Implementation of Design Thinking Methods in Information Systems Academic Guidance at the Information Systems Department Faculty of Computer Science Sriwijaya University

Nurullah Marina Kelana*[1], Rahmat Izwan Heroza, M.T*[2]
[1,2,3]Information Systems, Sriwijaya University
Jl. Palembang – Prabumulih KM.32 Kabupaten Ogan Ilir, Sumatera Selatan, Indonesia
E-mail : 09031281823029@students.ilkom.unsri.ac.id*[1,] rahmatheroza@unsri.ac.id*[2]

ABSTRACT- During their study period, one of the programs provided to students is academic guidance. Academic mentoring is an activity where students consult academic supervisors which aim to help students plan studies and solve study problems, one example is the academic mentoring program at the Information Systems Department, Faculty of Computer Science, Sriwijaya University. However, in practice there are problems experienced by students but they are not detected from the start because of the low monitoring of their academic supervisors which causes delays in graduation. This study aims to produce a prototype design of the Academic Guidance Information System so that it can be used as a platform for monitoring student guidance. The method used is the design thinking method which has 5 stages, namely empathize, define, ideate, prototype and test. At the ideate and prototype stages, the Fogg Behavior Model theory is used as a reference material. Evaluation of the prototype design results using the Maze Design usability tool. Testing uses two test methods, namely the Mission Usability Score (MIUS), Maze Usability Score (MAUS) and System Usability Score (SUS). The MIUS and MAUS tests got a score of 78 and entered the medium/marginal characteristics. The SUS calculation gets a score of 90.25 which leads to the acceptable category with a grade scale (A). The test results were carried out with 1 test iteration to 20 respondents and showed that the design had met the feasibility standard.

Keywords : Information Systems, Academic Guidance, Design Thinking Methods, Fogg Behavior Model, Maze Design.

1. INTRODUCTION

During the study period, one of the programs provided to students by the university is academic guidance. Academic guidance is an activity where students consult academic supervisors which aim to help students plan their studies and solve problems or problems experienced by students [1]. Likewise in the Department of Information Systems, Faculty of Computer Science (FASILKOM) Sriwijaya University (UNSRI).

The Design Thinking method focuses on problem solving with the initial stages of defining the needs of potential users and analyzing the problems encountered. Next, there will be a brainstorming session with potential users to look for innovative ideas and solutions. The final result is a prototype design that fits the user's needs using a user-centered approach [2].

In interviews and distributing online questionnaires, several problems were found related to ongoing academic guidance such as the low monitoring of academic guidance, causing student problems to not be detected early on and can cause student graduation delays and students are threatened not to be able to complete their studies on time. So we need a system that can supervise students and have a special guidance schedule in the hope of increasing awareness of the importance of academic guidance to students and academic supervisors. With the academic supervisor information system, academic supervisors are expected to be able to more easily check and validate student data and documents under their guidance, including academic guidelines, curriculum, courses, and other matters related to student academics. A good and well-documented mentoring process can help improve the quality of students and the Information Systems Department.

In previous studies, there are still many academic guidance information systems that have been made but have not paid attention to visuals and user experience. The results of research conducted [3] also state that the implementation of the design thinking method can help become innovative solutions that meet user needs.

Based on previous research and to complete the need for academic guidance in the Information Systems Department of FASILKOM UNSRI, the researcher aims to design an academic guidance information system using the Design Thinking Method.

2. THEORY STUDY

2.1 Design Thinking Method

Design Thinking is a problem solving method and user-focused design process [4].

Figure 1. Design Thinking Method (Source: www.fawco.org)

Starting from the empathize stage, which is the stage to understand the experiences, situations faced, habits, emotions of potential users. Furthermore, interviews, questionnaires were filled out, and observations were made to users to understand their needs. After understanding what prospective users need, the researcher will perform the define stage, which is to determine the problem to be solved. Followed by the ideate stage to find and determine solutions to the problems experienced according to user needs. This phase can also be called the idea development stage or brainstorming [3]. Next, the researcher designs a prototype, which is an interactive model of an application or website that is designed to resemble the actual shape or appearance of the information system to be built. The last stage, the researcher conducts testing where the user will test the prototype to ensure that the product is suitable for the user's needs and is easy to use. One way is to conduct usability testing.

