PARADIGMA

Mobile-based Application Development on Admission of New Students with Design Science Research Methodology

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ARTICLE INFORMATION

ABSTRACT

Increased use of mobile devices in recent years has led to a change in human behavior as users. Mobile devices today are being used for a wide range of sectors ranging from entertainment, and business to education. In the field of education, it can be used to interact between teachers and students, and lecturers with students, and can also be done for registration of New Student Admission. The presence of PMB registration through mobile devices can help prospective students apply wherever they are without having to come directly to the campus. It's not implemented by the Indonesian Siber University. (Cyber University). The Cyber University campus is currently implementing New Student Admission registration directly through the campus, so this process is still likely to take a long time. To solve the problem, this study will solve the problem of new student enrolment that is still being done manually to be digitized by building mobile-based applications. The method to be used is the Design Science Research Methodology (DSRM) known as the fast method because it includes the Agile software development model. The programming language used is the Dart-based Flutter framework. As a result of the research carried out, the mobile-based PMB application on the Cyber University was successfully constructed and in line with expectations. Candidate students can download the app on the Google PlayStore with the keyword Cyber PMB.

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INTRODUCTION

The use of mobile-based devices or smartphones has increased rapidly in recent years, in addition to changing the technological infrastructure itself, it has resulted in a major change in user behavior(Ihsan et al., 2021). In 2023, Indonesia will be the fourth largest mobile market in the world, reaching 354 million active mobile phones. Compared to the total population of Indonesia by the middle of 2023, which was 278 million people, the ratio of active mobile devices has exceeded the population by 128%. In other words, the Indonesian population can have more than one mobile device(V. M. Putri, 2023). Advances in telecommunications technology, hardware, and software that enable mobile devices to do more than just phones are key drivers of this growth.

Nowadays, mobile devices are an inseparable part of human life in all sectors, from health sector(R. N. Putri et al., 2021), the business sector(Herdiansah et al., 2022), to the education sector(Suharyanto, 2022). In the educational sector, mobile devices can be used for communication media between students and teachers, students with lecturers, or with the community within them. In addition, the use of mobile devices may also be used to register for lectures online.

Admission of new students is one of the most important processes in the academic cycle of the university. This process involves various stages, from registration, and selection, to the announcement of the results of the selection(Narizki et al., 2023). In the digital age, the use of information technology, especially mobile-based applications, has become an

urgent need to simplify and speed up the process.(Ansori et al., 2023; Fathur Bahri et al., 2022) Mobile applications can provide easier access for prospective students, improve operational efficiency, and reduce the administrative burden that is often challenging in the admission of new students. A common case of new student admission is that students tend to be in trouble because they have to come directly to bring the files and wait for the front line to campus(Simanullang et al., 2021).

Similar things were experienced by the Siber University of Indonesia (Cyber University). The campus of Cyber University (CU) is one of the campuses that supports the study of technology that is located at Jl. TB Simatupang No.6, RT.7/RW.5, Tanjung West, Kec. Jagakarsa, South Jakarta City, DKI Jakarta. The campus that has five curricula is the first Fintech (Financial Technology) campus in Indonesia. The problem that CU Campus is currently experiencing is that the new student registration system (in Indonesia called Penerimaan Mahasiswa Baru or PMB) process still uses a manual concept that requires students to register directly on campus. Meanwhile, in today's era of technological advancement, people's lives are different, and they tend to want to be instant and fast(Ariani & Syahrani, 2022).

To solve the problem, a system should be put in place that would make it easier for prospective students to be able to register quickly and practically. The intended system is to build a PMB information system at the Cyber University campus. The information system will be built on a mobile basis using the Design Science Research Methodology approach. (DSRM).

The DSRM method is a procedural framework for facilitating information technology research, which is used as a process of understanding and testing to recognize and evaluate research findings. (Yulistiawati et al., 2022). The DSRM method is one of the software development models that belongs to the Agile software development model category which means that the method is fast and constantly changing to meet the changing needs of users.(Guntara, 2023). The output of the DSRM method is assessed as the development of a good method and theory model(Hermawan et al., 2023).

The research that performs the DSRM method is carried out by (Orisa et al., 2023), this research is about the creation of a website-based company profile information system. Website built using HTML and CSS programming. This research can help the company PT. Dynamika Indonesia Precision moves in the field of contractor services in promoting its services.

