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Verification Of Student Diplomas Based On Qr Code

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A B S T R A C T

Diploma verification is still done manually. During this time, the diploma is verified by displaying the original diploma. Because the campus does not match the diploma with the existing archives, diploma falsification is possible. IAIN Bukittinggi uses manual methods to verify the authenticity of diplomas. The goal of this research is to create a diploma verification system based on QR CODE to verify the authenticity of diplomas. Research and Development is the type of research employed (R&D). The system development model employs a waterfall approach and the System Development Life Cycle (SDLC). The validity test results are valid, with an average of 0.90. The average practicality test result is 92, indicating that the product is very practical. And the effectiveness test results with an average of 0.90, which is very high.

1. Introduction

All products must be legal. Legality is a state of lawfulness/legitimacy [1]. Legality encompasses all aspects of education, economics, and other fields. After completing the education level, educational institutions issue diplomas or graduation certificates, as stated in the National Education System Law (SISDIKNAS) No. 20 of 2003 article 61 section (2) states that diplomas are given to students after passing the examination [2].

Insitut Agama Islam Negeri (IAIN) Bukittinggi issued a diploma as proof of graduation. So far, the mechanism for legalizing IAIN Bukittinggi students' diplomas have been alumni bringing five copies of diplomas to the general department of the rectorate to be checked and stamped, and alumni attaching the original diplomas for verification. The only way to verify a diploma is to show the original diploma held by the alumni. However, the campus does not match the diploma with the archives stored on campus. Supposedly, in order to avoid diploma fraud, a verification must be performed between the original diplomas held by alumni and the data owned by the campus.

The verification of the legalization of the diploma is still done manually when it is stamped in the general section of the rectorate with the original diploma attached. If a company outside of Bukittinggi wants to inquire about the authenticity of the diploma, the company sends a letter to IAIN Bukittinggi to verify the authenticity of the diploma, which takes time.

Knowing something is legal (according to statutory regulations or law) [3], then verification is performed. Verification is an examination of the accuracy of reports, statements, financial calculations, and

so on [3]. This verification is intended to prevent counterfeiting. Diploma falsification has been reported in West Sumatra province [4].

The QR CODE can be used to verify diplomas electronically. QR CODE can store data both vertically and horizontally [5]. Versions of the QR CODE symbol range from 1 to 40. Each higher version number includes four more modules per side [6]. By using a QR CODE for diploma verification, the user can point the scanner at the document information and be directed to an online official website where the authenticity of the diploma can be verified. All of this data is stored in a database and is only publicly/privately accessible via URL. When a user or authority wants to verify the authenticity of a diploma, they can scan the QR CODE printed on the diploma, which will redirect them to the website URL and show them information from the website's official database that cannot be falsified.

2. Method

This research falls under the category of Research and Development (R&D). The system development model used is the waterfall model of the System Development Life Cycle. The waterfall is depicted in the Fugure 1 [7]:

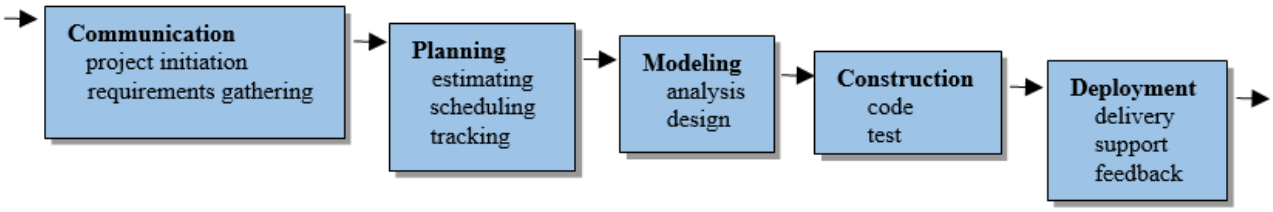

Figure 1. The Waterfall Model System Development Life Cycle

The following is an explanation of the stages carried out in the Waterfall model by Presman [7]: (1) Communication, communicate with the user. (2) Planning, planning the software development process. (3) Modeling, designing data structures, software architectures, interface representations, and procedural details. (4) Construction, writing code in a programming language. (5) Deployment, stages for product deployment and maintenance.