2.2 Fogg Behavior Model Theory

The Fogg Behavior Model is a theory which states that any behavior will occur if there is a combination of three elements at the same time. The three elements are: the motivation or encouragement of the user to perform certain behaviors (motivation), the ability of the user to perform certain behaviors (ability), and the last is the trigger for the user to do something (trigger) [5].
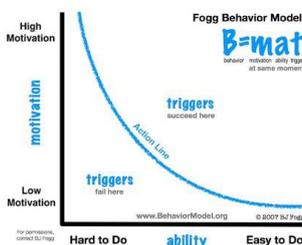

Figure 2. *Fogg behavior Model Theory (Source: www.behaviormodel.org)*

2.3 Mission Usability Score (MIUS) and Maze Usability Score (MAUS)

value obtained from the MIUS test proves the level of user convenience in using the prototype design of a system. The formula for calculating the MIUS score is:

$$MIUS = DSR + (IDSR/2) - (MCR/2) - (Min(10,Max(0,(AVGD-5)/2)))$$

Information:
- DSR   = *Direct Success Rate*
- IDSR = *Indirect Success Rate*
- MCR   = *Miss click Rate*
- AVGD= *Average Duration*
- Function :
- Max=max(number_1, number_2) => to find the maximum value between number_1 and number_2
- Min=min(number_1, number_2) => to find the minimum value between number_1 and number_2

MAUS is used to assess the overall score of the task. The formula for calculating the MAUS score is to calculate the average of the MIUS scores. The MAUS score states the final value of usability testing and will determine how easy a system is to run by the user [6].

2.4 System Usability Scale (SUS)

The SUS method is a questionnaire method containing 10 statements, which has an answer scale of 1-5. Users will provide an assessment based on their experience trying to run the prototype that has been made [7].

The results of the questionnaires that have been filled out by the respondents will be calculated using the SUS method so as to get the results that become the benchmark of the prototype that has been tested whether the prototype design of the system is feasible to use or not [8].

Figure 3. SUS Scale (Source: *www.medium.com*)

3. RESEARCH METHOD

In Figure 4 below, there are details of the flow of the research stages in the use of the design thinking method. The research begins with the empathize stage, namely distributing online questionnaires and interview activities. Furthermore, at the define stage, a POV table "How Might We" is created which defines the problems experienced by potential users and the needs of potential users. In the ideate stage, a brainstorming activity was carried out using the Fogg Behavior Model theory as a reference and writing down the ideas that had been submitted by prospective users into sticky notes, and in the end they were selected using the Now Wow How Matrix. The feature ideas obtained from the ideate results and which are felt to be implemented are then poured into a prototype in the form of a high fidelity wireframe, the results of which will later be tested using the usability testing method, namely MIUS and MAUS and SUS.
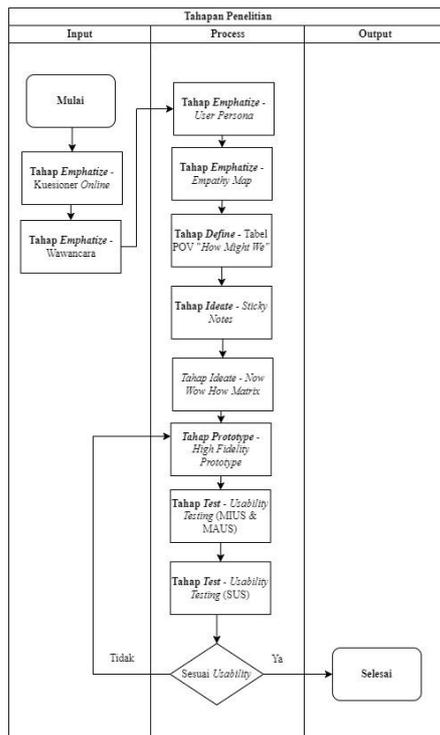
Figure 4. Research Stages Flow

4. RESULTS AND DISCUSSION

In this study, a prototype of the Academic Guidance Information System application will be designed with the implementation of the design thinking method approach:

4.1 Emphatize

At this stage, the activities of filling out questionnaires and interviews with students and academic supervisors were carried out. This activity is carried out to find problems faced and analyze user needs for academic guidance. The user interviews that have been carried out provide the conclusion that the problems in this research are; First, there is still low monitoring by academic supervisors, which results in not detecting the problems encountered early on so that it can cause delays in student graduation and students cannot complete their studies on time. Second, this system is expected to be able to manage student data and documents so as to make it easier for supervisors and departments to monitor students which will further facilitate the reporting process of academic guidance activities, and also supervisors can also validate student documents which are later expected to facilitate the department so that the academic guidance process clearer and more direct. In the empathize stage, a user persona and empathy map are generated.

