

## Developing Bidikmisi Information System

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### ABSTRACTS

Bidikmisi is a scholarship provided by Indonesian Government. This scholarship is for outstanding students coming from poor family. The importance of this scholarship is for the sustainability of education in Indonesia and it needs a system to support it. This paper discusses the development of Bidikmisi Information System Web and Android Based. The design tool was by using Unified Modelling Language (UML). The software equipment implementation was web based using Lavarel framework aiming for registration data validation. While android application is aimed for the supporting aid when visitation. The results of the examination obtain 45,86% data of the registrants are invalid.

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### KATA KUNCI

Bidikmisi,  
Laravel Framework,  
Information System,  
Android,  
Realm

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### 1. INTRODUCTION

Bidikmisi is one of the reception paths of new students in universities in Indonesia. Students who are accepted in this path will receive scholarship named bidikmisi. Bidikmisi scholarship is scholarship which is given by the government of Indonesia for students prospective who have economic limitations but also have good academic potential [1].

This Bidikmisi Program is held since 2010 by the government of Indonesia. Every year, the amount of people who are interested in Bidikmisi is significantly increased [2]. This research is conducted in one of the university institutions in Indonesia which is xyz. Based on data obtained from xyz bidikmisi management, in 2019 the number of registrants reached around six thousand while quota to be accepted is less than 300. The number of prospective students who register through bidikmisi part requires extra effort and time in selecting the prospective bidikmisi recipient as well as possible.

Research related to this Bidikmisi case has been conducted. Such as research on monitoring systems for Bidikmisi scholarship recipients based on web, android and SMS gateway [3]. Other researcher who discuss similar review about monitoring information system and Bidikmisi evaluation [4]. The evaluation is conducted by monitoring the GPA of scholarship recipients.

Even though, the regulation of Bidikmisi selection is handed to University management by referring to regulations predetermined by Belmawa Ristekdikti.

The registration of Bidikmisi through site belmawa.ristekdikti.or.id provides sufficient data as consideration materials for the decision maker. But unfortunately, this Bidikmisi registration system does not have a filter on incoming data. So, this will burden the college management to process data that contains a lot of garbage. The purpose of this study is to propose an information system model that can solve management problems in managing Bidikmisi scholarship registration.

The initial selection stage for bidikmisi recipient prospective by conducting data validation. The data to be validated includes score data, parents' income, the average income of parents per family dependent, suitability of student majors with selected study programs.

The next stage is conduct visitation. Visitation is activity of visiting Bidikmisi recipient students. This is conducted to check the suitability of data given with the actual condition in the field. The data examination in this visitation is still conducted manually which is by filling out the form provided by institution management. This is less effective and less efficient (not environmentally friendly). The challenges faced when visitation is when conducted visits to remote areas. The signal problem in these remote areas unable people for conducting voice communication and data communication.

From the elaboration above, this paper discusses about the management of Bidikmisi Registration Data. The result of data process is next used for DSS application owned by xyz university. Therefore, it becomes the focus of research. First, web based bidikmisi information system, functions to conduct data validation. Second, android based mobile application as client side can change student's data when they are in the location of student's house. This mobile application can run even though without internet connection. Considering the visitation location is usually difficult to get internet signal.

## 2. LITERATURE REVIEW

### 2.1. Web Framework

Web Application Framework or commonly abbreviated as web framework is a collection of code in the form of library and tool which is combined in certain form becomes a framework to ease and accelerate web application process.

There are several Framework webs for PHP, such as: CodeIgniter, Yii Framework, Zend Framework, Laravel, Symfony, Cake PHP, Phalcon, Kohana, Fuel PHP and others. Most of the frameworks implement the design of Model-View- Controller (MVC), which separates some code for the management of business process in some code for presentation (display).

Laravel is a PHP framework which is built by MVC concept. Laravel is web application work framework which ease the development process also simplifies the repetitive tasks which is used in most we applications currently [5].

Laravel is written in PHP language which is designed to improve software quality by reducing initial development cost and to increase maintenance cost and to improve work experience with application by providing syntax which is expressive, clear, and saving time.

