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Design an Alumni Data Collection Information System Using the Waterfall Method

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A B S T R A C T

The background of this research is that there is no alumni data collection information system at the Informatics and Computer Engineering Education Department (PTIK) IAIN Bukittinggi. Because the PTIK department already has a large number of alumni, a system that can serve as a forum for alumni data is required. The method used is Research and Development (R&D). R&D is a research method used to manufacture a specific product and test its effectiveness. The development model used is ADDIE, which stands for analyze, design, develop, implement, evaluate. The waterfall model is used in the system development model. The findings of this study include the development of an information system for collecting alumni data. The product is available for use by the head of PTIK department and the alumni. To demonstrate the system's effectiveness, three validators were obtained with a total value of 0.76 and were declared valid, while three examiners obtained a total value of 86.7 and were declared very practical. The effectiveness test on 5 graduates yielded a total score of 0.88 using very effective criteria.

1. Introduction

Technology is rapidly evolving, causing changes in all aspects of life, particularly the academic environment, to support the performance and quality of educational institutions [1]. One of the benefits is in registering alumni.

Alumni are very important for institutions because of the personal relations they have, and the quality of their alumni is one indicator of the quality of higher education in a company. A university should have a way for alumni to reconnect with their alma mater, including fellow alumni, lecturers, and students from the college in question [1].

Every year, hundreds of students graduate from the State Islamic Institute of Bukittinggi's various study programs, one of which is the Informatics and Computer Engineering Education (PTIK) department. It is difficult to obtain information about alumni after graduation, and communication between alumni is poor, so the design of the alumni data collection information system at the PTIK IAIN Bukittinggi department allows alumni to communicate effectively and share information.

Alumni data is an example of a system designed to assist stakeholders in both processing data and providing detailed data [2]. The data includes name, id, GPA, address, phone number, year of entry, year of

graduation, and gender. It is possible to improve the Institute's image in the eyes of the general public by using alumni information. Until now, many universities have not used information systems to collect and track alumni data, which is expected to facilitate the processing and management of alumni data.

Based on observations of the alumni data collection information system at the IAIN Bukittinggi e-campus, which still covers IAIN Bukittinggi, the alumni data was automatically inputted into the existing system, indicating that the alumni were already registered. Pass rather than manually, so that alumni can view their data on the e-campus without logging in again.

An information system that can provide alumni data, useful for obtaining detailed and easy information accessing the alumni data, is required to make it easier to obtain information on alumni data for the Informatics and Computer Engineering Education study program at the Bukittinggi State Islamic Institute (IAIN). Data collection from alumni at the IAIN Bukittinggi PTIK department.

2. Method

The research method used is R&D, with the ADDIE development model consisting of five stages, namely Analysis, Design, Develop, Implement, and Evaluate [3]. The developed product is a web-based information system.

The system development model used refers to the System Development Life Cycle (SDLC), the process of creating and changing systems, as well as the models and methodologies used to develop software engineering systems. The waterfall development method is used [4]. The waterfall method places a premium on sequential and systematic phases. The process is called a waterfall because it flows in only one direction, fall. This waterfall method must be followed in the order that the stages are listed. The waterfall is depicted in the figure below [5]:

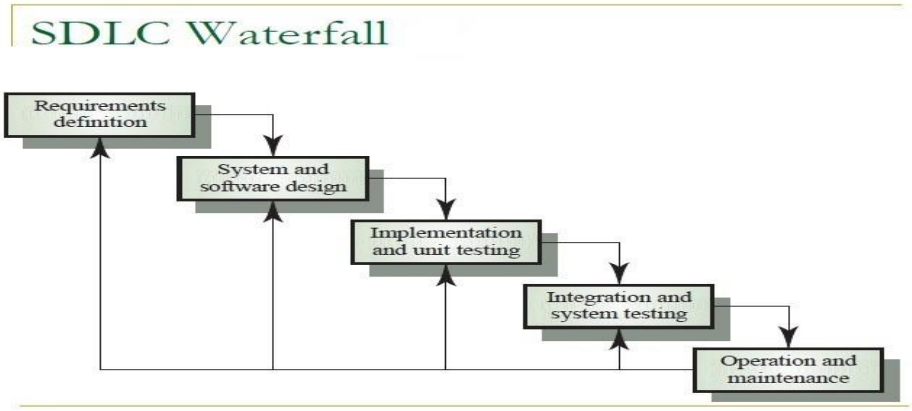

Figure 1. Waterfall Model System Development Life Cycle

The explanation of the figure above is as follows [6]: (1) Requirements definition, collect all requirements for analysis and define what the system should accomplish. Information can be obtained through interviews, discussions, or surveys with PTIK department alumni and lecturers. So gather information on the system that will be designed. (2) System and software design, following the collection of data, the next step is to design the software as an estimate before writing the code. A flowchart, mind map, or entity relationship diagram (ERD) can be used to create a system design. (3) Implementation and unit testing, this implementation stage is where all previously created designs are converted into program codes. The resulting code is still in the form of modules, which must be assembled later. (4) Integration and system testing, this stage is completed by combining previously created modules and testing to determine whether the software produced is in accordance with its design and function. (5) Operation and maintenance, this is the final stage of the waterfall model. The system has been completed, and maintenance has been performed.

Maintenance in the form of repairing errors discovered in the previous step. The administrator only needs to enter the names of the most recent alumni and check the system for errors.

In this study, product testing carried out is validity, practicality and effectiveness. The test uses a questionnaire sheet to test the validity, practicality and effectiveness.

A product validity test is a test that describes what is being measured [7]. To achieve the best validation results, use a questionnaire distributed to experts. Where the product category determination is declared valid if the value is between 0.6 and 1.0 and invalid if the value is less than 0.6.

The test is carried out with the statistical formula of Aiken's V, as follows [7] :

$$V = \sum s / [n(c-1)] \quad \text{.....(1)}$$

A product practicality test is a user evaluation. Using the formula, the data from the product practicality test results were analyzed by the percentage of rhythm [8] :

$$p = \frac{\sum f}{N} \times 100\% \quad \text{.....(2)}$$

The results of the sum per indicator can be measured using the Likert scale criteria as follows:

Table 1. Product Practicality Test

Percentage	Criteria
P ≤ 20	Impractical
20 < P ≤ 40	Practical
40 < P ≤ 60	Quite Practical
60 < P ≤ 80	Practical
80 < P ≤ 100	Very Practical

The final stage of product testing is the effectiveness test. The alumni data collection information system performs as expected in terms of operation. The effectiveness test is carried out using the Kappa Moment Statistics formula, which is as follows [9] :

$$k = \frac{\rho - \rho e}{1 - \rho e} \quad \text{.....(3)}$$

This effectiveness test sheet was obtained from 5 alumni of PTIK IAIN Bukittinggi. The test sheet's criteria for each indicator are as follows:

Table 2. Effectiveness Rating Scale

Percentage (%)	Criteria
0.81 – 1.00	Very high
0.61 – 0.80	High
0.41 – 0.60	Medium
0.21 – 0.40	Low
0.01 – 0.20	Very Low
≤ 0.00	Ineffective

3. Results and Discussion

3.1. Analyze

The analysis stage is the first step in designing an application. The analysis stage is carried out by investigating the issues encountered while designing the alumni system.

3.2. Design

An application is designed at this stage based on what is required. Alumni information system is a product.

3.3. Develop

3.3.1. Requirements definition

Following the design stage, the development stage begins by conducting a needs analysis and defining it. The goal of this needs analysis is to determine what is required. Before designing a system, several analyses are performed. The needs analysis includes the administrator or head of the study program, as well as alumni as users.

3.3.2. System and software design

After the examination of system requirements, the next stage is to design a system that aims to describe how a system is formed and to make it easier to understand how the system works. So we need a use case diagram to make it easier for administrators, heads of study programs, and alumni to do. The use case diagram for the alumni data collection information system is shown below.

