

# Android Based Thesis Mentoring System Using Google Firebase

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**Abstract** - This research aimed to build a platform to carry out the thesis mentoring process which was periodic, real-time, systemized, and well-integrated in Ciputra University in Surabaya. The researcher used Google Firebase technology provided by Google and built it on an Android-based platform. The method used was the Systems Development Life Cycle (SDLC) model. It was divided into six stages of the process: requirement analysis, system design, implementation, system testing, system deployment, and system maintenance. Data collection methods used were observation and interviews conducted to the final project coordinator in the study program. The results show that system has six main features including progress overview of thesis, chat room, guidance schedule, guidance book, important date, and announcement. Moreover, the thesis mentoring system is easy to use and consists of easy-to-understand menus. After going through the process of analysis, this system is very helpful in scheduling guidance, monitoring the progress of student thesis work, and managing announcement and important date.

**Keywords:** android, thesis mentoring system, Google Firebase

## I. INTRODUCTION

Doing the final project or thesis is one of the pre-conditions for the students to complete their studies for the bachelor degree. The final year students who do the final project experience a setback in the process or overtime. This case is also experienced by final year students at Ciputra University in Surabaya, especially for Informatics Engineering study program and Information Systems study program of Creative Industry Faculty in Technopreneurship 3 course related to the final student project. Based on the observations and a short discussion with the chairperson in charge of the final project in the study program, several things become the subject matter in the process of the student's final assignment. First, there is the difficulty of coordination between the supervisors and their students in determining the guidance schedule. Many factors support

this. The supervisors do not always remind the students of the guidance schedule. Then, the students do not always put their guidance schedule into the calendar, so they forget it.

Second, there is also the difficulty of the supervisor in supervising and tracking the progress of the thesis writing. In general, students have been directed and told the steps that must be done by their supervisors. However, the students cannot do it coherently or at all. Third, one supervisor can handle several students. Thus, the supervisor may forget the last update of many students such as what stage they are, how far the progress is, and how much the students are prepared to go to the final exam.

Guidance has the meaning as a guide in how to do something. Meanwhile, the online can be interpreted as a state that is using the network or connected in one network. A device is connected with other devices so that they can communicate with each other. Thus, online guidance can be interpreted as instructions in how to do something that is connected in one network so they can communicate with each other.

Tileng and Wahyudi (2016, 2017) showed the use of Information and Communications Technology (ICT) in the world of education can be widely accepted and the availability of online platforms (e-learning) allows students to work effectively even remotely. Moreover, the importance of online guidance is supported by previous research by applying the concept of online guide to the web-based student final project. There are those who build it using pure PHP framework and server hosting (Muhamad, 2014; Sastypratiwi & Dwiyani, 2016), and CodeIgniter as the PHP support framework combined with the use of Google Calendar (Rosari, 2016).

Android is an operating system with an open source. Google releases its code under the Apache License. Open source code and licensing licenses on Android allow software to be freely modified and distributed by device makers, wireless operators, and application developers. The utilization of the Android platform has been widely used in the community to solve existing problems, including the use of presence systems (Chawhan, Girhale, & Mankar, 2013) with mobile-based barcode (Fadlil, Firdausy, & Hermawan, 2008) and QR code (Tresnani & Munir, 2012). The other