Model is class which presents or models type of data used by application. Type of data that can be modelled is in many forms; can be table in data basis, files or others [5].

View is basically a web page or certain parts of web such as header, footer and sidebar. The inner part of web is often called fragment. View can be containing of other views. It means that, we can insert view in the form of fragment to other view as web page. View is responsible to display data from model through [5].

Controller is the heart of application which is made by Laravel. This component that bridging data travel using view and model [5]

### 2.2. Unified Modelling Language (UML) [6]

UML (Unified Modelling Language) is a modelling language for system or software which has paradigm of oriented to project. Modelling is used to ease and learn and understand.

TABLE 1. Mean abrasion weight losses of high-performance DSP cementitious mortars with nano- and/or micro-scale reinforcement

Picturers	Description
	Use case describes the functions provided by the system as the units to exchange messages between the unit and the actor.
	Actor describes someone who activates the functions of target system. Actor interacts with the use case.
	The association between the actor and the use case is described with the line without arrow which identifies who and what asks for direct interaction and not identifying the data.

	The association between the actor and use case which uses the open arrow identifies if the actor interact passively with the system.
<code>&lt;&lt;include&gt;&gt;</code>	Include is the calling of use case by other use cases.
<code>&lt;&lt;extend&gt;&gt;</code> 	Extend is the extension of another use case if the condition or the requirement is fulfilled.

**2.2.1 Use case diagram**

Use case diagram is modelling for behaviour of information system to be made. Use case is used to find out what functions in the information system and who have rights to use those functions. Symbols used in the use case diagram can be seen in table 1[6].

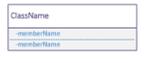
**2.2.2 Class diagram**

Class diagram is a diagram that illustrates system structure from the side of class definition to be made for system building. Class diagram is typically including class, associations, generalization, and aggregation, attribute, operation and visibility. The relation between class has description which is called multiplicity or cardinality [6]. The explanation of symbol in class diagram can be seen in table 2.

**2.2.3 Activity diagram**

Activity diagram is diagram which illustrates activity that happens in the system. This diagram is similar to a flowchart because we can model a workflow from one activity another activities or from an activity to temporary condition (state)[6]. Symbols in activity diagram can be seen in table 3

**TABLE 2.** Symbol Class Diagram

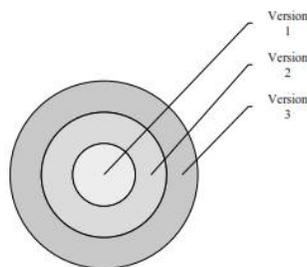
No.	Pictures	Names	Descriptions
1.		Association	The relation among the classes which means one class is used by another class.
2.		Class	The compilation of objects that share attributes and the same operation.

**TABLE 3.** Explanation of Activity Diagram Symbol

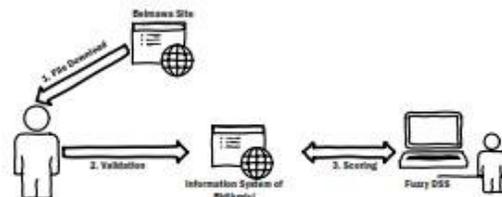
Symbols	Description
	Start point is the beginning of the activity.
	End point is the end of the activity.
	Activities describe certain process or activities
	Control Flow represents the existence of control flow. It means, an arrow between node action means that after the first action is done, the second action is started.

**3. METHODOLOGY**

This research uses incremental software development model. Initially, the model of this cycle builds simple software which implement several basic features. The scheme of incremental model can be seen in figure 1



**FIG 1.** Incremental Software Development



**FIG 2.** Proposed System

All information is collected first, and then in software development it is divided into modules. This software module can also be called a software version [7]. Version 1 of software built is a core system. Core system is made with basic features which support it. This version 1 is given to users to get feedback. Then continued by the development of version 2 software which is development of version 1 or the making of another module. After finished, it is given to the users and so on the cycle until this software is completed thoroughly. The concentration of every version is still using software development basic which is Waterfall. The followings are the sates of waterfall method [8]:

1. Analysis of Software Needs

Analysis of software needs is activity of needs collection which is conducted intensively to specify software needed by users.

