



## SYSTEM DESIGN AND IMPLEMENTATION OF ONLINE ADMISSION SYSTEM AT XYZ UNIVERSITY

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### ABSTRACT

Digital transformation that is developing along with the industrial revolution 4.0 makes all sectors must be able to adapt and compete more competitively. XYZ University in Ambon, Maluku is currently still carrying out the admissions process manually and using the Google Form. This study aims to design and implement a web-based admissions system at XYZ University. Thus, this system can help the admissions committee and the new students who will register from anywhere and at any time. The method used in this research is Agile Software Development (ASD). This method is very popular in the IT industry today because of its speed and ability to adapt to the changing needs of users. ASD has several models and the one used in this study is the Scrum model, where each Product Backlog obtained from the user is divided into several sprints to make software development easier and faster. The results of this study have been tested and are running well from an operational and functional standpoint to help the admissions committee and new students in the registration process. The conclusions based on the results of this study are (1) the ASD method can help and speed up the software development process, and can be adapted to user needs because it is end-user-centered; (2) This system can help solve research problems, in this case the admissions committee at XYZ University to manage online admissions of new students. In addition, this system can make the process of admitting new students easier and more affordable for students to register from anywhere and at any time.

**Keywords:** Agile Software Development; Scrum Model; Student Admissions;

### 1. INTRODUCTION

Technology in various government and private agencies has become necessary to adapt to current developments. Digital transformation is currently being carried out more intensively by various sectors to improve their business because it can affect all aspects of their customers' lives (Reis et al., 2018). Digital transformation, also known as digitization, is developing along with the industrial revolution 4.0, which includes Cyber-Physical Systems, the Internet of Things, and Cloud Computing (Kurniawan et al., 2021; Rahmawati, 2020). Competitive competition makes companies or organizations adopt the use of technology such as big data, cloud, social media, and mobile platforms (Kurniawan et al., 2021). Digital transformation is also carried out in the education sector, starting from the level of playgrounds, and elementary schools, to universities (Nursyifa, 2019; Putri et al., 2021). However, not all institutions have carried out digital transformation so far. XYZ University, as one of the private tertiary institutions in Maluku Province, currently does not have a cloud-based admissions system.

The new student admission process that occurs is still carried out manually by paper, where prospective new students who wish to register must go to the registration counter opened by the Academic Bureau. They are required to bring the required documents in hardcopy form and validate the payment of the registration fee at the finance department before collecting the documents at the registration counter. The counter clerk then inputs their daily data into the computer for the recap. This process is inefficient because a lot of time is wasted just to re-enter the registrant's data into the computer, especially during the registration period. Another problem arose when determining the participant serial number code which was still done manually by the officers, where numbering errors often occurred, thus confusing the participants. This is also a problem for prospective students because they have to print documents for hours. In addition, the geographical conditions of Maluku make prospective new students also have to pay more for accommodation and transportation, considering that many participants come from outside Ambon Island.

Based on these existing problems, this study aims to design and implement an online admission system at XYZ University. This system not only records student registration data quickly and efficiently but can also display statistical information on registration for each study program and faculty, registration and payment information as well as analysis results (Liu et al., 2012). This system will also make it easier for prospective students and officers in the registration process. Prospective students can register from anywhere so they don't have to go to campus and stand in line for hours. The personal data of prospective new students and registration documents have been entered directly by the participants, making it easier for the counter staff.

Previous research on the admissions system has also been discussed by several researchers. Pramana A., et al. (2019) in their research entitled "Android-Based New Student Registration Information System" aim of designing and implementing an Android-based registration information system (Pramana et al., 2019). Simanullang, H. G., et al (2021) also conducted research on new student registration information systems using the CodeIgniter (CI) framework and Application Programming Interface (API) with the aim of providing the best service for prospective students and overcoming manual registration problems at registration locations using Waterfall method (Simanullang et al., 2021). Related research was also conducted by Priyanto and Sirajuddin (2018) with the title "Web-Based New Student Registration Information System at the Wiratama Polytechnic of Science & Technology, North Maluku". This study aims to design an admissions system for prospective new students at the Wiratama Polytechnic of Science & Technology, North Maluku using the waterfall method (Priyanto & Siradjuddin, 2018).

