliness, marked lower due to limitations on user profile picture alterations restricted to admin access; 85% for website appearance, 87.5% for website menu, and 86% for website content.

Based on the results of beta testing by users, the percentage results are determined as in Table 18.

Table 18. Percentage of User Assessment Validation

Criteria	Rating Percentage (%)	Information
Website display	85%	Very Good
Website Menu	87,5%	Very Good
Website content	86%	Very Good
User convenience	83,33%	Very Good
Expediency	90%	Very Good
Average	86,36%	Very Good

The beta testing conducted by two expert individuals within the e-rapor information system, specifically by a computer education lecturer from the University of PGRI in West Sumatra, resulted in an average assessment percentage of 84.17% with an excellent rating. Consequently, it can be stated that both the functional and non-functional aspects of the e-rapor information system are valid for use. Therefore, SMK Tamansiswa Padang can utilize this system to simplify report management. Based on the aforementioned results and testing, it can be concluded that the designed e-rapor information system fulfills the expected functional requirements, minimizing the occurrence of errors. Additionally, the system is user-friendly and does not pose significant difficulties in its usage.

The average beta testing conducted by five users of the e-rapor information system, consisting of 1 admin, 1 homeroom teacher, 1 subject teacher, and 2 students, resulted in an average rating of 86.36%, with the assessment indicating "Very Good." Hence, it can be concluded that both the functional and non-functional aspects of the e-rapor information system are operating well for the users. Consequently, this system is deemed suitable for use at SMK Tamasiswa Padang.

4. Conclusion

The web-based E-rapor Information System at SMK Tamansiswa Padang was developed using the System Development Life Cycle method with a waterfall model. Alpha Testing (comprising Whitebox and Blackbox Testing) and beta testing were utilized for evaluation. The Alpha Testing yielded valid results for each component tested, and the subsequent beta testing showed highly favorable outcomes: an average of 84.17% in expert validation and an 86.36% average from user assessment questionnaires, both indicating excellent performance. This indicates the system's components or functions are suitable and beneficial for enhancing the efficiency of student report input processes within the school.

Based on the aforementioned conclusions and research findings, there are several recommendations proposed to further enhance the quality of the existing system. These suggestions include: (1) Regularly update both the interface and the information system to incorporate new features that can facilitate users. This involves implementing forms that enable data transfer between users and creating a user-friendly form for individual users to modify their profile pictures; and (2) Improve the system's functionality in terms of portability, as the current data transfer capabilities between users are limited. Future researchers should focus on developing a form that allows seamless data transfer between users. Additionally, enhances user convenience within the system, as it presently restricts users from independently changing their profile pictures. It is recommended that subsequent researchers design a system that empowers users to modify their profile pictures autonomously.

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