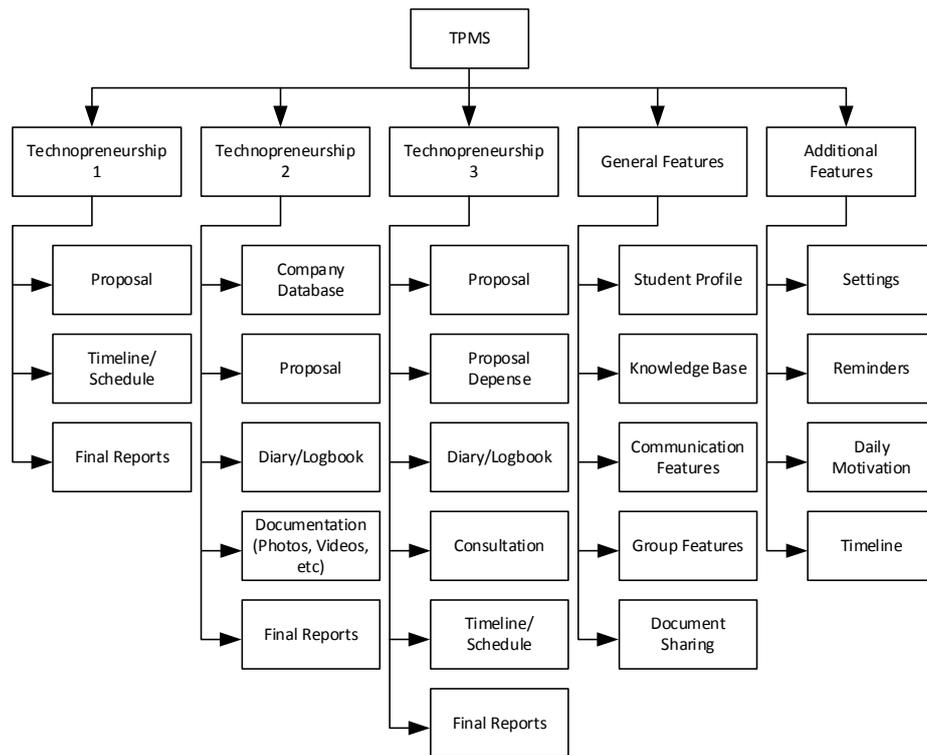


Figure 1 Feature Model of TPMS  
(Source: Wahyudi & Tileng, 2017)

examples can be the use of Near Field Communication (NFC) technology systems (Coskun, Ozdenizci, & Ok, 2013) or augmented reality (Castillo, Villegas, & Sanchez, 2015).

Google Firebase has been introduced to the public based on research of Google Firebase API for Android. Mehta, Madhani, and Patwardhan (2017) stated that Firebase was a real-time database that made it superior to all traditional database services such as SQL, SQLite, and shared preferences. Google provides firebase. It means it is the most reliable database and has many new features in the future. Google Firebase has been used for the implementation of smart home (Kumar, Akhi, Gunti, & Reddy, 2016). There is also research regarding the Internet of things system called as JustIoT that the firebase acts as a real-time back-end database (Li, Yen, Lin, Tung, & Huang, 2018). Then, there is also a cloud IoT platform for Extracorporeal Membrane Oxygenation (ECMO) simulation. It is a lifesaving procedure developed for the care of patients with short-term respiratory or circulatory issues. It is proven to improve survival rates up to 75% (Alsalemi *et al.*, 2017). Moreover, it can be voice interaction-based messaging applications for people with visual impairments (Justicia, Tolle, & Amalia, 2017).

Referring to the research by Wahyudi and Tileng (2017), it shows the necessary features included in the updated version of the information systems. The different coaching and mentoring features can support subject coordinators, supervisors, and students. In addition, it allows them to complete the subject on time and in accordance with the standards. Technopreneurship Project Management System (TPMS) model is produced which can be seen in Figure 1.

Like the research that has been done by Wahyudi and Tileng (2017), this research aims to synchronize an asynchronous communication between students and

supervisors. However, the previous research focuses more on the supporting features in the project management system on web-based application. In contrast, this research focuses on the systems that support the quality of the mentoring process carried out as long as the subject is running.

Based on some of the issues, in the end, all of them will affect the final quality of the thesis produced. It is also necessary to improve quality with the existence of mentoring that is periodic, real-time, systemized, and integrated. It is not only from the data but also from the improvement and development of the guidance process for the thesis of the student. The development and progress of information technology have enabled the researcher to build a thesis mentoring system to solve the problems. Utilization of Google Firebase technology provided by Google and Android-based platform is possible for this case. The focus of the research is on the object of Technopreneurship 3 subjects related to the final project of students in the study program of Informatics Engineering and Information Systems in Ciputra University.

## II. METHODS

The method used in this research is the Systems Development Life Cycle (SDLC) model or better known as the Waterfall model (Isaias & Issa, 2015). The Waterfall model is divided into six stages. First, it is a requirement analysis. The previous system analysis is carried out. Then, details of what is needed in system development and planning related to the system project are analyzed. Second, the system design is the design of workflow, management, and programming to develop the information system. At this stage, the design of the thesis mentoring system will be made using an overview of the system architecture model. Third, it is the implementation of an Android-based

thesis mentoring system by utilizing Google Firebase. This stage is also a software design as a series of programs or software. There are three applications, which are Android-based applications for students, supervisors, and head of the study program made by using java material design (Android studio) and supported by Google Firebase technology. It also includes features of authentication, realtime-database, firebase cloud messaging, and firebase storage.

Fourth, the system testing and analysis of test results are carried out. In alpha testing, the method used is Black box testing which the test focuses on the functional specifications of the software. The test cases are important features in the system. It includes login, chat, guidance schedule, guidance book, important schedule, announcement, and logout features. The tester can define a set of input conditions and test functional specifications in the program. Then, the acceptance test or beta testing is carried out by the user in the operating environment, which are the student, supervisor, and the head of the study program. They also need to be interviewed. The related respondents are 30. Thoses are selected based on the suitability of their final assignment requirements at Universitas Ciputra, Faculty of Creative Industries. Fifth, in system deployment, the system will be distributed to all students and educators in the study program. Sixth, for system maintenance, the maintenance process of the thesis mentoring system happens if there is a system update or improvements to the desired features and functions. The SDLC model can be seen in Figure 2.