The research mentioned above has proven that an online registration information system has been able to make the process of admitting new students faster, more effective, and more efficient. This is the basis for researchers to develop an Online Admission System for New Students at XYZ University. The differences from previous research are in terms of the business process for new student registration at XYZ University and the demographics of prospective students. The system developed in this study also takes into account the recommendations from Tuhuteru, et al. (2021) in a study entitled "An Analysis of New Student Online Registration Information Systems at XYZ University Using the Technology



Acceptance Model" because it has relatively the same demographics of prospective new students, namely in Maluku (Tuhuteru et al., 2021). The results of this study indicate the importance of the convenience factor for users in using the online registration information system by providing guidance on using the system and good navigation between links. In addition, this research uses a different software development method from previous studies, namely Agile Software Development (ASD).

This research is urgent to do especially to carry out digital transformation at XYZ University. Current technological developments require every institution to make a change to be more competitive in the current era of the industrial revolution 4.0. The registration process which is still done manually has many weaknesses so changes to the online registration process need to be implemented immediately. This will also attract the interest of prospective new students to register because the process is easy and straightforward.

## 2. THEORY

### *Management Information System*

Wijoyo, et al (2021) defines a Management Information System (MIS) as follows: "a series of information sub-systems that are comprehensive and coordinated and rationally integrated that are capable of transforming data so that it becomes information in several ways to increase productivity by the style and nature of top managers based on predetermined quality criteria" (Wijoyo et al., 2021). Meanwhile, Sri Mulyani (2017) defines MIS as "a computerized information system that works because of human and computer interaction" (Mulyani, 2017). Based on these opinions, MIS can be interpreted as a computer-based information management process involving interaction between humans and computers. Its relation to the current research can be interpreted as a computer-based registration data management process to facilitate ongoing business processes.

### *Model-View-Controller (MVC)*

Model – View – Controller (MVC) is an architectural pattern in software development that is divided into three interconnected elements (Aniche et al., 2018; Guaman et al., 2021). MVC is a very popular architectural pattern due to its advantages that separate application focus for user interface and data management (Guaman et al., 2021). The model represents the data structure, the View is information that will be displayed to the end-user, while the Controller is the link between the Model, View, and additional extensions to process HTTP requests so that they can produce web pages.

### *CodeIgniter Framework*

CodeIgniter (CI) is a web framework for the PHP programming language that is open-source and can be used by anyone for free. The framework itself is a framework that contains a set of functions or procedures and classes that are made with specific goals and are ready to use to facilitate and speed up the work of a programmer (Simanullang et al., 2021; Suhartono & Khodirun, 2020). CI is built with the MVC development pattern and is flexible if later application development does not use Models. The CI flowchart as shown in Figure 1 below can be explained as follows (CodeIgniter Foundation, 2022):

1. Index.php acts as the front controller, initializing the basic resources needed to run CI.

2. The router checks the HTTP request to determine what to do via the Unified Resource Identifier (URI).
3. If there is a cache already stored in the browser, it will be sent back to the browser immediately.
4. Security. HTTP requests and user-submitted data are filtered for security before being loaded.
5. The controller loads the Model, Core Library, Helpers, and other resources needed to process special requests.
6. Views that have been processed in the Controller are then sent to the browser to be displayed. If there is a cache, then the display is processed first before the next request is served.

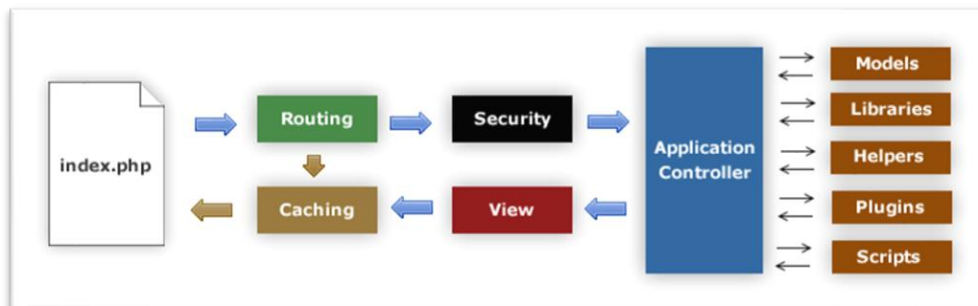


Figure 1. Flowchart CodeIgniter (Source: <https://codeigniter.com/userguide3/overview/appflow.html>)

### 3. METHOD

The stages of the research were carried out using the Agile Software Development (ASD) method. This method is one of the software development models that are more often used in the software industry worldwide than traditional models such as Waterfall because it is faster and more sustainable and allows interaction with users during the development process and can adapt to changes needed (Dima & Maassen, 2018; Jain et al., 2018; Shastri et al., 2021). The stages of development with the ASD method are shown in Figure 2.