Other research using the DSRM method was conducted by (Fatoni et al., 2023), this research is about the service of the village office of Hegarmanah in the case of mobile-based letters. The tools used to construct the application prototype are Figma. The results of the system testing obtained a score of 82,583 using the System Usability Scale (SUS), which indicates that the research can be accepted by the staff of the village of Hegarmanah as the user. The difference from other studies above is that solve different problems but with the same methods.

The purpose of this study is to solve the problem of enrolment of new students at Cyber University by building a new student admission (PMB) application on a mobile-based Cyber University Campus using the Design Science Research Methodology (DSRM). The limitation of the information system to be built starts from the stage of student account creation, obtaining the Student ID to following pre-curricular activities held by the campus.

RESEARCH METHOD

Stage on this research using the Design Science Research Methodology approach (DSRM). In its implementation, the application will be built using the Flutter framework by integrating the Restful API as a data exchange. The mobile-based application to build is using the Flutter framework. Flutter is a multiplatform framework developed by Google(Santoso et al., 2020). Flutter is used in application development for Android, iOS, Windows, Linux, and MacOS, from a single codebase(Flutter, 2024). The data exchange process in the application will use the Restful API approach to receive data from the database. Restful API is a concept of a web service that accepts requests from users and provides output formats in the form of JSON(Hasyrif & Intan, 2019). As to the steps of the DSRM method can be seen in Figure 1:
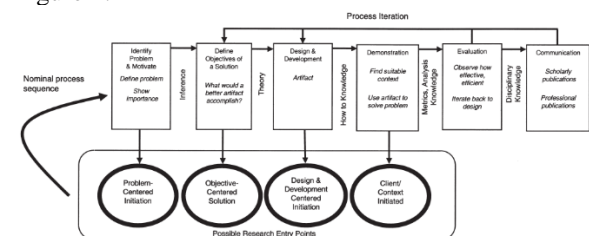
Source: (Orisa et al., 2023)
Figure 1. DSRM Method

1. Problem Identification

The initial phase of the DSRM method is to identify and understand a particular problem or need. This phase involves an in-depth analysis of the context of the problem, identifying gaps in existing knowledge or technology, and setting clear research goals. To identify a problem, you can use a direct observation approach or conduct interviews with users.

2. Definition of the Objectives of a Solution

If a problem has been identified, formulate an initial idea or proposal to solve the problem. The proposal covers design concepts, potential solutions, or approaches that may be used to develop appropriate systems.

3. Design and Development

The design and development phase involve the implementation of ideas or proposals that have been

formulated previously, such as designing, building, and implementing systems that are considered to be solutions to identified problems. This process can involve software development, system design, or modeling based on a proposed concept.

4. Demonstration

This phase involves a demonstration of the solution that has been developed for the user. This demonstration aims to demonstrate directly how the solution developed can work in practice and how such a solution can add value to solving existing problems.

5. Evaluation

The evaluation results are used to identify the advantages and disadvantages of the system and to determine whether the system can be accepted and used by the user.

6. Communication

The communication phase covers various activities such as publishing scientific articles, presenting at conferences or seminars, collaborating with research colleagues, and interacting with users. Through this communication, you can describe approaches and methods used, as well as findings obtained in research.

RESULTS AND DISCUSSION

This section provides a more detailed discussion of the steps of the DSRM method that have already been explained in the methods section

1. Problem Identification

The step taken at the identification stage of the problem is to use an interview approach and direct observation. The source interviewed was Mr. Surachman T. Pussung the head of the Public Information Division handled the admission of new students to the Siber University of Indonesia. (Cyber University). After the interview session, the desired width is recorded by the user on the system to be created. The user's needs can be seen in Table 1.

Table 1. User Needs

#	User Needs
1	Applications can be accessed anywhere and anytime.
2	There are 22 stages to be completed by prospective new students ranging from account creation, self biodata entering, choosing the desired study programs, making payments, filtering exams to uploading required requirements such as KTP, family card, degree, and transcript grades.
3	Business processes are easy to maintain and can be connected to any platform.
4	Academic Payments can be made using a Virtual Account.
5	There are academic info features like faculty info, prodi, tuition fees, news, and campus activities.
6	Students can ask directly to the campus administrator.