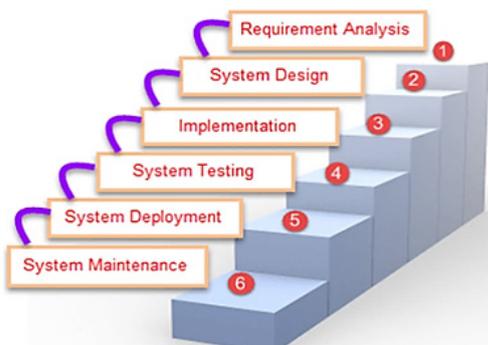


Figure 2 The SDLC Model  
(Source: Isaias & Issa, 2015)

The current system in the thesis mentoring process at Ciputra University can be seen in Figure 3. First, the students must determine the guidance schedule with the supervisor through chatting in social media and manually record the schedule in the calendar. This guidance process is carried out continuously by students with the supervisor until the final assignment of the student or until they reach the final result and ready to be tested. As a proof of the guidance process, there is a guidance book that must be filled by students and supervisors by signing it after the guidance process.

Second, if the student has finished writing the final project report, the guidance book and validation sheet must be reported and signed by the head of study program as the approval to advance to the thesis hearing. Third, there is still a final checking stage by the final project coordinator to list each advanced final project requirement that must be fulfilled.

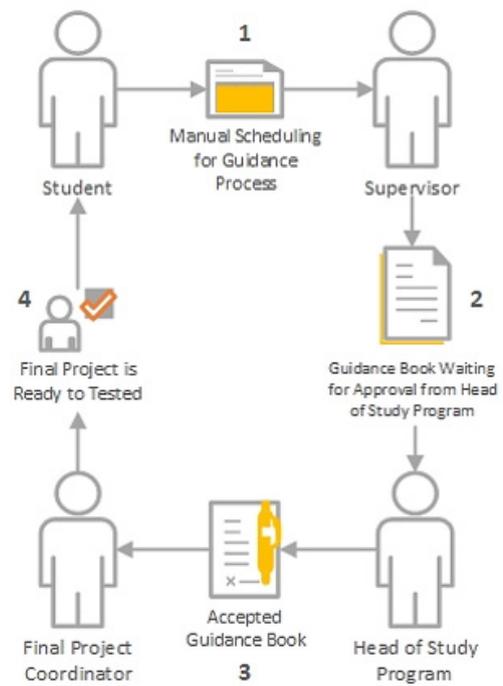


Figure 3 Old System of Thesis Mentoring Process

Fourth, if all the requirements are completed, and the students are ready to advance the final assignment exam, the final project coordinator will announce the final assignment exam schedule following the specified test period. However, if there are still incomplete test requirements, the students have to complete all requirements without exception to advance the thesis process.

From the previous system which is deemed inefficient, a new system is proposed. It should be periodic, real-time, systemized, and well-integrated. The process of the suggested system can be seen in Figure 4.

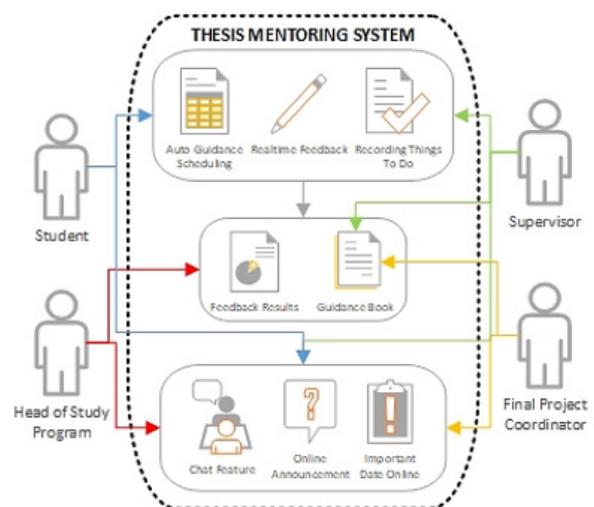


Figure 4 Suggested System of Thesis Mentoring Process

The system offers the integration of the relationship between the four main users, who are students, supervisors, heads of study programs, and final project coordinators. The students who want to do the guidance process confirm the guidance schedule through the existing chat feature with the supervisor. If they have agreed, the mentor will input a guidance schedule in the system, and it will automatically be recorded on the student and supervisor calendar. There will also be a reminder before the guidance time process. Shortly after the guidance process is complete, students can provide feedback on the guidance service from the supervisor. The feedback is guaranteed to be confidential. Students can also view announcements related to the thesis process that runs along with recorded important dates.