Products that have been tested for validity refer to the Aiken'V Statistical formula as follows [8]:

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

Description :

s = r – lo

r = the score given by the appraisers

lo = lowest validity research number

n = number of appraisers

c = the highest number of research validity

Therefore a practicality test is performed. A formula is used to process the results of the practicality tests [9]:

$$\text{Practical Value} = (\text{Total score answers for each item} / \text{Total ideal score of items}) \times 100\% \text{ .....(2)}$$

Table 1 displays the criteria for practicality testing results.

Table 1. Practicality Test [9]

Percentage	Criteria
0-20	Very Impractical
21-40	Less Practical
41-60	Sufficiently practical
61-80	Practical
81-100	Very Practical

The effectiveness test was then performed using the Cohen's kappa formula [10]:

$$\text{Kappa moment (K)} = (\rho 0 - \rho e) / (1 - \rho e) \quad \ldots\ldots(3)$$

Description [11] [12]:

K = Kappa moment

ρ0 = Realized proportion

ρe = Unrealized proportion

Table 2 displays the criteria for the results of the effectiveness test:

Table 2. Decision Categories based on Kappa Moments (K) [10] [13]

Interval	Category
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. Communication

The problem formulation is completed at this stage. This stage identifies user requirements, system requirements, human resource requirements, and technology requirements.

3.2. Planning

This stage defines the tasks that alumni, stakeholders, and administrators can complete. This system was created in one month.

3.3. Modeling

The data structure used is an array, with loops within the array. General design with UML, user output system design, output user design reading Android-based QR CODE, admin output and input system design, and database design are the steps in creating this system. Figure 2 is a use case diagram of the system.

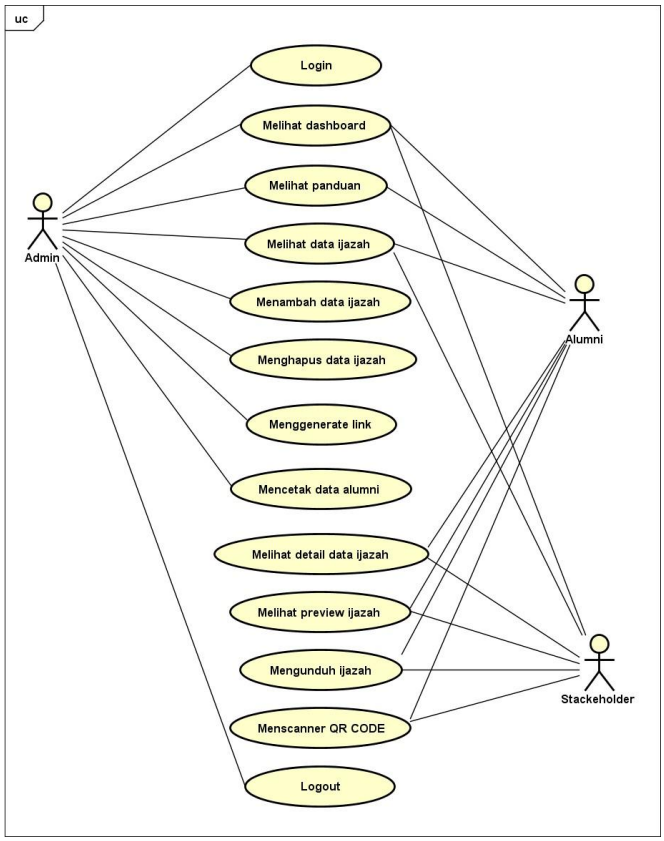

Figure 2. Use case diagram of a QR CODE-based Student Certificate Verification System

According to the use case diagram above, there are three actors, namely the administrator who manages the QR CODE-based student certificate verification system. Logging in, viewing home, viewing guides, viewing diploma data, generating links, printing diploma data, adding diploma data, changing diploma data, deleting diploma data, and logging out are all possible activities. Users (alumni and stakeholders) can see home, view guides, view detailed diploma data, preview diploma photos, download diploma photos, and scan diplomas.