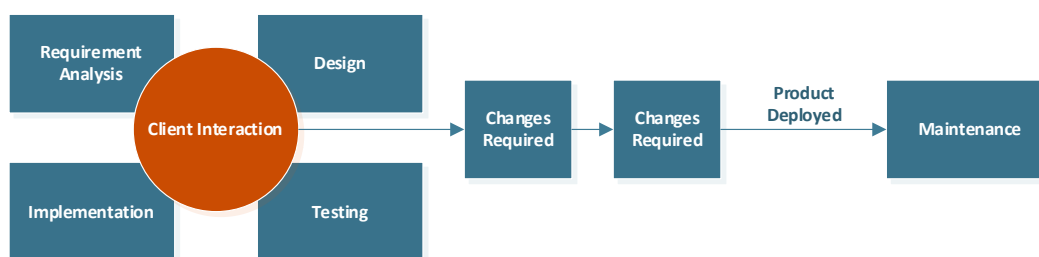


Figure 2. Agile Software Development (ASD) Method

Software development using the ASD method has several models, and the model used in this study is the Scrum model (Al-Saqqa et al., 2020; Curcio et al., 2019; Dima & Maassen, 2018; Jain et al., 2018). The Scrum method divides software development into small, iterative processes which are usually called sprints. The Scrum model on ASD is shown in Figure 3 below.

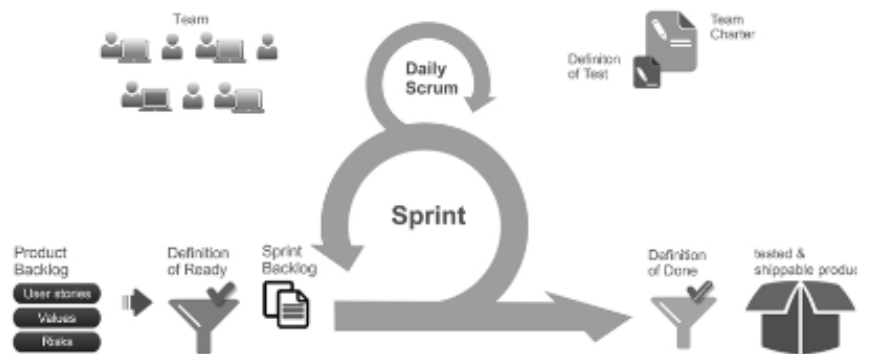


Figure 3. The Basic Principles of the Scrum Process (Dima & Maassen, 2018; Linz, 2014)

In the Scrum model, as described by Linz (2014), in the first stage a Product Backlog is created which contains a list of priorities obtained from users (Linz, 2014). This priority list is then divided into several sprints that each will work on to completion.

### **Requirements Analysis**

At this stage, an analysis of system requirements is carried out through data collection using interview techniques and observation of the old system that is already running. In addition, a literature review was carried out on documents or new student registration guidelines that apply at XYZ University.

### **Design**

At the design stage, software modeling is carried out using the Unified Model Language (UML). UML is one of the standard languages used to define requirements, make analyses and designs, and describe architecture in object-oriented programming (A. & Salahudin, 2019). At this stage, modeling is carried out using use case diagrams and activity diagrams.

### **Implementation**

The implementation of the design results is carried out in a program with coding. The program is built using the PHP programming language: Hypertext Preprocessor with the CI framework. As discussed in the previous chapter, CI uses the MVC development pattern which divides software development into 3 elements, namely Model, View, and Controller.

### **Testing**

Testing is carried out for verification and validation (V&V) of software as a guarantee of software quality (Software Quality Assurance (SQA)) (A. & Salahudin, 2019). Testing at this stage uses the Black-Box Testing approach which tests the software in terms of program functional specifications. This test is carried out by trying all the functions in the software to see if they are under the required specifications (A. & Salahudin, 2019).