4.2 Define

The define process is carried out using the How Might We technique. How Might We is a table containing the results of discussions related to problems and solutions to existing problems [9].

Table 1. How Might We

Needs	Insight	"How Might We"
Requires a system that can be used to monitor students.	Requires a system that can be used to monitor students. Because there are students who do not provide guidance, resulting in undetected student problems (either related to academic, psychological, economic, etc.) which can result in students not graduating on time.	Create a platform that can monitor student guidance.
Requires a clear guidance schedule	Because there are some academic supervisors who are difficult to contact, making it difficult to do academic guidance	Create a platform that can schedule academic guidance after the required documents are complete
Requires an electronic-based system that can be used both online and offline.	Because the current system is still conventional and varies according to the academic supervisor.	Create an electronic-based academic guidance information system platform.

4.3 Ideate

Ideate is the stage used to find ideas and solutions based on the constraints previously defined in the define stage. This study uses one of the behavioral theories, namely the Fogg Behavior Model which is used as a reference for system development design. The idea selection process is based on the use of the Now Wow How Matrix, where ideas obtained during brainstorming are placed in three quadrants.
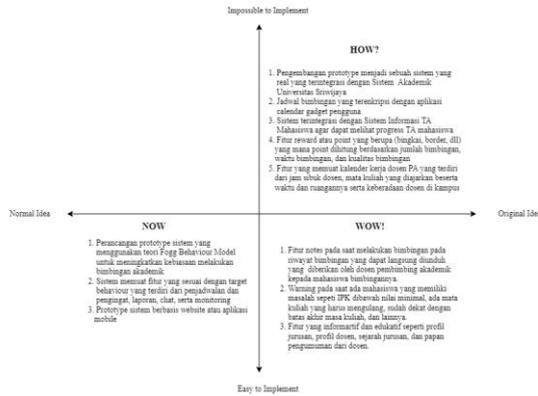
Figure 5. Now How Wow Matrix

4.3.1 App Features

An explanation of the features that have the potential to be built and their relationship with the Fogg Behavior Model to improve user habits in conducting academic guidance are:

Table 2. Scheduling and Reminder Features

Fogg Behavior Model		
Motivation	Trigger	Ability
The existence of clear scheduling and reminder features will make users more motivated to do academic guidance.	There is scheduling of academic guidance, notification of every academic guidance schedule, as well as an alarm if activated so as not to forget the existence of academic guidance	Reminder features such as pop-up notifications or alarms will make it easier for users to remember the tutoring schedule that has been set.

a. Report Feature

Table 3. Report Feature

Fogg Behavior Model		
Motivation	Trigger	Ability
The existence of this report feature will make it easier for academic supervisors to find out who is not doing academic guidance, so that students are more motivated to do academic guidance.	There is a special marker if there are students who have problems, accompanied by information entered by the academic supervisor.	The department can find out students who have problems, students who have or have not done academic guidance, and read criticisms and suggestions sent by students

b. Chat Feature

Table 4. Chat Feature

Fogg Behavior Model		
Motivation	Trigger	Ability
If communication goes well, students are most likely not lazy to do academic guidance.	Incoming notification when a student or lecturer sends a message.	Students and supervisors will find it easier to communicate quickly.

c. Monitoring Feature

Table 5. Monitoring Feature

Fogg Behavior Model		
Motivation	Trigger	Ability
Academic guidance will be more focused if it has student data that has been inputted so that it increases motivation to do academic guidance because it is already in one place.	A marker if there are students who have problems	Lecturers can see student progress more easily so that they can monitor all their guidance students.