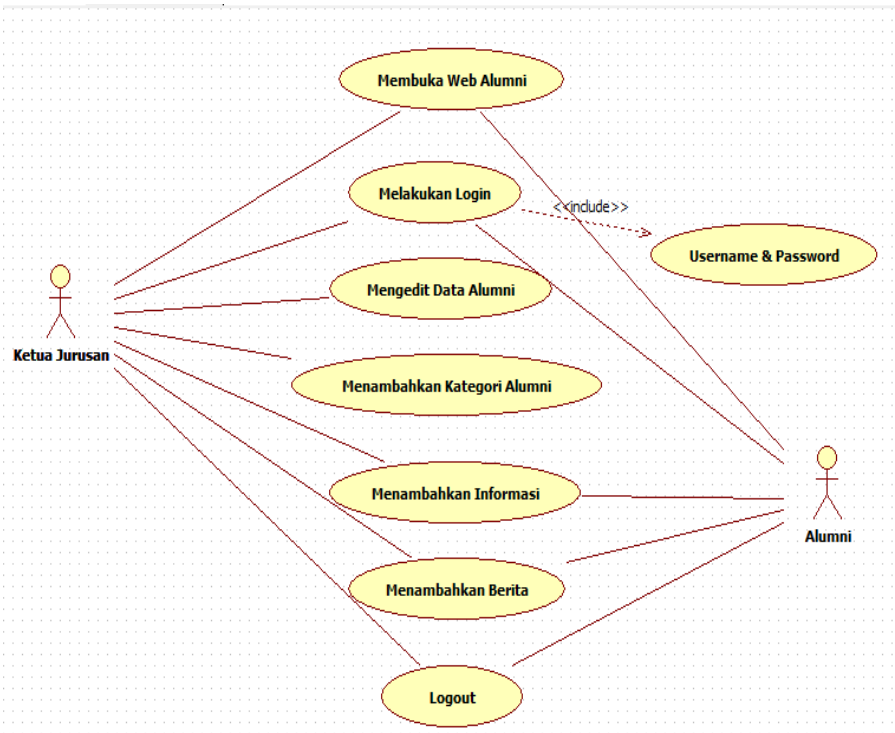

Figure 2. Use Case Diagram of Alumni Data Collection Information System

According to Figure 2, the use case diagram above, there are two actors the head of the study program and alumni. Opening the alumni web, logging in, editing alumni data, adding alumni categories, adding information, adding news about job vacancies, and finally logging out are the seven actions.

Activity diagram is the development of use case which has activity flow. The following is an illustration of the activity diagram of the alumni data collection information system.

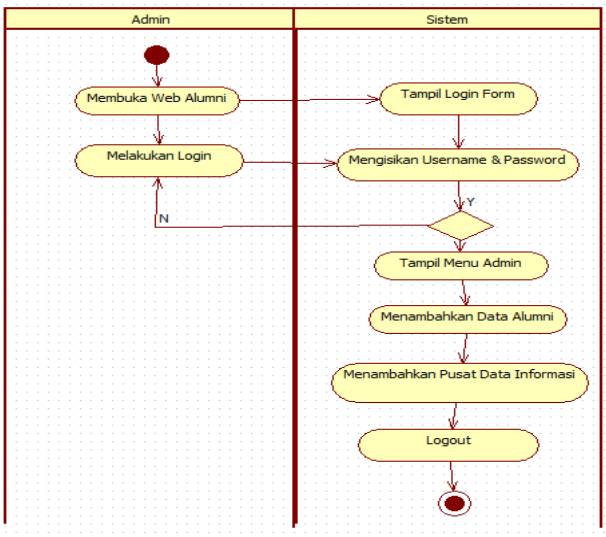

Figure 3. Activity Diagram Admin

According to the diagram, the admin opens the web, and then the login screen appears. The administrator logs in. After logging in, the administrator will enter alumni information. After finishing, the administrator can log out of the alumni information system.

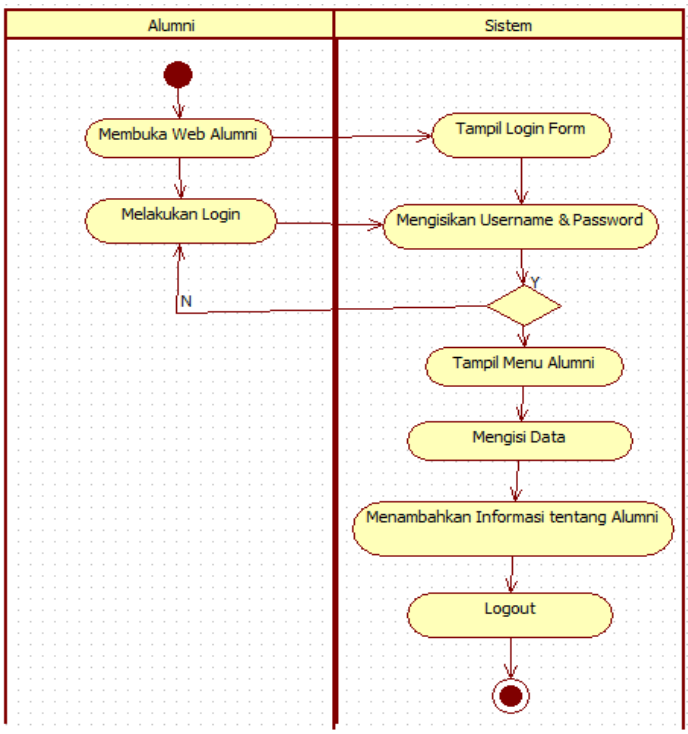

Figure 4. Alumni Activity Diagram

The alumni activity diagram can be explained as follows open the web, then the login screen appears, if the login is successful, the alumni menu appears, otherwise it returns to the initial view. Alumni can fill in data and add information if the alumni menu appears. When you're finished, log out of the alumni information system.