2. Design

The design of software is activity of designing system to be made, including the interface design, architecture of software, and coding procedure according to device needs that have been analysed before. This activity is needed to ease the next processes

3. Making of Program Code

In this stage, the design that has been made previously is translated into software program so that it results computer program which is in accordance with the needs.

4. Testing

To see whether the program has compatible with the need from logic and functional sides, then testing is required. Testing stage also conducted to minimize error.

TABLE 4. Description of Use Case

No	Use Case	Description
1	Login	Managers and visitors must login first.
2	Manage manager data	Managers can add, see, change, and delete manager data.
3	Manage student data	Managers can add, view, change, and delete data of students who register bidikmisi.
4	Manage school data	Managers can add, view, change, and delete school data of students who register bidikmisi.
5	Manage house data	Managers can add, view, change, and delete data on the houses of students who register bidikmisi.
6	Manage score data	Managers can add, view, change, and delete the score data of students who register bidikmisi.
7	Manage parent income data	Managers can add, view, change, and delete the income data of parents of students who register bidikmisi.
8	Manage registration data	Managers can add, view, change and delete registration data.
9	Manage lecturer data	Managers can add, view, change, and delete lecturer data.
10	Manage visitor data	Managers can add, view, change, and delete visitor data.
11	Manage visitation data	Managers can add, view, change and delete visitation data.
12	Manage report	Manager can make a report that includes a data validation report, a percentage report on the number of study programs selected, and a report on the number of prospective students per region and per school that registers.
13	Manage relatives data	Managers can add, view, change and delete the relatives data of students who register bidikmisi.
14	Manage relatives information data	Managers can add, view, change and delete relative information data of students who register bidikmisi.
15	Manage record data	Managers can add, view, change and delete data records of students who register bidikmisi.
16	Manage photo data	Managers can add, view, change and delete photos of the house of students who register bidikmisi.
17	Manage organization data	Managers can add, view, change and delete student organization data who register Bidikmisi.
18	Manage fuzzy score data	Managers can import and view fuzzy score data of students who register bidikmisi
19	Manage news	Managers can add, view, change and delete news.
20	View of change student data	The visitor can view student data to verify the data, if the data is not compatible the visitor can change the data.
21	View of change organization data	Visitors can see the student organization data that is visited, if the data is not compatible the visitor can change data.
22	View of change relatives data	Visitors can see the data of relatives of students who visited, if the data is not compatible then visitors can change the data.
23	View or change relatives information data	Visitors can see the information of the student's relatives visited, if the data is not compatible the visitor can change the data.
24	View or change report	Visitors can see data report about students visited, if the data is not compatible, visitors can change the data.
25	Enter photo data	Visitors can enter photos of student houses that they visit
26	View or change house data	Visitor can see data of student houses visited, if the data is not compatible, visitor can change the data.

No	Use Case	Description
27	View or change parent income data	The visitor can see the income data of the parents of students, if the data is not compatible the visitor can change the data.
28	View or change school data	The visitor can see the data of the school visited, if the data is not compatible, the visitor can change the data.
29	View or change score data	Visitors can see the value of students who visited the data, if the data is not compatible, visitors can change the data.
30	View personal information	Visitors can view personal data, such as name, email, and visitor username.
31	Verification bidikmisi data	Visitors can verify all data of students visited, if the data is correct.
32	View news	Students can view the news on the Bidikmisi information system.
33	View information on the percentage of study programs that	Students can view the percentage of study program interest.
34	See percentage information for the number of students per region	Students can see the percentage information of the number of students in certain areas.
35	See percentage information for the number of students per school	Students can see the percentage information of many students who register bidikmisi per school.