## **4. RESULTS AND DISCUSSION**

The initial observation process has identified the main problems currently faced by XYZ University, especially the acceptance of new students which is still done manually. Therefore, there is a need to change this problem with digital transformation. Processes that previously took a long time can be completed effectively and efficiently with the current software development.

### System Modeling

With the ASD method with the Scrum model, the first step is to analyze requirements, both functional and non-functional. Based on the results obtained at this stage, the information system to be built refers to the 2020 Regulation of the Chancellor of XYZ University concerning the Admission System for Vocational, Undergraduate, Master, and Doctoral Programs at XYZ University. In addition, the number of actors in this study was also determined, namely Users and Admins.

Then at the design stage, modeling is carried out for software development using UML. The design and modeling results are represented using a use case diagram which can be seen in Figure 4 and an activity diagram which can be seen in Figure 5 below.

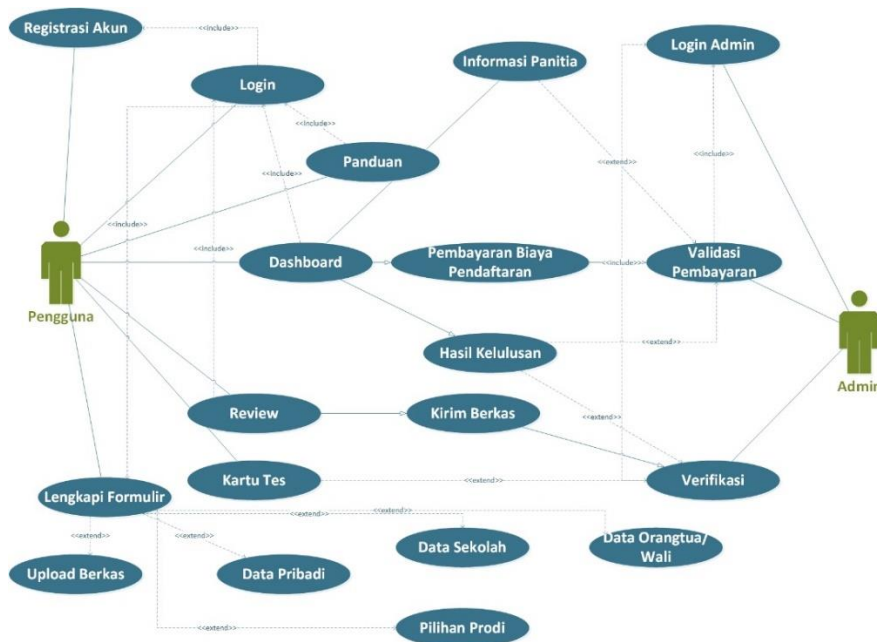


Figure 4. Use Case Diagram of Admission System

The Use Case Diagram as shown in Figure 4 has 2 actors, namely prospective new students and admins as operators who handle user data. Users can register, log in, view the system usage guide, enter the dashboard menu, complete the form, and review the results that have been previously filled in and sent for verification by the admin. Users can view information from the committee and complete the registration form if the registration fee payment process has been validated by the admin. Users can also see the results of graduation if the file has been verified by the admin. The menus available on the Complete Form menu are Personal Data, Parent/Guardian Data, School Data, Choice of Study Program, and Upload Files.