4.4 Prototype

The prototype design of this Academic Guidance Information System uses Figma software with a screen size of 375px X 812px. The colors used in this application prototype are predominantly white, red, and yellow. The dominant writing is black. The language used on average uses Indonesian. This application has three types of views according to their respective roles. The roles/positions are Student, Academic Advisory Lecturer (PA), and the Department. The results of the prototype design of the Academic Guidance Information System are as follows:

a. Scheduling and Reminder Features

The academic tutoring schedule and reminder page contains information about the academic tutoring schedule. PA lecturers and students can activate reminders so they can get notifications when the academic mentoring schedule will take place.
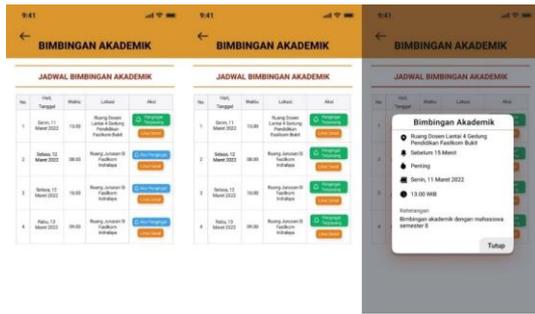
Figure 6. Scheduling and Reminder Feature Prototype

b. Report Feature

The report page is equipped with student profiles and special notes that have been given by PA Lecturers to guidance students. Special notes will be marked in red if the status is urgent, important, or if there is a problem guidance student.
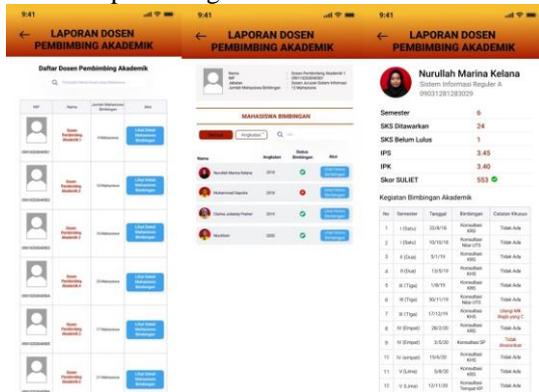

Figure 7. Report Feature Prototype

The suggestion box page is used by students to send criticism and suggestions regarding academic guidance problems. The department can see and read the criticisms and suggestions that have been sent by students.
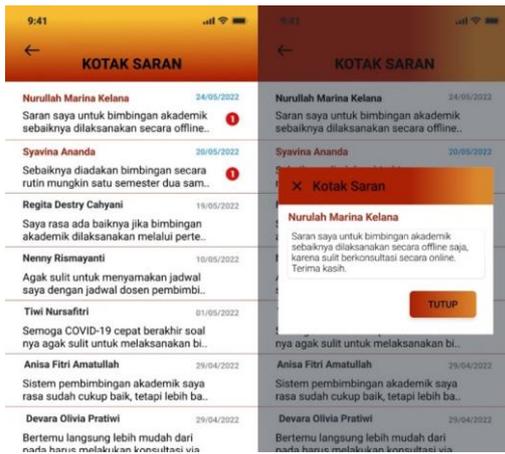

Figure 8. Suggestion Box Feature Prototype

c. Chat Feature

Students and Academic Advisors can communicate using this feature, there will be a notification if there is an incoming chat.
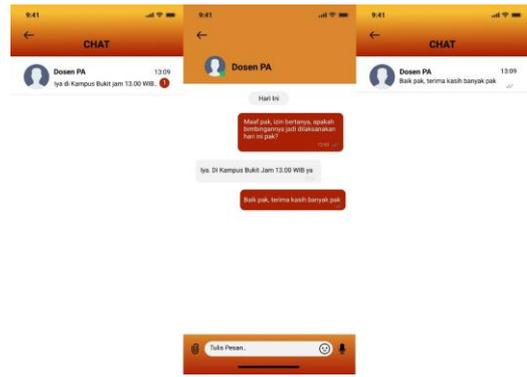

Figure 9. Chat Feature Prototype

d. Monitoring Feature

On this page, PA Lecturers can see a list of their mentored students and the status of their guidance, namely information related to whether their tutored students have done guidance or not. In addition, for each student guidance, PA Lecturers can view student data and student guidance history.
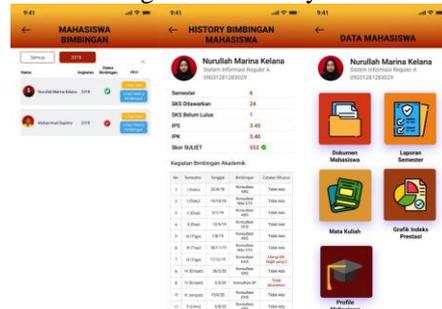