#	User Needs
7	Get the system easy to use, lightweight, and good performance.

2. Definition of the Objectives of a Solution

From the problems obtained at the previous stage, to be able to respond to the user's wishes in Table 1, then the solution to be suggested can be seen in Figure 2.
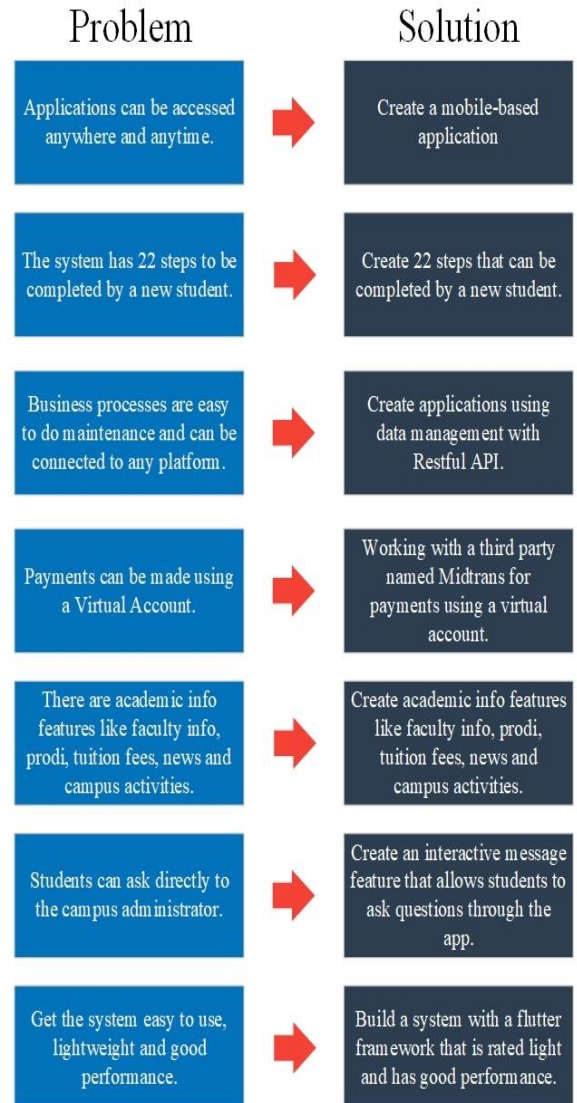

Figure 2. Problem Solution

3. Design and Development

This step is the solution phase of the previous problem, which involves the design of the system to be created, such as wireframes, use case diagrams and activity diagrams.

a. Wireframe

Wireframe is the initial framework of an application's interface. Before UI design was created, wireframes were an important step in setting the application information layout(Hartawan, 2022). The wireframe of the system interface to be built can be seen in Figure 3.
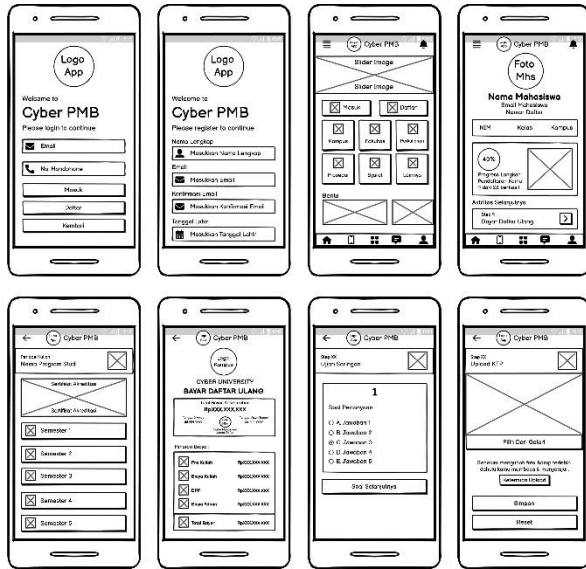
Figure 3. Wireframe

Can be seen in Figure 3, illustrated an example of 8 pages of the interface on the application to be built. First-row page (starting from left) among the other login page, homepage, and PMB page. The second-row interface page (beginning from left), among other study program information pages, paid re-listing, filtering exam, and upload an ID Card (KTP).