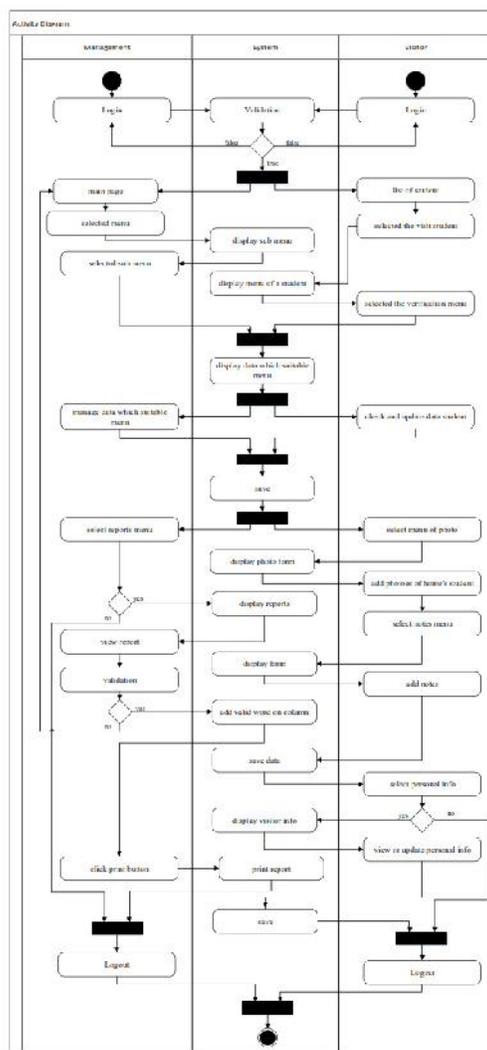


FIG 3. Activity Diagram Of Administrator And Visitors

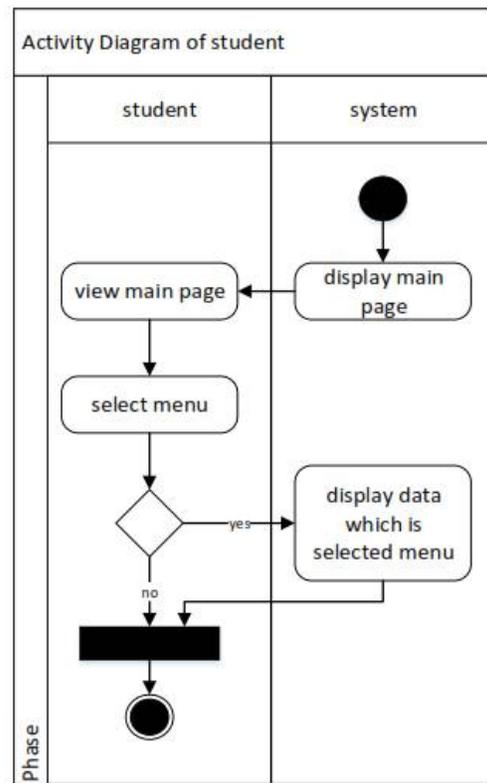


FIG 4. Activity Diagram Of Students

**3.1 Design**

The stage of system design aims to provide illustration about bidikmisi information in xyz campus to be built and developed. In figure can be seen the scheme of system design.

Based on development model of software using incremental model that becomes core system is fuzzy DSS. Even though this paper only discusses design and information system development of Bidikmisi. In this system there are two applications which are first data validation using web or second visitation using android

**3.1.1 Use case diagram**

Use case diagram illustrates the order of interaction between actors with system to be built. In figure Use Case Diagram in information system of bidikmisi has three actors which are managers, visitors and students.

Manager can manage master data in bidikmisi information system such as student data, score data, visitor data, and others. Visitor has role in verifying student data, which is consist if student personal data, student family data, relative data, achievement data, understanding data, means data, support data, and conduct photo data addition also record data addition. Student can see information provided by information system, such as study program presentation information and the number of students who registered bidikmisi. The explanation of use case diagram in figure 2 in detail dan be seen in table 4.