Figure 10. Student Guidance List Feature Prototype

The Student Documents feature is used to add student documents. For PA Lecturers, this feature is used to view documents that have been uploaded by students.
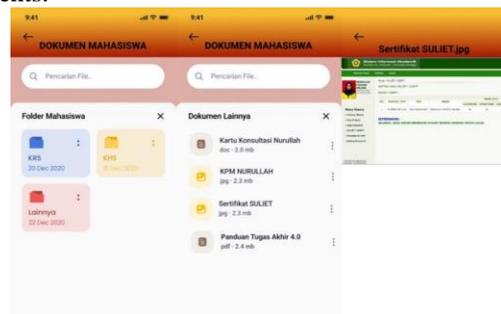

Figure 11. Student Document Feature Prototype

The semester report page is created to display the progress of the guidance students per semester.
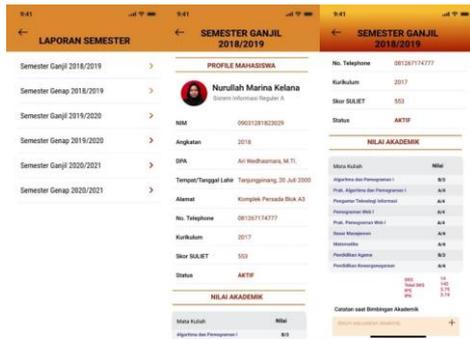
Figure 12. Semester Report Feature Prototype

The course page contains information about what courses are taken by students along with grades and history of repetition of taking courses.

Figure 13. Course Feature Prototype

The Student Profile and Academic Advisory Lecturer Profile page contains data or information from these PA students and Lecturers. The Achievement Index Graph page contains the student's Grade Point Average (GPA) and Semester Achievement Index (IPS). If the student's score is below the specified conditions, it will show a red warning. This page also displays student social studies charts in the form of line charts.

Figure 14. Prototype of Achievement Index Graph Features

The Student Profile and Academic Advisory Lecturer Profile page contains data or information from these PA students and Lecturers.
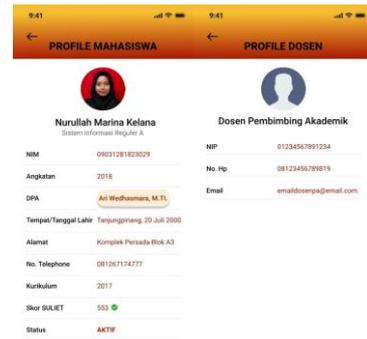

Figure 15. Prototype Feature of Student Profile and Academic Advisory Lecturer Profile

4.5 Test

The testing stage is the last stage, namely testing of the prototype that has been designed in the previous stage.

4.5.1 MIUS and MAUS Test

After testing using the Maze Design application, 20 participants or respondents were obtained. The test results that are characterized by using task scenarios can be seen in the following table:

Table 1. MIUS and MAUS Results (Academic Advisory Lecturer)

No	Task Scenario	Maze Usability Score
ST01	Academic Guidance Schedule	71
ST02	Report	82
ST03	Chat	52
ST04	Calendar	72
ST05	Guidance Student	66
ST06	Student Documents	86
ST07	Subject	57
ST08	Performance Index Chart	46
ST09	Student Profile	88
ST10	Semester Report	86
Maze Usability Score (Average Score)		70

Table 2. MIUS and MAUS Results (Scholar)

No	Task Scenario	Maze Usability Score
ST01	Academic Guidance Schedule	39
ST02	Student Documents	83
ST03	Suggestion Box	89
ST04	Chat	96
ST05	Student Profile	86
Maze Usability Score (Average Score)		79

Table 3. MIUS and MAUS Results (Department)

No	Task Scenario	Maze Usability Score
ST01	Suggestion Box	90
ST02	Academic Advisor Report	79
Maze Usability Score (Average Score)		85

Table 4. MAUS Average Results

No	Task Scenario	*Maze Usability Score*
1.	Academic Advisor Task Scenario	70
2.	Student Task Scenario	79
3.	Department Task Scenario	85
Maze Usability Score (Rata-rata nilai)		78

Table 5. MAUS Score Ranking

No	Score Level	Score Range
1.	Low (Not Acceptable)	0-49
2.	Marginal	50-79
3.	High (Acceptable)	80-100

The results of Table 5 show that the average value of the Maze Usability Score prototype of the Academic Guidance Information System obtained a value of 78 and belongs to the medium/marginal characteristics.