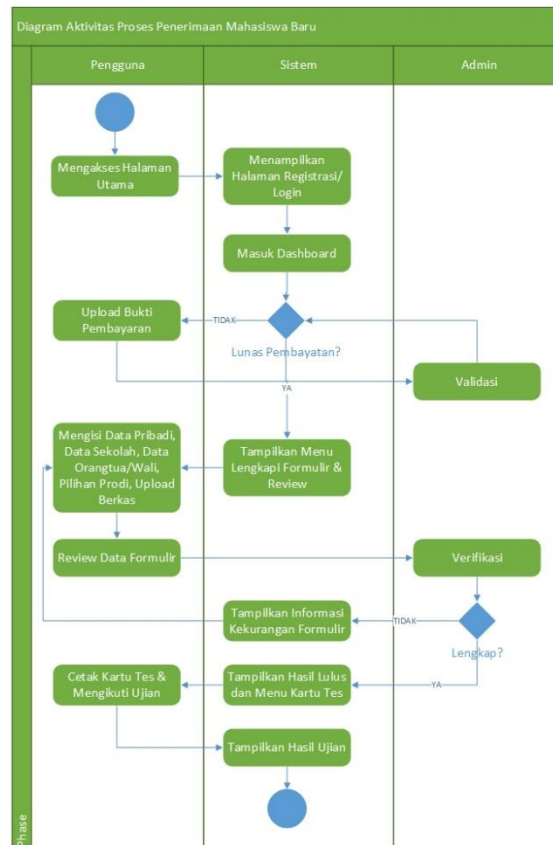


Figure 5. Activity Diagram of the New Student Admission Process

The activity diagram as shown in Figure 5 shows how the admission system activity flows. This flow starts with the User accessing the main page, i.e. the registration page. After that, the user can log in and the system will display the Dashboard page. On this page, if the User has not paid the registration fee, the system will display an uploaded proof of payment which will be validated by the Admin. If it has been declared paid off, the system will display the Complete Form and Review menu. Users can then fill in Personal Data, School Data, Parent/Guardian Data, and Choice of Study Programs, and Upload Files. Users can review the input data on the Review menu before submitting the filling results for further verification by the Admin. If verification has been completed, the system will display information on the test number and identity card. Then the user can take the entrance exam and the system displays the results of the exam or selection.

### **Implementation/Coding**

The implementation of the previously designed modeling has been carried out well. The image below shows the initial page that will be displayed to the User where on this page the User can fill in the required data before registering an account.



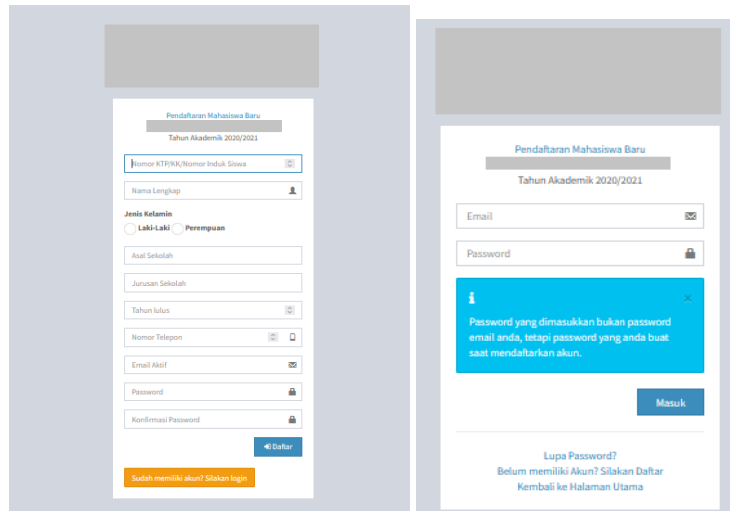


Figure 6. Main Page for Account Registration and Login

Furthermore, if you have not paid the registration fee, an upload proof of payment will be displayed. After the Admin validates the payment, the User can see the Complete Form and Review menu as shown in Figure 7 below.