b. Use Case Diagram

Use case diagrams are diagram models that show how one or more actors interact with the information system to be built(Rizki & OP, 2021). Use Case Diagram on this research can be seen in Figure 4.
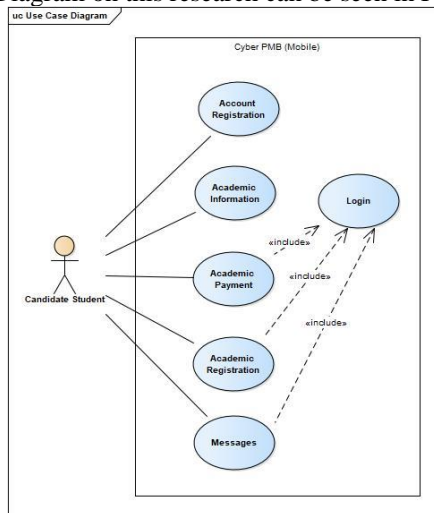
Figure 4. Use Case Diagram

It can be seen in Figure 4, that on the system created only one user is a candidate student. The candidate student can do several activities on the system among other things, do account registration, see academic features, and academic payments, select the list of new students, and give a message to the admin if there is something to be asked.

c. Activity Diagram

Activity Diagram is a diagram activity that describes ideas about the flow of data and controls as well as well-designed and well-structured actions

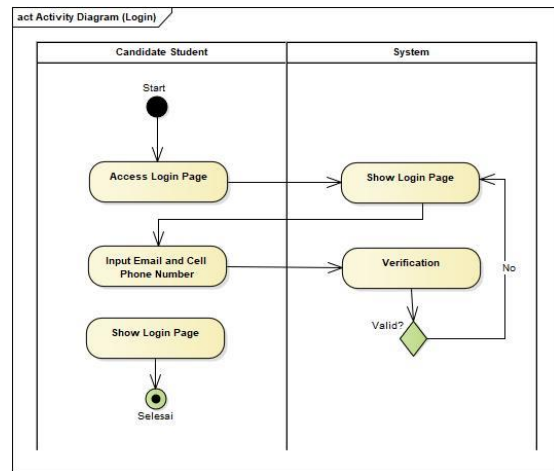within a system(Arianti et al., 2022). Activity Diagrams on this research can be seen in Figure 5 and Figure 6.

Figure 5. Activity Diagram *(Login)*

Figure 5 shows a login activity diagram for prospective students. To be able to log into the system, the student must register an account first. If it is, then the user can access the login page, and then fill in an email and a mobile phone number. If the account is not found then the system will notify that the account has not been registered, if successful, the user will be redirected to the user who has already logged in menu and can undertake academic registration.
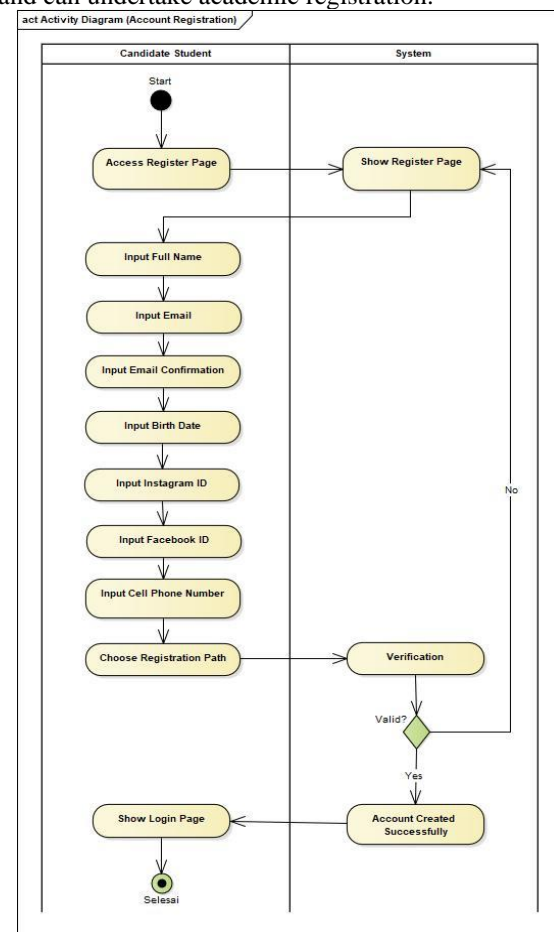

Figure 6. Activity Diagram of Account Registration

Figure 6 shows the activity diagram of the candidate student account registration. The candidate student first opens the account list page and then fills in the form with full name, email, email confirmation, date of birth, Instagram ID, Facebook ID, mobile phone number, and registration path. If the form is not completed, the system will ask the candidates to fill in first. If it is complete, the account is successfully created and can be logged in immediately.