The system activity diagram is as shown in the Figure 3:

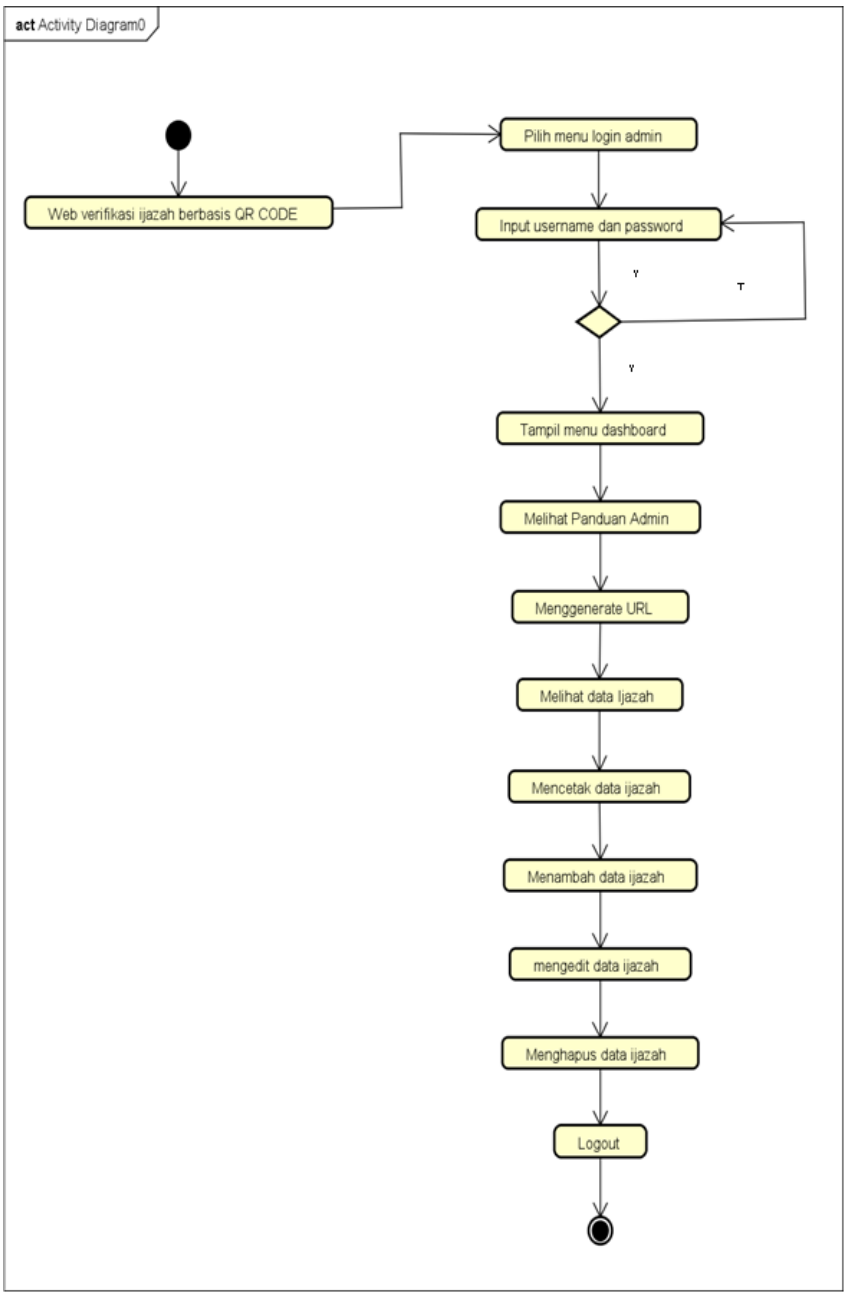

Figure 3. Administrator Activity Diagram

From the administrator's Activity Diagram in Figure 3 it can be seen the activities carried out by the admin. If you are logged in as an administrator, the first activity is to look at the home view, then see the admin guide, then generate the link, then proceed with managing alumni data, which includes inputting diploma data into the database, printing diploma data, and editing and deleting certificate data from the database.

The activities carried out by Alumni are depicted in Figure 4, namely viewing the home, viewing the usage guide, viewing diploma data, viewing diploma details, previewing diplomas, and downloading diplomas.