Class diagram is the core of the object modeling process expressed in the form of a box which is divided into several compartments. The compartment refers to the area of the class that contains information. The first box contains the class name, followed by the next attribute, and finally by the last operation. The system class diagram is shown below:

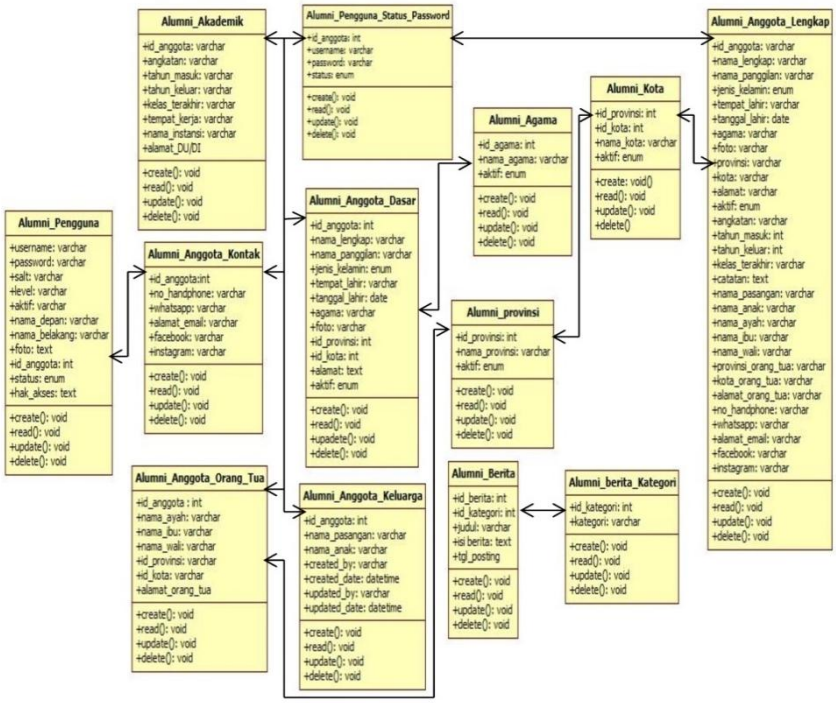

Figure 5. Class Diagram of Alumni Data Collection Information Systems

The following is the system design in detail. Design input, according to Figure 6, login is the data input process that consists of a username and password and is used to determine who can access the system on the alumni data collection information system.

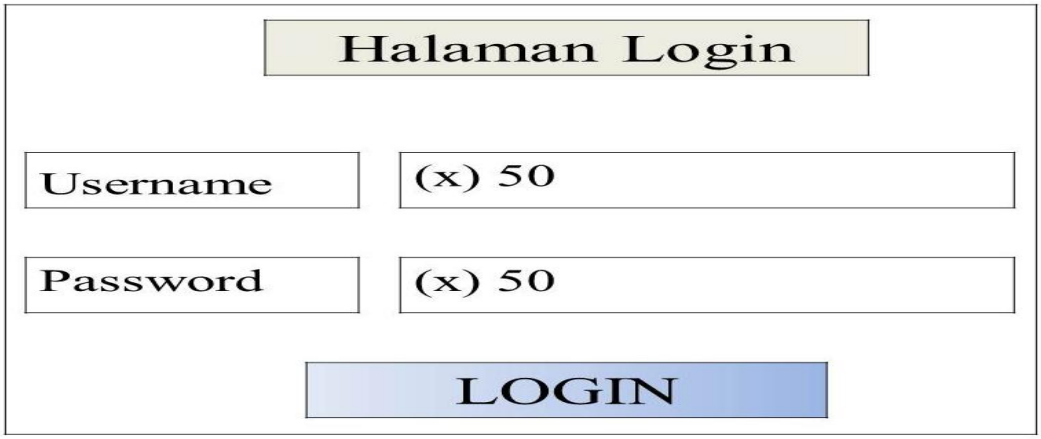

Figure 6. Login Form Design

The admin member list is the next input design. Figure 7 is the administrator enters the personal information of PTIK IAIN Bukittinggi alumni on this page.