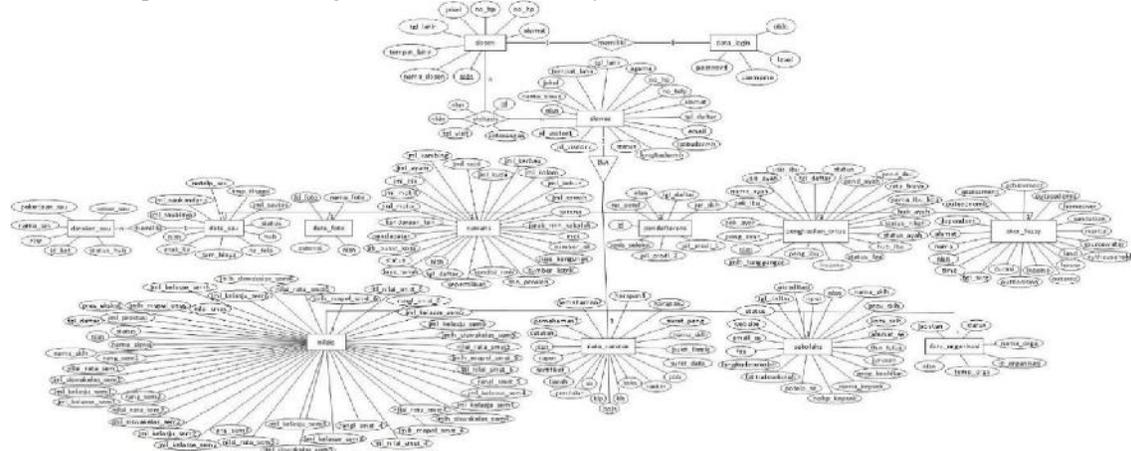
**3.1.2 Activity diagram**

Figure 4 Activity Diagram of Student by illustrating the activity conducted by student of visitor towards bidikmisi information system. Students or visitors are only able to see data provided by bidikmisi information system.

Figure 5 Activity Diagram of Manager and Visitor illustrate activities, conducted by two actors which are managers 3nd visitors towards bidikmisi information system. Manager has task to manage bidikmisi data while visitor has task to verify data in the system

**3.1.3 Class diagram**

Figure 6 Class diagrams are diagrams that illustrate the structure of the system to be built through the definition of classes. The Bidikmisi Information System of Politeknik Negeri Padang has several classes, namely lecturers, login data, visitation, students, registration, sibling data, sibling information, home data, grades, photo data, record data, school, parents' income, organizational data and fuzzy scores.



**FIG 5. ERD Bidikmisi Information System**

**3.1.4 Entity relationship diagram**

Before the database creation process, an ERD (Entity Relationship Diagram) design is needed. The database design on the Bidikmisi information system contained fourteen entities, namely login data, lecturers, students, registration, grades, parents' income, photos, houses, sibling data, sibling information, organizations, schools, data records and fuzzy scores. Each entity is interconnected by using cardinality. One login data is owned by one lecturer with a cardinality of 1 to 1. Each visitor visits each student with a cardinality n to n, giving rise to a new table, namely visitation. One student has parts by applying specialization that is a set of entities will produce a number of new entity sets. The parts are one registration, one value, one parent's income, one school, one photo, one house, one sibling's data, one sibling has each of sibling information with 1 to n cardinality, each student can have several organizations with 1 to n cardinality, one fuzzy score and one data note. ERD for Bidikmisi information system can be seen in Figure 5

### 3.1.5 Web application form design

This paper shows some of the draft forms used in the Bidikmisi information system. This information system is named SIBM-PNP. Before entering the information system, the user must first log in. Figure 8 is the login page for administrator and visitors. Login as an administrator can carry out the process of validation of student grades and suitability of school majors with selected study programs. Validation sub menu can be seen in figure 9.

On the SIBM-PNP main page the administrator can see information on the dashboard. Information is displayed in the form of total data and also in the form of graphs. The main page display can be seen in figure 7. Figure 8 and figure 9 display sub- menus.