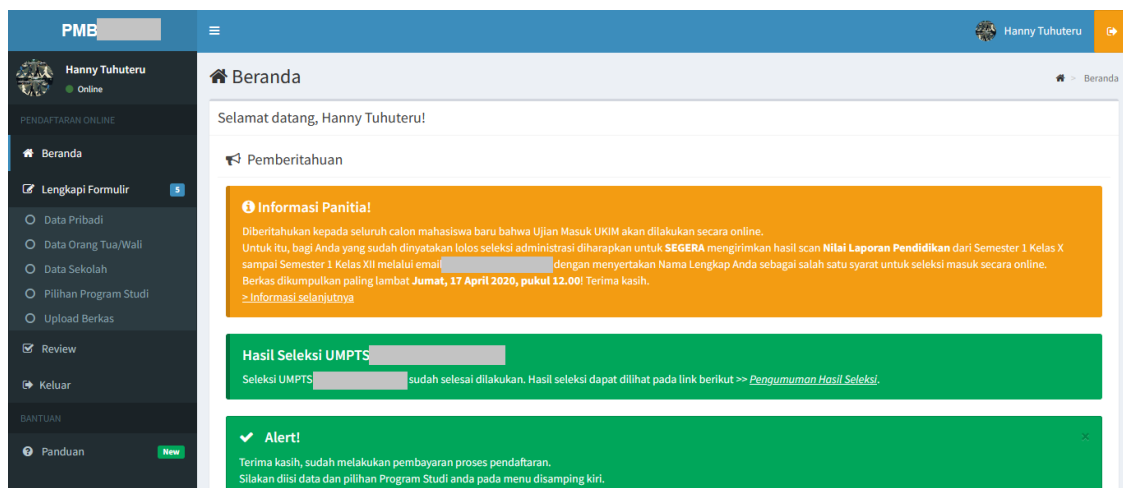


Figure 7. Dashboard and Side Menu

One of the sub-menus in the “Lengkapi Formulir” menu is Personal Data as shown in Figure 8. The “Lengkapi Formulir” menu is used by the User to fill in the required data such as a passport photo, personal data, school data, parent/guardian data, choices study program and upload the necessary requirements files.



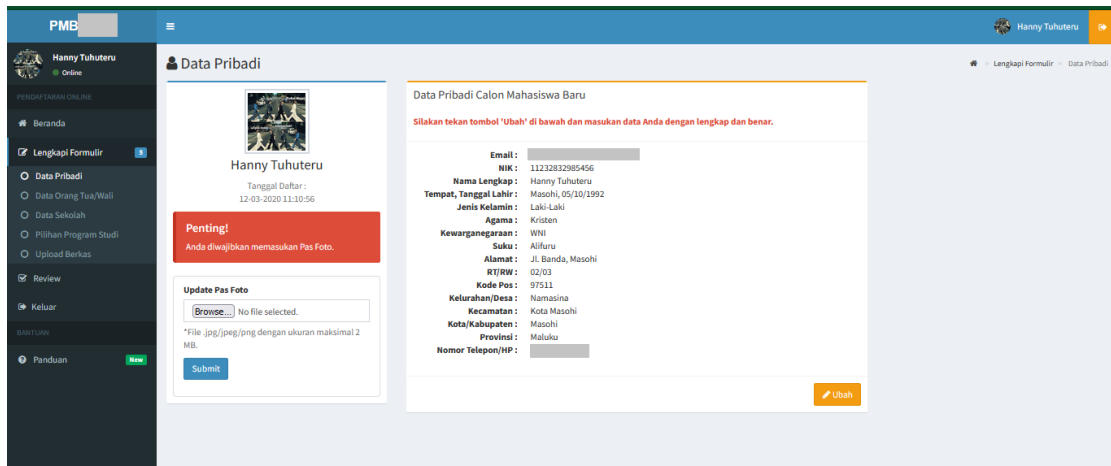


Figure 8. Personal Data Sub Menu

Next, the User can re-check the pre-filled data on the Review Menu as shown in Figure 9. If it is correct, the User can click Process to send his registration data and it will be verified by the Admin.