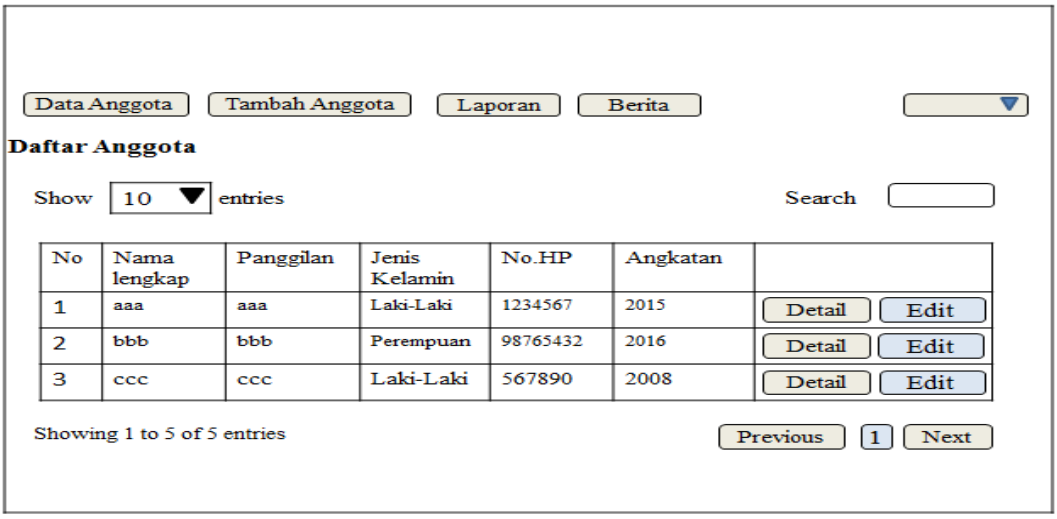

Figure 7. Admin Member List Input Design

Figure 8 is the list of alumni members can be viewed in detail, including alumni phone numbers, and alumni can edit their own data.

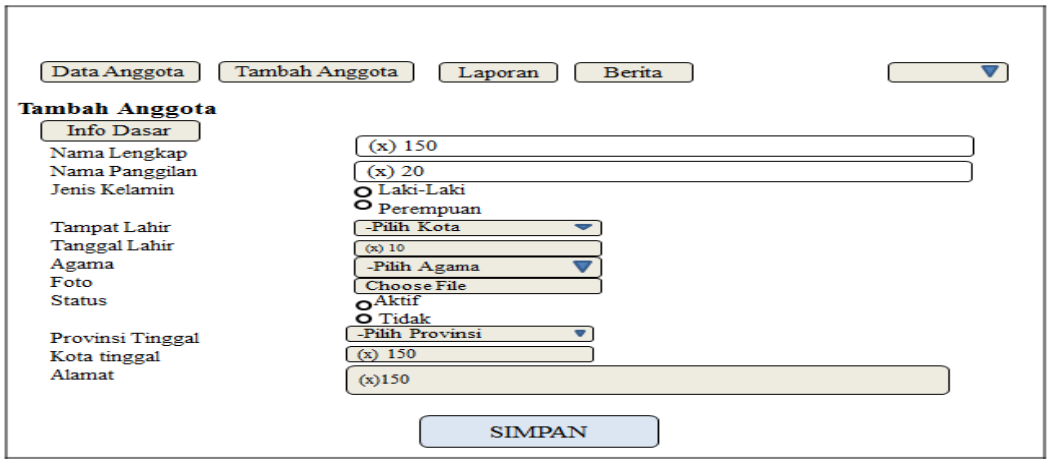

Figure 8. Basic Member Info Page Input Design

Figure 9 shows married alumni family members filling out the alumni family data.

Figure 9. Input Design of Members' Family Page

Figure 10 shows an alumni contact who can be contacted, such as a phone number.