Figure 7 shows a core activity diagram of academic registration at stage 1. Candidate students can choose the admission period between March and September. After that select a college course (S1 Regular), choose a campus, choose a course of study available as many as 5 courses of study. And finally, choose the hours of the morning class or the night class. If it's complete then the first stage of academic registration is completed. On academic registration, students will fill up to the 22nd step.
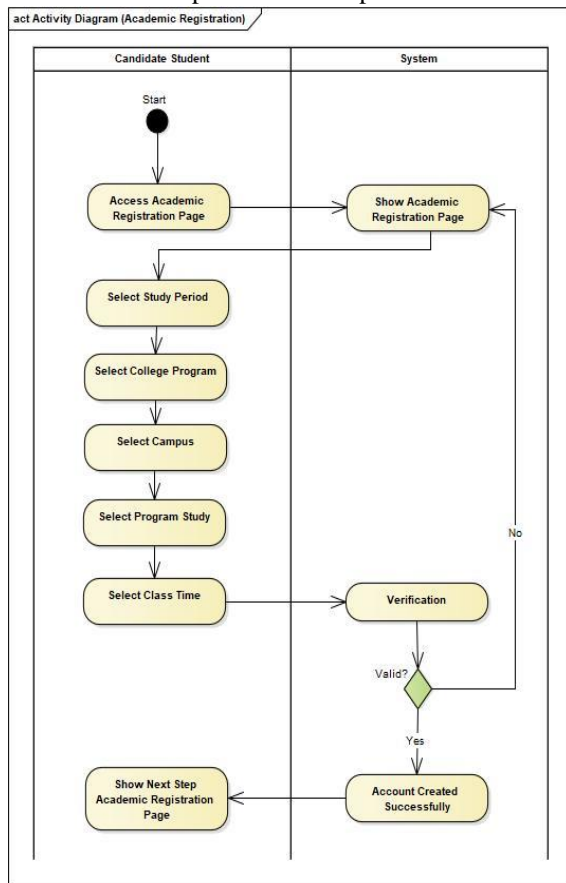

Figure 7. Activity Diagram of Academic Registration (1st step)

d. Demonstration

From the previous design and development phases, the next phase is an application demonstration scenario. This demonstrative scenario from an interface frame view is made into a real interface. In this study, the initial prototype is made on the Figma application and directly implemented in code form to produce an interface. The interface shown below only generates a few interfaces of the entire system.
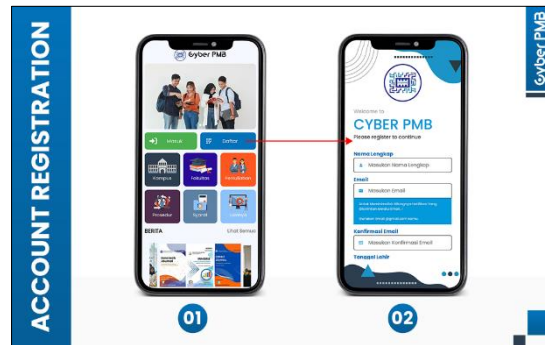

Figure 8. Registration Interface

In Figure 8, there is a list feature. Users in this case can see the list feature with the opening phase of the application so that they automatically log into the home menu and then click on the login button. On the list page, the candidate students can fill in the registration form to access the login page.
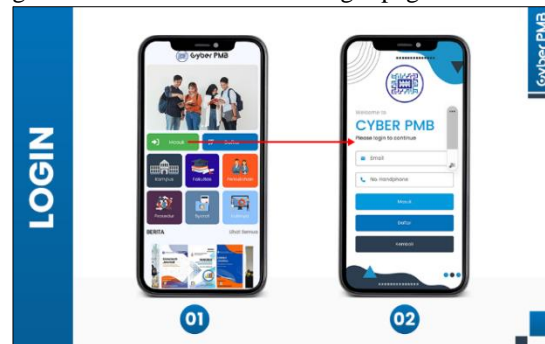

Figure 9. Login Interface

In Figure 9, there is a login feature. In this menu, prospective students can log in to the system by accessing this page. To access the login page, prosecuting students can access the home menu, and then select the login button.
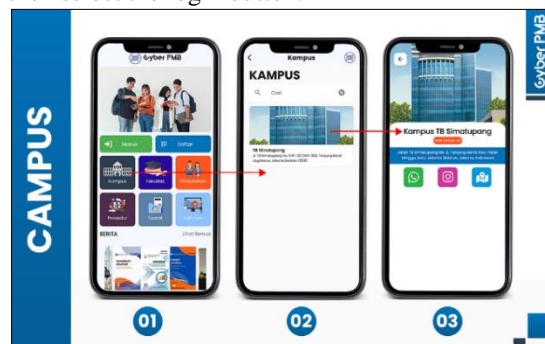