4.5.2 SUS Testing

The following are the steps to get the final score from the SUS test:

1. Statements in odd order are statements that are positive, then the score obtained from the respondent is reduced by 1 (Score obtained - 1)

2. The statement of even order is a statement that has a negative tone. Then the score is calculated by 5 minus the score obtained from the user (5 – Score obtained)

3. After calculating the results of the value of each statement, all the results are added up and the results are multiplied by 2.5 to get the final value [8].

Table 6. SUS Statement Results

SUS Statement	Average	Result
I think I will use this system again	4,45	3,45
I find this system complicated to use	1,6	3,4
I find this system easy to use	4,5	3,5
I need help from someone else or a technician in using this system	1,7	3,3
I feel the features of this system are working properly	4,35	3,35
I feel there are a lot of things that are inconsistent (incompatible on this system)	1,85	3,15
I feel others will understand how to use this system quickly	4,15	3,15
I find this system confusing	1,55	3,45
I feel there are no obstacles in using this system	4,35	3,35
I need to get used to it first before using this system	2,6	2,4

SUS Final Score = ((Number of odd statements + number of even statements)) x 2,5

$$= ((3,45+3,5+3,35+3,15+3,35) + (3,4+3,3+3,15+3,45+2,4)) \times 2,5$$
$$= 32,5 \times 2,5$$
$$= 90,25$$

The average value of the SUS test is 90.25 leading to the value of the acceptable category or acceptable with a grade scale (A). So, it can be concluded that this shows that the prototype design that has been made is acceptable and suitable for use by users.

4.5.3 Recommendation for Repair

Based on the test results above on the parameters of the level of completion of the task scenario and the number of errors made, there is feedback obtained from the user after doing the test. Feedback on improvement recommendations can be seen in Table 5 below:

Table 5. Recommendation for Repair

No	App Page	Role	Recommendation for Repair
1.	Student Guidance History Page	Academic Advisor	The signature for the consultation card or KRS can be added using a QR Code instead of a wet signature.
2.	Add Tutoring Schedule Page	Academic Advisor	It is better to add guidance students to the form added to the guidance schedule which is not carried out by the lecturer, so that it does not add to the work of the lecturer. The addition of students can be done by sharing the guidance room link, so students just enter the room using the link.
3.	Guidance Student Page	Academic Advisor	Integration or loading data regarding MBKM activities.

5. CLOSING
5.1 Conclusion

According to the results of the stages that have been carried out to design the prototype of the Academic Guidance Information System, several conclusions were obtained, namely:

a. The main problem found from the results of the analysis of the empathize and define stages is that students' problems were not detected from the start so they experienced graduation delays due to the low monitoring of their academic supervisors.

b. Researchers have produced a design in the form of a prototype of the Academic Guidance Information System so that it can be used as a platform for monitoring student guidance and can schedule academic guidance so that the academic guidance process is clearer and more focused.

c. Evaluation of the prototype design results using the usability tool, namely Maze Design. The Mission Usability Score (MIUS) and Maze Usability Score (MAUS) tests get a score of 78 and fall into the medium/marginal characteristics. Based on usability testing using the SUS calculation, the SUS value is 90.25, which means it leads to the value of the acceptable category or can be accepted with a grade scale (A). The results of testing (testing) the proposed prototype design shows that the design has met the feasibility standard. This is done with 1 test iteration (testing) to 20 respondents on each test method.

5.2 Suggestion

Because there are still shortcomings in this research, it is hoped that further research can make a better prototype design in the future. Therefore, the researcher has several suggestions, namely:

a. Further research can be carried out with the design theme of the prototype of this Academic Guidance Information System, so that it can be implemented into a real application.

b. In further research, it is necessary to develop a prototype design for all device sizes.

c. It is hoped that further research can add features that are in accordance with the recommendations from users. These features include: adding the option of changing wet signatures to QR-Codes on consultation cards, creating academic guidance rooms using links, and integration with MBKM data.

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Contact person Author:
Nurullah Marina Kelana
Hp: 081267174777
Rahmat Izwan Heroza, M.T.
Hp: 085228034258