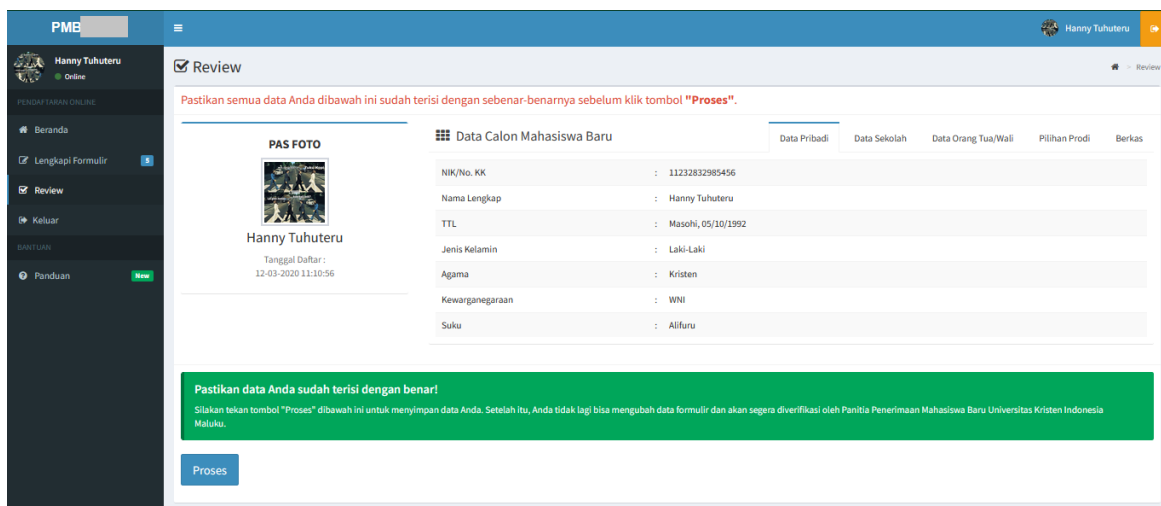


Figure 9. Review Menu

Meanwhile, Admin can login to his dashboard as shown in Figure 10 below.

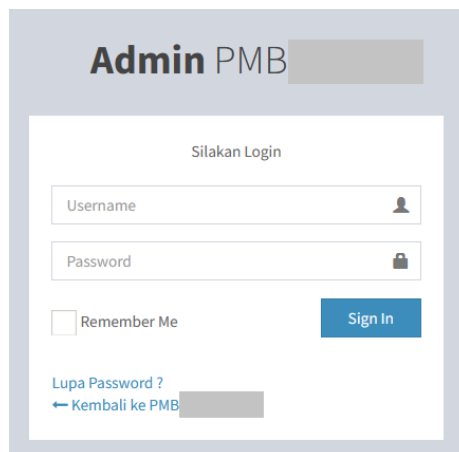


Figure 10. Admin Login Page

Then they will be directed to the Dashboard menu in Figure 11. In this menu the admin can see a summary of the registrant data, both the number of registrants, the number of users who have paid, those who have not been processed and those who have been received. In addition, the Admin can see the data of all registrants with their validation status and verification status.

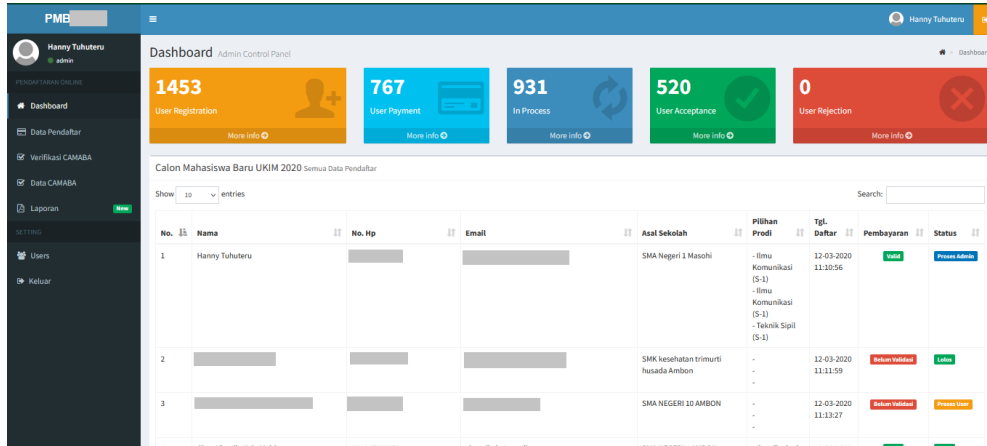


Figure 11. Admin Dashboard Page

The validation and verification processes carried out by the Admin are shown in Figure 12 and Figure 13 below. Validation is carried out by the Admin for payment of registration fees, while verification is carried out to verify the data of each User.