Figure 10. Campus Interface

In Figure 10, there are campus features. In this menu, prospective students can see a list of existing campus locations. To access the campus page, prosecuting students can access the home menu, select campus buttons, select campus, and then show campus details such as campus photos, addresses, and campus social media.
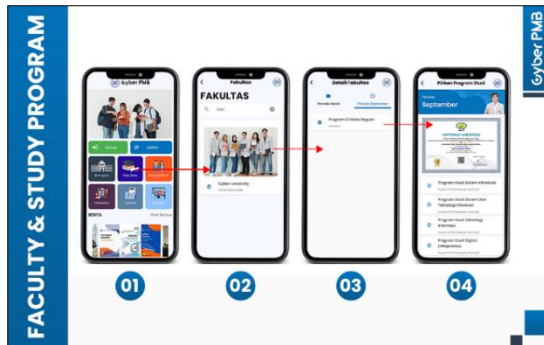
Figure 11. Faculty and Study Program Interface

In Figure 11, there are faculties and curricula features. In this menu, prospective students can see a list of existing faculty and programs. To access this page, prosecuting students can access the home menu, select the faculty buttons, select faculty, and then appear the enrolment periods of March and September. If prosecuted students choose the September period, then the programs opened in that period will appear.
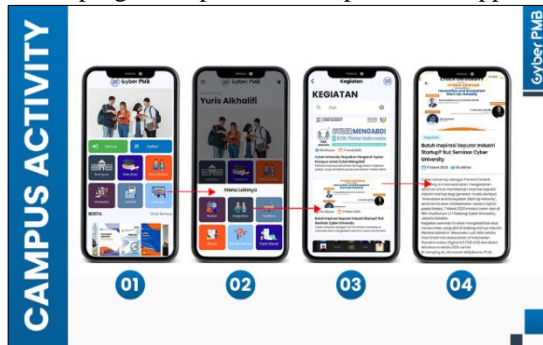

Figure 12. Campus Activity Interface

In Figure 12, there are campus activities features. In this menu, prospective students can view campus activities. To access the activity page. Prosecuting students can access the home menu, select other buttons, select activities, and then display a list of campus activities, to see the details of activities, prosecuted students can choose one of those activities.
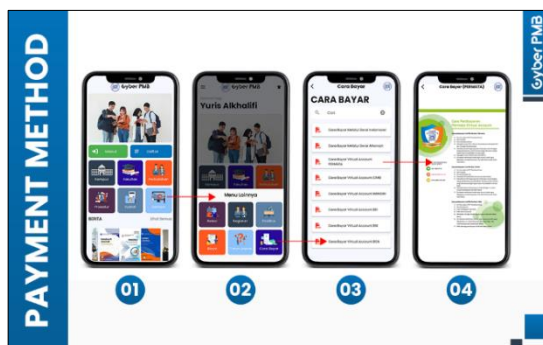

Figure 13. Payment Method Interface

In Figure 13, there is a payment method feature. In this menu, a prospective student can see a list of payments that can be made. A prospective student can access the home menu, select another button, select a method of payment, and then a payment list appears, to see the payment method, the prospective student can choose one of the methods of payment.
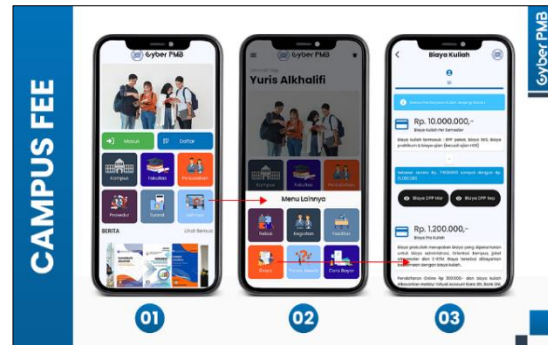