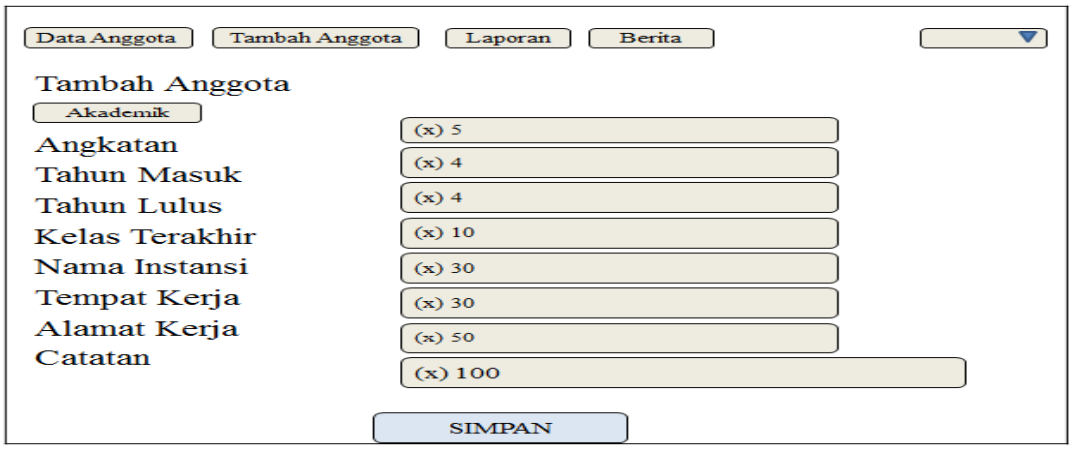

Figure 10. Input Design of Members' Family Page

Figure 11 shows alumni filling in the academic education of the most recent batch of alumni.

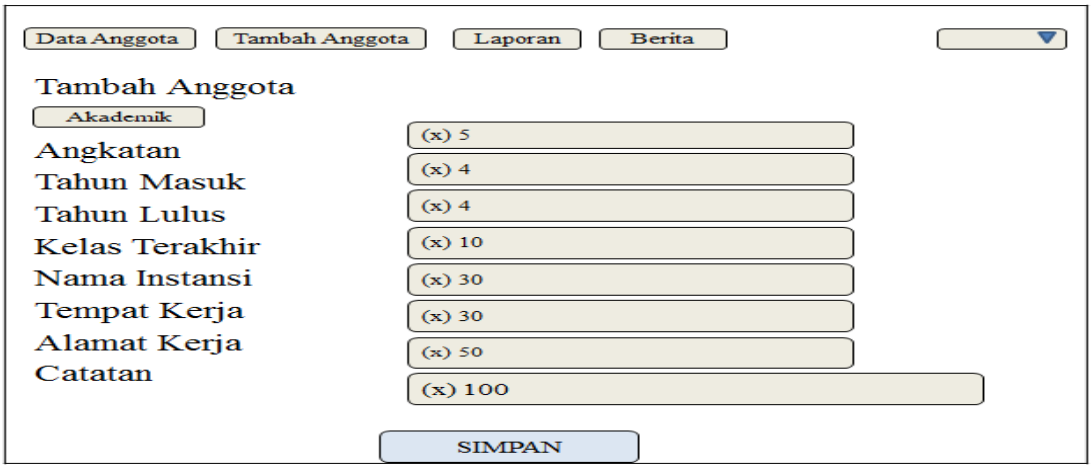

Figure 11. Member Academic Page Input Design

Figure 12 shows how administrators and alumni can use this page to post the most recent news, such as job vacancies.