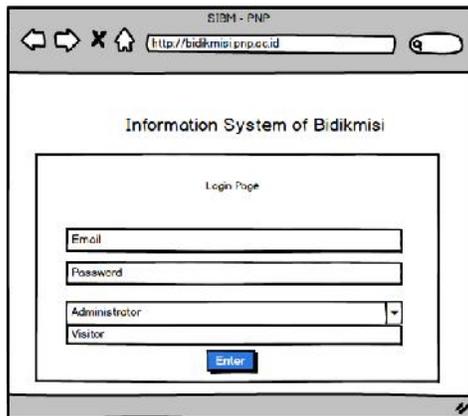


FIG 6. Login Page

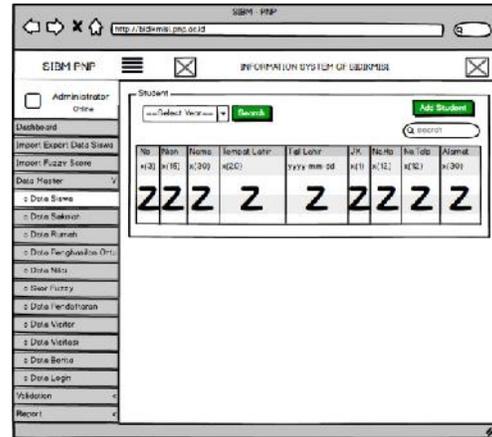


FIG 8. Sub Menu Of Data Master

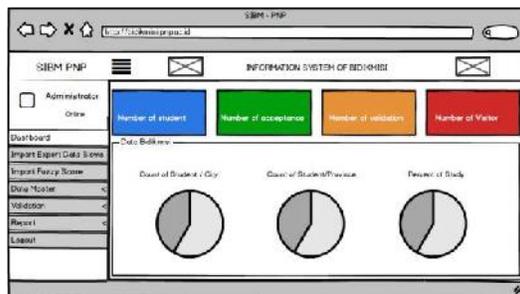


FIG 7. Main Page As Administrator

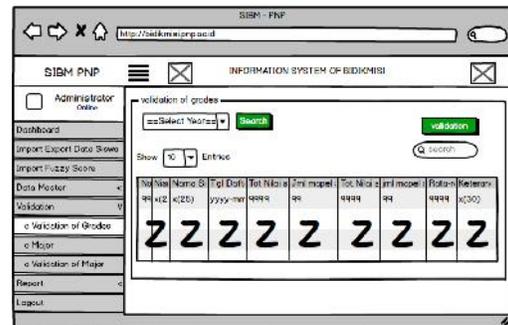


FIG 9. Sub Menu Of Validation

### 3.1.6 The design of the android application form

Android application users are visitors who are assigned to visit the prospective Bidikmisi recipient's residence. Every visitor has a username and password. The login page display can be seen in figure 10.

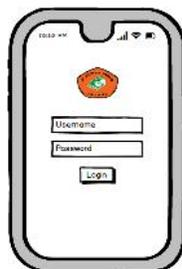


FIG 10. Android Login Page

One visitor with another visitor will find a list of different students. One student has personal data, sibling data, education data, family data, achievement data, home photos and so on. The student data is contained in the navigation in figure 11 & 12.



FIG 11. list of students names

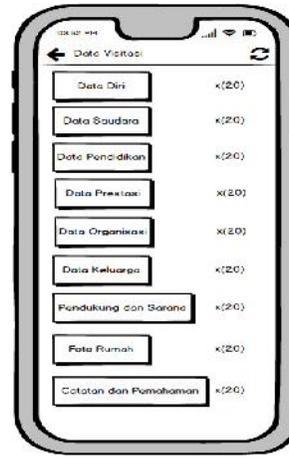


FIG 12. Student Data

4. RESULTS AND DISCUSSION

Bidikmisi information systems are generally divided into two sides, namely the client side and the server side. On the server side, it is using a web application with the Laravel framework while on the client side it is using a mobile application with Android. Architecture of Bidikmisi information systems can be seen in figure 13.