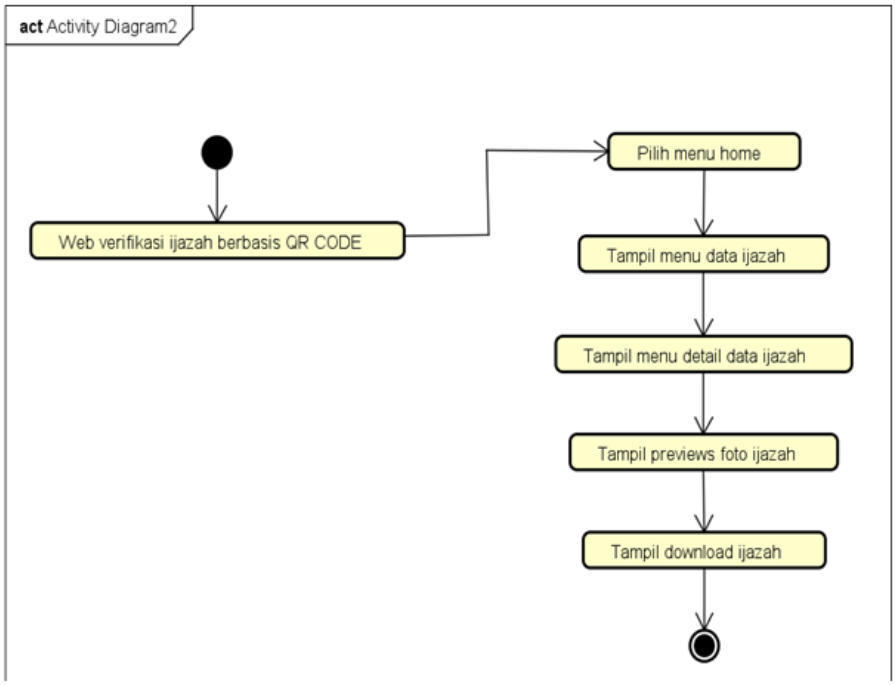

Figure 4. Alumni Activity Diagram

The activities carried out by Alumni are depicted in Figure 5 by the Alumni Activity Diagram Menscanner QR CODE on Diplomas, which includes viewing the home, viewing the usage guide, viewing diploma data, viewing diploma details, previewing diplomas, and downloading diplomas.

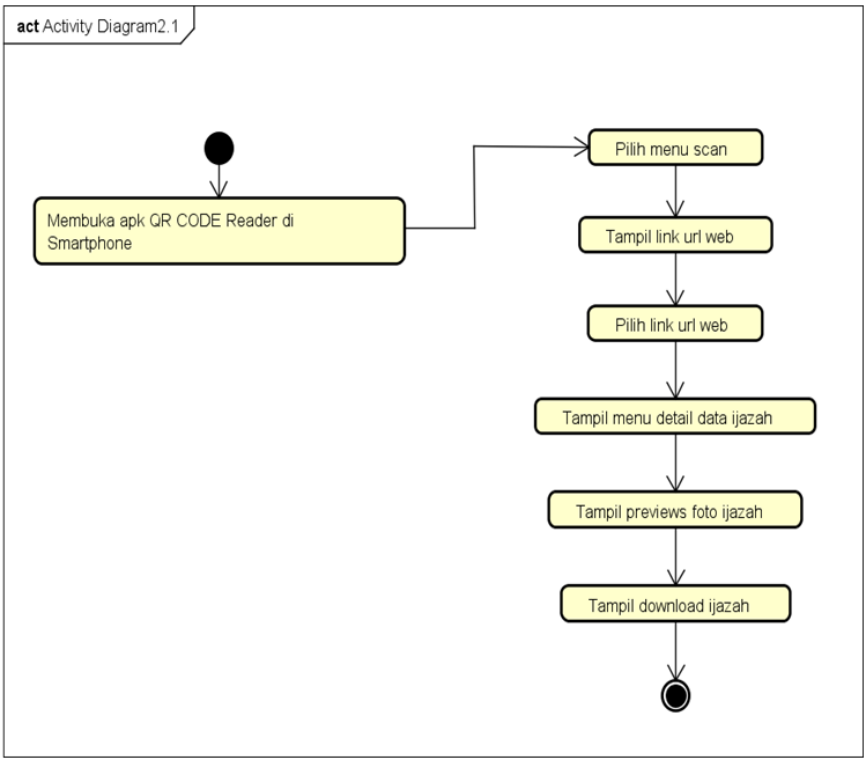

Figure 5. Student Activity Diagram

Class diagram of this system can be seen in the Figure 6:

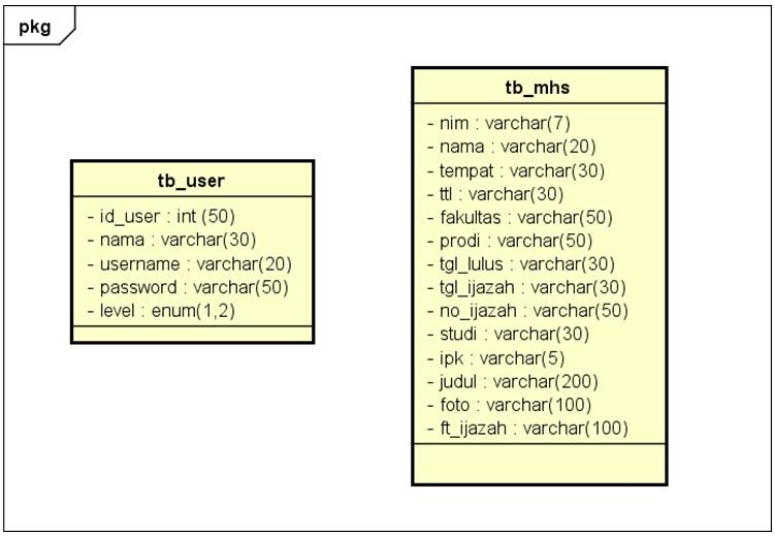

Figure 6. Class Diagrams

The input interface is designed with a login form, a QR-CODE generate form, and an alumni (admin) data addition form. The first input design is the login form design, which serves as the application's gateway. The login form is available at the user level so that all system users can access the application through it. Create the login form shown in Figure 7:

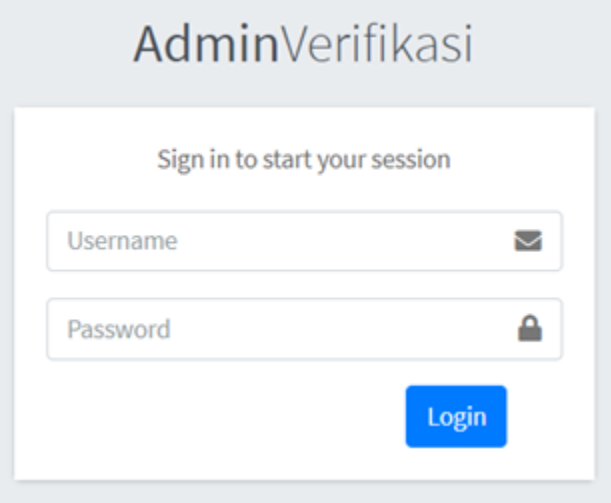

Figure 7. Login Form Design

The next input design is the QR-CODE generate form. This form serves to change the url link into a QR-CODE. The QR-CODE generate form design is shown in Figure 8 below:

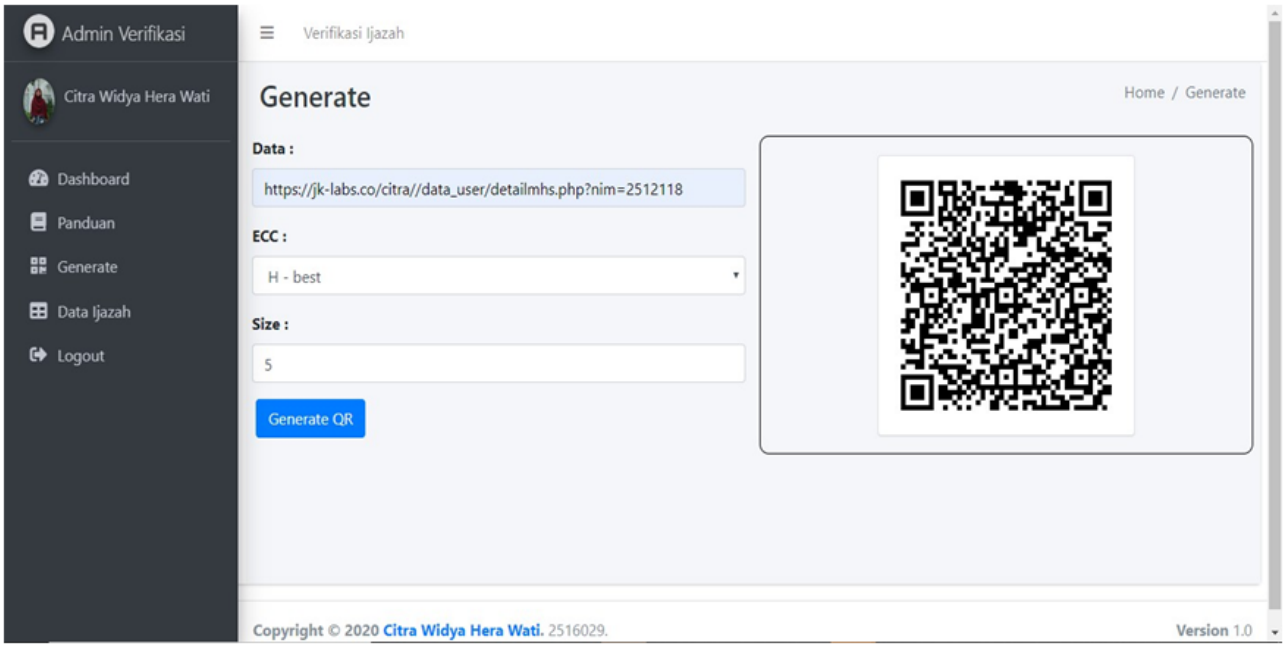

Figure 8. Design of The Form to Generate QR-CODE

The Diploma Data form follows, and it is used to manage diploma data, such as adding, editing, and deleting diploma data. Figure 9 depicts the design of the form for adding diploma data.