Figure 14. Campus Fee Interface

In Figure 14, there is a campus fee feature. In this menu, prospective students can see the tuition fee. Prospective students can access the home menu, select another button, select the cost, and then display tuition fees.
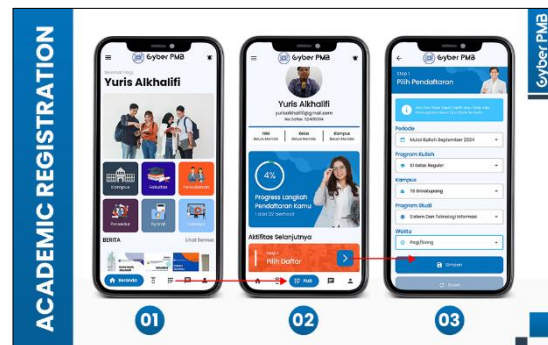

Figure 15. Academic Registration

In Figure 15, there is a select registration step. In this menu, prospective students can sign up for the lecture. Students first log in, then go to the home menu, on the homepage menu, then select the PMB button in the navigation menu below. This college registration menu contains the 22nd step that prospective students should complete.

e. Evaluation

At this stage, the application has been successfully built and demonstrated, the next step is to test the application using the Black-box Testing and UX Testing. The application is tested by the internal user, namely the Public Information Division, before being published on Google Play. Test results are shown in Table 2.

Table 2. Black-box Testing

#	Testing	Result	Status
1	Account Registration	Displays the list page and can access the login page	Valid
2	Login	Display the login page and log in to the system	Valid
3	Academic Information	Show academic feature pages such as faculty, study programs, tuition fees, news, and campus activities.	Valid

#	Testing	Result	Status
4	Payment Method	Displays a payment page and can make academic payments using a virtual account	Valid
5	Academic Registration	Show list stages from account registration to file upload stages	Valid
6	Messages	Show message page between student and campus administrator	Valid

In addition to using black-box testing such as Table 2, other testing methods such as UX Testing are performed. These tests focus on how long users can fill in and complete registration until they become active students. UX Testing Testing can be seen in Figure 16.
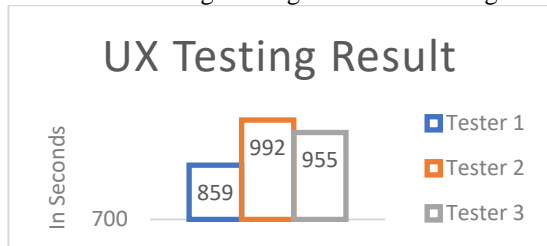

Figure 16. UX Testing Result

In Figure 16, the results of application testing using UX Testing in conducting registration until successfully becoming an active student, the first tester managed to complete registration for 14 minutes 19 seconds, the second tester for 16 minutes 32 seconds, and the third tester for 15 minutes 55 seconds. In comparison, before using the application system, the manual registration process may take more than 30 minutes.

f. Communication

If the app has already been evaluated following the procedures of the previous stage, the next step is to contact the user, to present the built-in application. It also writes the documentation of each module or feature of the app built to make it easier for the user to operate the application and to facilitate the maintenance of the system if there is an update of the application features. The app was then uploaded to the Google Play page so students could sign up for college using this app. The final results of this research are also poured into the form of a journal of publication. The application was successfully published in Google Play, as in Figure 17.
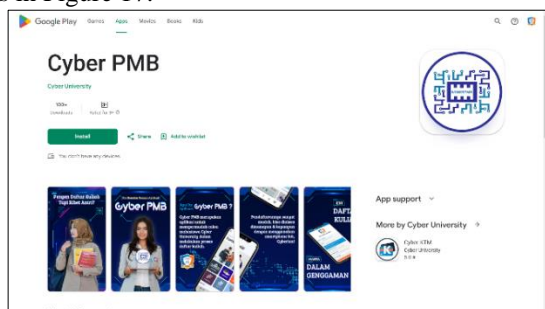

Figure 17. Cyber PMB on Google Play

CONCLUSION

Based on the results of this research, the problems at Cyber University in terms of the registration of new students who are still manual can be solved with an information system named Cyber PMB. Cyber PMB is built with a mobile-based Flutter framework and uses Restful API. With the DSRM method, the application can be resolved well structured. In the UX Testing process, it was seen that by using the information system, the registration process until becoming an active student could be completed in less than 30 minutes, which previously could take 30 minutes if still done manually. Of course, the creation of the Cyber PMB, is expected to help the university in getting new students quickly, easily, and organized.

For further development, it is suggested that the Cyber PMB application can be developed again like a chatbot. It can also be developed as a special application for Cyber University students who are already active so that they can register and payment to improve the effectiveness of students in the academic field.

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