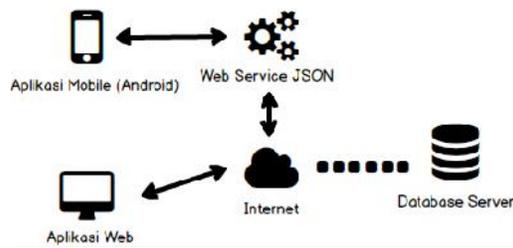


FIG 13. Bidikmisi Information Systems Architecture



FIG 15. Implementation Of Main Administrator Page



FIG 14. Implementation Of The Login Page

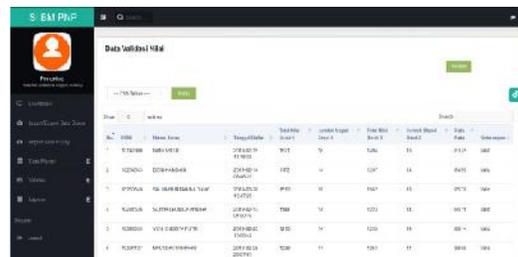


FIG 16. Implementation Of The Value Validation Page

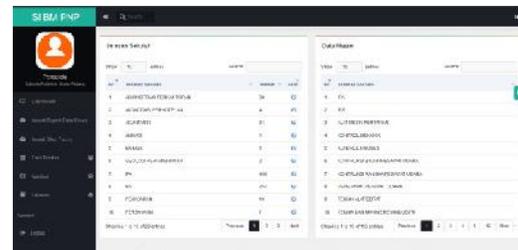


FIG 17. Major Checking Implementation

The web application is used by administrators to manage bidikmisi data, while the mobile application is used by visitors to verify the data of prospective Bidikmisi students. The web application is directly connected to the database on the server, while the mobile application is connected through a web service intermediary (JSON). Web service (JSON) is a data exchange technology that connects mobile applications with databases on servers.

Here are some SIBM-PNP views. In figure 14, it is provided for managers and visitors. Figure 15 provides main web page with manager login. The main page contains dashboard information. Figure 16 Display of Value Validation Data. After all student data has been successfully imported, the administrator can validate the values that are owned by students. Before the validation button is run, from the Value validation field we can see which data values are valid and which data values are invalid. Value data is said to be valid if the average of these values  $> 0$  and  $\leq 100$ . Otherwise, the value data is said to be invalid. At the top right there is a validation button which is useful for filtering valid and invalid data. If the button is run, invalid data is automatically deleted from the database system

Figure 17 Display of Major Validation Data. In addition to grades, the compatibility of school majors with the choice of first and second study programs also needs to be checked. Major data is said to be valid if the school major is in accordance with the choice of study program, both the choice of the first study program and the choice of the second study program. Similar to the value validation, before the validation button is run, from the major validation description field, we can see which major data is valid and which major data is invalid. At the top right there is a validation button which is useful for filtering valid and invalid data. If the button is run, invalid data is automatically deleted from the database system



FIG 18. Android Login Display

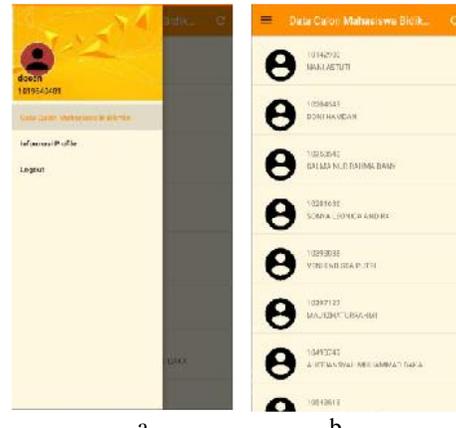


FIG 19. a. Navigation Menu, b. List Of Students

Figure 21 Navigation display has 3 menus, namely prospective Bidikmisi student data, personal information, and exit. On the bidikmisi student candidate data menu there is a list of bidikmisi student candidate names. Personal information contains information about visitors where visitors can change their data. Exit menu is a menu to exit the visitation application. The application of android uses the Realm database. Realm is widely used for temporary database storage on the Android platform. This is useful when there is a change of data the data is stored in android local memory. In Realtime android will send data changes to the server when connected to the internet.

Testing aims to determine the weaknesses of the software, to ensure quality, to find out how effective the software has been made and to find out whether the software is in accordance with the analysis and design created. Testing is done by the Black Box Testing method.

The results of system testing can be seen in the table below. Table 5 test results on web applications. Table 6 test results on the android application. The testing scenario uses data downloaded from the belmawa.ristekdikti.or.id site in excel form. The data is used in 2019. The number of registrants for xyz colleges is 6023 data. The data is imported into the system. There are 6012 successful data imports entered into the database server, meanwhile there are 11 data detected duplicates.