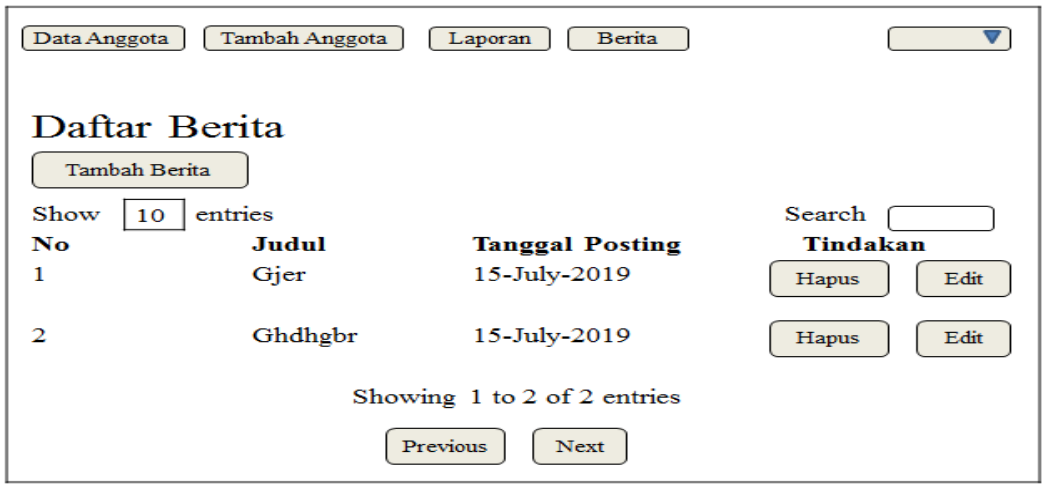

Figure 12. News Page Input Design

Output design is a term used to describe an external unit or device that is used to display or translate data from a computer microprocessor. The following is the output of alumni data collection for more information.

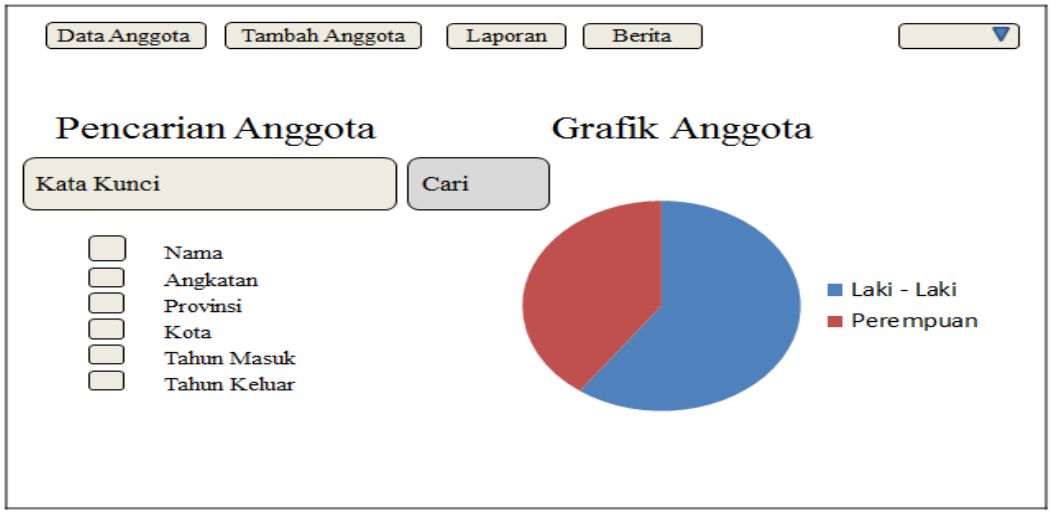

Figure 13. Admin Dashboard Design

Figure 14 shows how to download the output report based on all alumni reports, reports on alumni equipment, and reports on where alumni currently live.

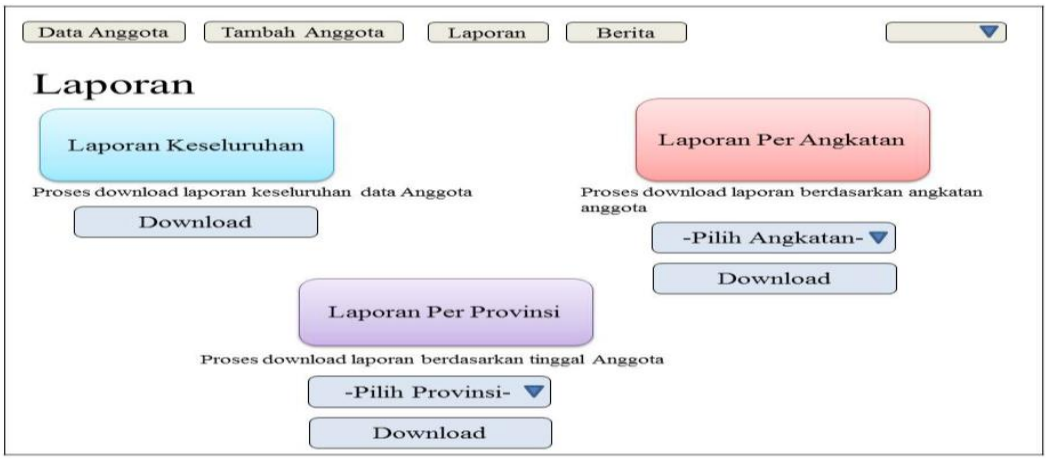

Figure 14. Report Page Output Design

3.3.3. Implementation and unit testing

The steps taken include translating the design, which is in the form of a system description and includes everything from use case diagrams to class diagrams, into a predetermined programming language. The programming language employed is a web-based programming language known as PHP. While MySQL is used as the database management system.