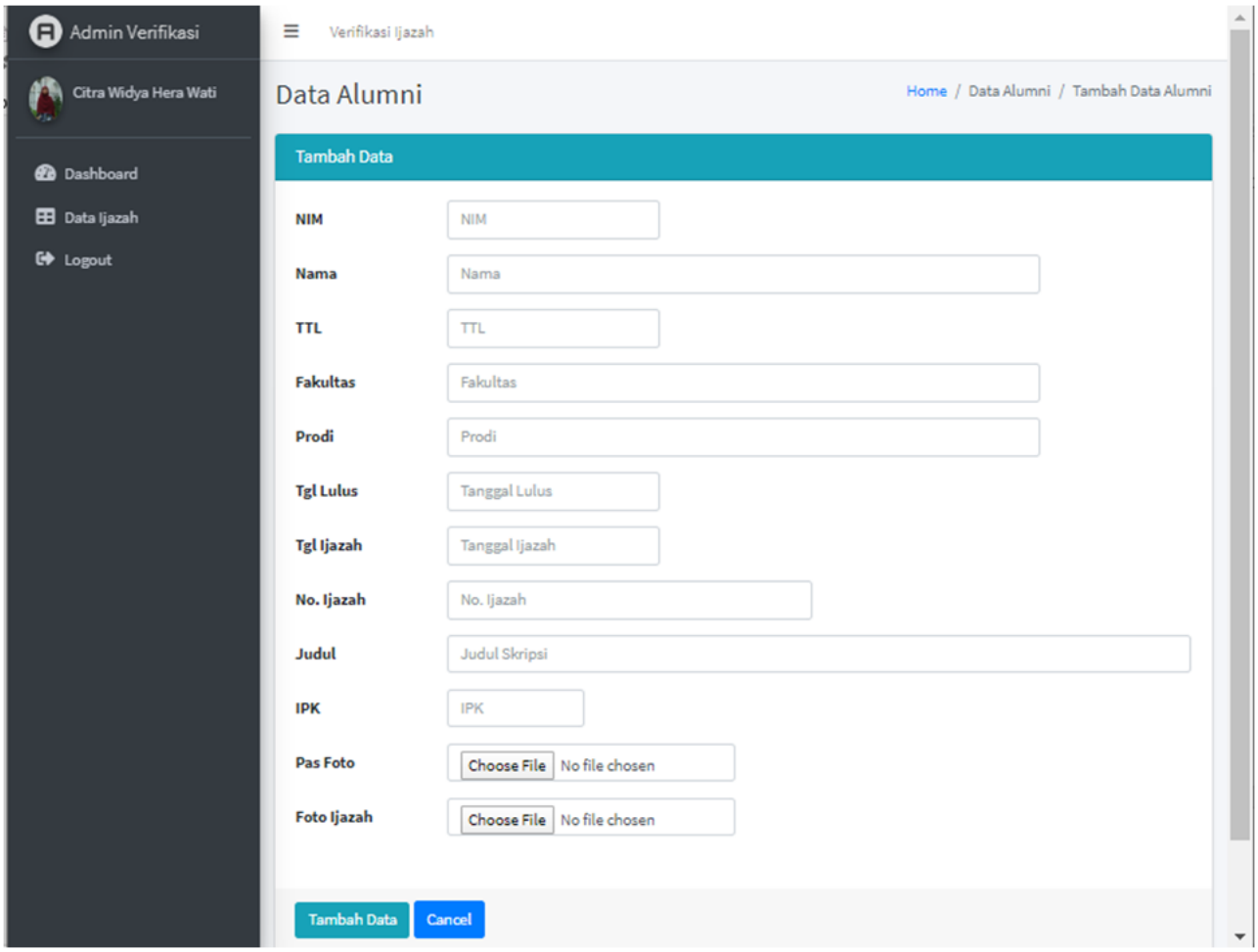

Figure 9. Diploma Data Form Design

The output design of this system is detailed Alumni Data, as shown in Figure 10 below:

IAIN Bukittinggi **Alumni PTIK**
Jl. Raya Gurun Aur, Banuhampu
Kab. Agam, Sumatera Barat, 26181

Nomor Telp (+62) 82167158815 NIM : 2512118
DETAILS DATA ALUMNI

Nama Mahasiswa	*Hari Febrianto*
Teampat Lahir	
Tanggal Lahir	*1994-02-08*
Fakultas	*Fakultas Tarbiyah dan Ilmu Keguruan*
Prodi	*Pendidikan Teknik Informatika dan Komputer*
Tanggal Lulus	*2016-08-23*
Tanggal Ijazah	*2016-10-06*
No. Ijazah	*1291/In.26/PP.01.1/FTIK.940/PTIK.330/10/2016*
Studi	
Judul	*Perancangan Media Pembelajaran pada Mata Pelajaran Penjas Orkes di SD 04 Garegeh Menggunakan Adobe Flash*
IPK	*3.47*

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Figure 10. Detailed Design of Alumni Data

3.4. Contruction

The program syntax is created in the diploma preview, diploma download, admin login, admin logout, diploma data add, diploma data change, and data delete buttons. Table 3 shows the results of black box testing, which is used for system testing.

Table 3. Test Results with Blackbox Testing

No	Design And Process	Expected	Desc
1	Main / home page menu	Display the main / home page	Succeed
2	Click the guide menu	Display the guide menu	Succeed
3	Click the diploma data menu	Display the diploma data menu	Succeed
4	Click the menu to search for diploma data	Display the menu to search of diploma data	Succeed
5	Click the diploma data details menu	Display the diploma data details menu	Succeed
6	Click the menu to view / preview diploma data	Display the menu to view / preview diploma data	Succeed
7	Click the download photo diploma menu	Display the download photo diploma menu	Succeed
8	Main page menu of the QR-CODE Scanner application	Display main page menu of the QR-CODE Scanner application	Succeed
9	Click the QR-CODE menu	Display the QR-CODE menu	Succeed
10	Click the diploma verification web link menu	Display the diploma verification web link menu	Succeed
11	Click the open browser menu	Display the open browser menu	Succeed
12	Click the admin login menu	Display the admin login menu	Succeed
13	Click the generate link menu	Display the generate link menu	Succeed
14	Click the menu to print the entire	Display the menu to print the entire diploma data	Succeed

	diploma data		
15	Click the menu to print individual diploma data	Display the menu to print individual diploma data	Succeed
16	Click the diploma data menu	Display the diploma data menu	Succeed
17	Click the menu to add diploma data	Display the diploma data that has been added	Succeed
18	Click the menu to edit diploma data	Display the menu to edit diploma data	Succeed
19	Click the delete diploma data menu	Display diploma data that has been reduced	Succeed

3.5. Deployment

Dissemination of the system by utilizing social media, namely Facebook groups and WhatsApp groups.

4. Conclusion

This study was successful in developing a QR CODE-based student diploma verification system in the form of a web application. The results of the product test were valid, with the first validity test yielding results with an average of 0.90. The results of the practicality test have an average value of 92, which is very practical. And the effectiveness test has a very high average value of 0.90.

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