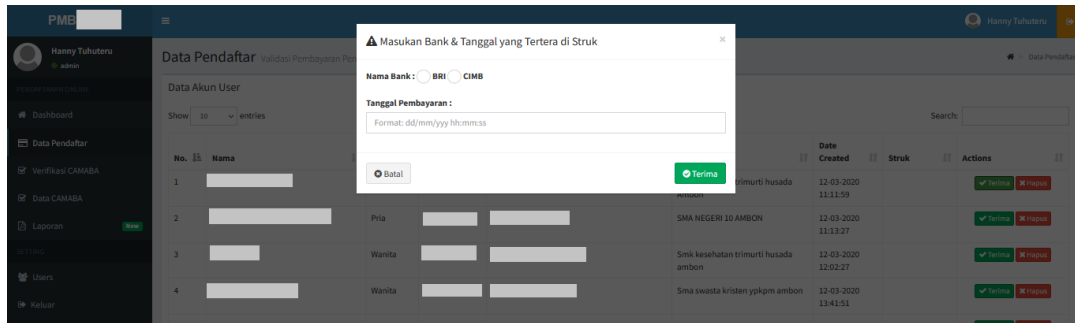


Figure 12. Payment Validation Page

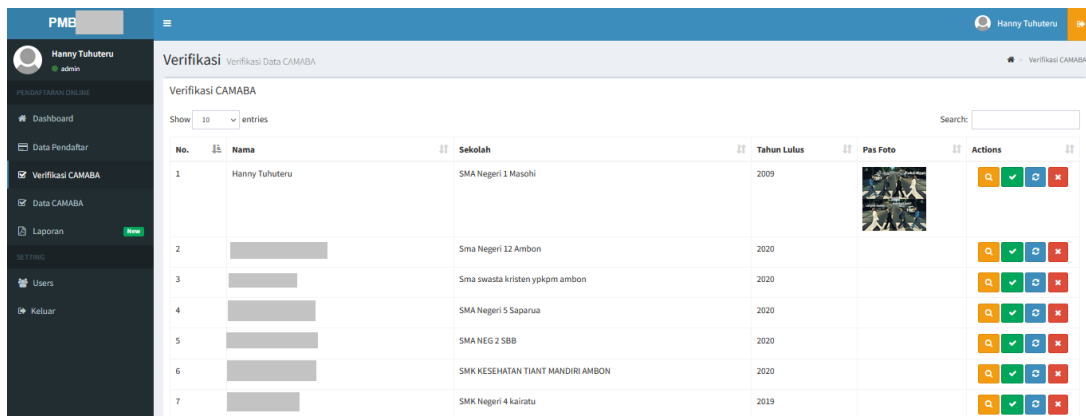


Figure 13. Verification Page



On this verification page there are 4 actions that can be performed by the Admin, namely viewing detailed data per user, receiving verification results, returning registrant revisions with comments, and rejecting the requirements file.

### System Testing

System testing is carried out to test every software function that has gone through the implementation or coding stage. Submissions are made by looking at each function in the program and will be compared with the expected test results. The results of black-box testing are shown in Table 1 below.

Table 1. Black-Box Testing Results

| Test ID | Description                                                                          | Expected Results                                                                    | System-provided Results |
|---------|--------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------|
| 1       | The user registers and logs into the system                                          | The account is registered and successfully logged into the system                   | As expected.            |
| 2       | User uploads the proof of payment                                                    | Proof of payment was uploaded successfully                                          | As expected.            |
| 3       | Users fill in and edit personal data, parent/guardian data, and school data          | Data can be filled in and changed                                                   | As expected.            |
| 4       | Users choose and change 3 study programs and upload requirements files               | The choice of study program was successfully selected and the upload was successful | As expected.            |
| 5       | The user sees a summary of the registration fields and process the requirements file | Displays a summary of entries and successfully sent data                            | As expected.            |
| 6       | Admin login and go to the Dashboard                                                  | Successfully logged in to the admin dashboard                                       | As expected.            |
| 7       | Admin performs payment validation                                                    | Can do payment validation                                                           | As expected.            |
| 8       | Admin verifies payment                                                               | Can do payment verification                                                         | As expected.            |

## 5. CONCLUSIONS AND SUGGESTIONS

### Conclusions

Based on the results of the needs analysis, design, coding, and testing that have been carried out successfully, several conclusions can be drawn as follows:

1. The ASD method can help and speed up the software development process, and can be adapted to user needs because it is end-user-centered.
2. This system can help solve research problems, in this case the admissions committee at XYZ University to manage online admissions of new students. In addition, this system can make the process of admitting new students easier and more affordable for students to register from anywhere and at any time.

### Suggestions

The suggestion for developing this admission system is to build a payment gateway so that applicants can make registration fee payments automatically without having to upload proof of payment and be validated by the Admin. This can also shorten the registration time to be shorter

because applicants can immediately fill in the data and required files after making a payment. Further development can also be carried out through the integration of the National Student Identification Number (NSIN) with the system, as well as integrating systems with existing systems at XYZ University, such as the Academic Information System and the Financial Management Information System.

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