From 6012 data obtained, the data with invalid values are 2,589 and data with invalid majors are 661. Therefore, the remaining data in the database is 2.762. Thus, the total data disposed is 3,261.

Based on the test above, the results obtained are 45.86% invalid Bidikmisi registration data. Through this system the administrator can quickly process the registration data for further scoring using the DSS system. The scoring results are imported again to SIBM-PNP for further ranking. Ranking is required to select registrants who are entitled to visit.

TABLE 5. Web Application Testing

Login as administrator				
No	User Interface tested	Testing Scenarios	Expected results	Test results
1.	Login Page	Run the system	The login page display appears	Matched
2.	Login Page	Enter username and wrong password	Alerts the username and password do not match	Matched
3.	Main page of the manager	Enter your username and password correctly	The main page display appears	Matched
4.	Import student data	Click the import data button	Data imported successfully	Matched
5.	Add lecturer data	Click the add button on the lecturer menu	Lecturer data has been added successfully	Matched
6.	Lecturer data display	Click the lecturer menu	The lecturer data display appears	Matched
7.	Delete lecturer data	Click the delete lecturer button	Lecturer data deleted	Matched
8.	Add visitation data	Click the add button on the visitation menu	Visitation data added successfully	Matched
9.	Display visitation data	Click on the visitation menu	The visitation data display appears	Matched
10.	Delete visitation data	Click the button delete visitation	Visitation data deleted	Matched
11.	Value data validation	Click the value validation button	Value data which is invalid deleted	Matched
Login as lecturer				
1.	Login page	Run the system	The login page display appears	Matched
2.	Login page	Enter username and wrong password	Alerts the username and password do not match	Matched
3.	Lecturer main page	Enter username and password correctly	The main page display appears	Matched
4.	Student data display	Click on the student data menu	Display of student data to be visited by the login lecturer	Matched
5.	Lecturer data display	Click on the lecturer menu	Data display the lecturer appears	Matched
6.	Display visitation data	Click on the visitation menu	The data display of the student to be visited appears	Matched
7.	Value data display	Click on the value menu	The data display of student grades to be visited appears	Matched
8.	Display registration data	Click on the registration menu	The data display of student registration to be visited appears	Matched
9.	Parents' income data display	Click on the parent's income menu	The income data display of the parents of students to be visited	Matched
10.	Home data display	Click on the home menu	The data display of the student's house to be visited appears	Matched
11.	School data display	Click on the school menu	The data display of the student school to be visited appears	Matched
Login as student/visitor				
1.	Display information on the	Click on the menu information the number of students per school	The information display for the number of students per school	Matched
2.	Display information on the number of students	Click on the information menu for the number of students per district or city	Information display of the number of students per district or city appears	Matched
3.	Display information on the number of students	Click on the information menu of many students per province	Information display of the number of students per province appears	Matched

4.	Display valid value data	Click on the value validation menu	A valid value data display appears	Matched
5	Display valid majors data	Click on the majors validation menu	A valid majors data display appears	Matched
6.	Display percentage of the first study	Click on the first study program selection percentage menu	Display of the percentage of first study program selection	Matched
7.	Display percentage of the second	Click on the the second study program selection percentage	Display of the percentage of second study program selection	Matched
8.	Display data on student	Click on the extracurricular student achievement menu	Data display of extracurricular students' achievements appear	Matched
9.	Display visitation schedules	Click on the visitation schedule menu	Display of the schedule visitation appears	Matched

## 5. CONCLUSIONS

The Bidikmisi information system has 3 types of users, namely the Bidikmisi administrator who is in charge of managing Bidikmisi data, visitors who are in charge of visiting the residence of prospective Bidikmisi students and verifying the Bidikmisi data and students who can see information about Bidikmisi. Web applications and mobile applications on Bidikmisi information systems can be connected and access the same database using a web service. Bidikmisi information system can be implemented on xyz campus to facilitate the selection process for prospective Bidikmisi students. The visitor can make changes to student data at the visit location saved in the cellphone memory. When the internet is connected the data changes will immediately be sent to the server. Testing data using SIBM-PNP obtained that 45.86% Bidikmisi registration data containing trash..

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