3.3.4. Integration and system testing

System testing is the testing phase that is performed on the system after all system units have been merged. If there is an error in the system, it will be repaired, and if the program is working properly, it will be distributed.

The blackbox method of software testing focuses on the functionality side, particularly on application input and output, with the goal of ensuring that all functions work as expected. The results of testing using the blackbox testing method are shown in Table 3.

Table 3. Test Results with Blackbox Testing

No	Design	Result	Description
1	Login	Display the admin login and alumni	Succeed
2	Login Main Menu	Display the main menu page	Succeed
3	Click News Details	Display the news details page	Succeed
4	Click News list	Show news list form, and can give comments	Succeed
5	Click Member Data	Display the alumni member data form	Succeed
6	Click the search form	Display alumni data based on your search criteria.	Succeed
7	Click form details	Display the member information form	Succeed
8	Click the Change form	Display the member change form	Succeed
9	Click the Delete form	Data that has been deleted will not be recovered.	Succeed
10	Click on the add member form	Display the add member form, as well as basic information, family, parents, contacts, academics, and accounts.	Succeed
11	Click save button	Data from the form was successfully saved.	Succeed
12	Click Overall report	Display all alumni data	Succeed
13	Click Report per year	Display alumni data by year	Succeed
14	Click report by Province	Select a province, and all alumni data for that province will be displayed.	Succeed
15	Click Report by Job Type	Select a type of work, and all alumni data for that type of work will be displayed.	Succeed
16	Click Last Education Report	When you select a new school, all alumni data for that school will be displayed.	Succeed
17	Click Work Status Report	Select work status, and all alumni data who are currently working or not working will be displayed.	Succeed
18	Click Report per Region of Origin	Select the area of origin, then all alumni data will be displayed	Succeed
19	Click Report per GPA	Select GPA, then the GPA of all Alumni will appear	Succeed
20	Click News Category	Display news in category form	Succeed
21	Click News Data	Display news in list form	Succeed
22	Click Add news	Display the new News form	Succeed

3.3.5. Operation and maintenance

During the operation and maintenance of this system, the researcher created an alumni data collection information system, observed features that did not exist in the system, and checked anti-virus and backup information system files on a regular basis.

3.4. Implement

If it was successful, the next step is product testing, which includes a validation test on PTIK lecturers by distributing questionnaires with the following aspects: general criteria, special criteria, appearance, practical aspects, and technical aspects are the different types of criteria. By distributing questionnaires to administrators, you can conduct a practicality test.

This test's results include the validity test, the practicality test, and the effectiveness test, which yielded the following results:

3.4.1. Validity Test

During the validity testing phase, questionnaires are distributed to three expert validators. After calculating the validity test results, the PTIK IAIN Bukittinggi information system product for alumni data collection received a value of 0.76 and was declared valid.

3.4.2. Practicality Test

This test was conducted by distributing questionnaires to three examiners at the research site. The result was a value of 86.67%, which is said to be very practical.

3.4.3. Effectiveness test

The phase of effectiveness testing is carried out by distributing questionnaires to 5 alumni. The PTIK IAIN Bukittinggi information system for alumni data collection then receives a value of 0.87, indicating high effectiveness.

3.5. Evaluate

Following the system's testing, which includes the validity, practicality, and effectiveness tests, several suggestions and inputs are received from experts (validators), practitioners, and users. The author has summarized the following suggestions and inputs for the improvement of this information system design:

3.5.1. Recommendation of program expert (validator)

Adding the time it takes for alumni to get their first job and the length of time they study.

3.5.2. Recommendation of practitioner

This product should include the alumni's graduation date as well as their first job.

4. Conclusion

This research resulted in a product, namely the alumni data collection information system for the PTIK department of IAIN Bukittinggi. This system records data related to alumni to obtain information, so users can search for data to be conveyed to alumni, because there is no need to wait for third parties to provide alumni information. With the category of PTIK IAIN Bukittinggi alumni data collection, the designed information system received a validity test value of 0.76. The PTIK IAIN Bukittinggi alumni data collection information system was designed to achieve a validity test value of 0.76 in the valid category, a practicality test value of 86.67 in the practical category, and an effectiveness test value of 0.87 in the effective category. It can be concluded that the PTIK IAIN Bukittinggi information system for alumni data collection is valid, practical, and extremely effective.

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