Then, the supervisors have to coordinate with students through the chat feature to arrange guidance schedules. The supervisor can add and remove guidance schedules with their students. The supervisor can also provide feedback to the student's guidance related to the progress of the thesis. It includes adding a list of tasks. The supervisor can also see the recorded announcements regarding the final project process and important dates.

Moreover, the head of the study program has special access to see the reviews and feedback given by students to the supervisor and vice versa. The purpose of this special access is given as a manifestation of tracking the progress of final assignment work in real time. Thus, the head of the study program does not need to check it manually one by one regarding the progress of the thesis. The head of the study program can also see announcements regarding the final project process and recorded important dates.

The final project coordinator has the main task to update each announcement along with important dates of the final project. In addition, the final project coordinator has primary access to manage master data for supervisors, students, the head of the study program, and guidance schedules. The final project coordinator also has the main access to coordinate with the head of the study program through the chat feature. However, the final project coordinator cannot track the progress of the thesis in realtime like the head of the study program.

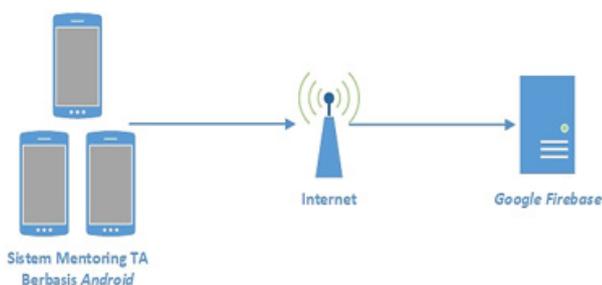


Figure 5 Suggested Architecture System

The architecture system of the Android-based student thesis mentoring system using Google Firebase can be seen in Figure 5. The architecture system of the student's thesis mentoring system consists of Android-based applications, Google Firebase technology, and Internet connections. The system does not need to use web services anymore to connect the applications with the servers. It is because Google Firebase has provided the services.

### III. RESULTS AND DISCUSSION

This research produces a mobile application that will be used in the mentoring process of the final assignment with four users. Those have different accesses including students, supervisors, head of study program, and final project coordinators. The mobile application is implemented on the Android platform.

The mobile application login page is only one page. However, the system can direct users to the next page according to their respective access. It can be seen from the identification of each email. The login page can be seen in Figure 6.

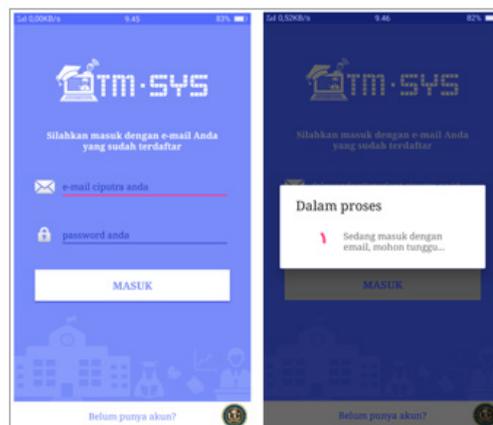


Figure 6 User Login Page

Students can see the summary of the entire mentoring process. It includes the graphics and intensity in mentoring with supervisors. Then, the students can chat with the supervisor and see the guidance schedule that will be done and the process of guidance that has been completed. Moreover, the students can see the results of a valid guidance review and record it as a valid guidance book. The students can also see the important schedules during the student's thesis process, and see announcements related to the thesis process. The student's home page can be seen in Figure 7.



Figure 7 Student's Homepage

Meanwhile, the supervisors can see the summary of the entire mentoring process including graphics and intensity in mentoring. They can also chat with guidance students and see the guidance schedule that will be done and the process of guidance that has been completed. In this activity supervisor also has the authority to provide validation to the guidance process that has taken place to be a valid guidance book. The supervisor also has the right to add the guidance schedule and see the results of the valid guidance review and record it as a valid guidance book. They also see the important schedules during the student's thesis process and announcements related to the thesis process. The supervisor's home page can be seen in Figure 8.



Figure 8 Supervisor's Homepage

Moreover, the head of study programs has several features on this homepage. They can see the summary of the whole process of mentoring in the study program including graphics and intensity in mentoring. They can also chat with final project coordinator and supervisors, see the data of active students and supervisors. Then, they can see important schedules during the student's thesis process and announcements related to the thesis process. The head of study program's homepage can be seen in Figure 9.

Final project coordinator can see a summary of the whole process of mentoring for all students in the study program. It includes the graphics and intensity in mentoring. They can chat with the head of study program and supervisors, view, add, and delete data from active students in the thesis process. They also see, add, and delete data from active supervisors, important schedules during the student's thesis process, and announcements related to the thesis process. The final project coordinator's home page can be seen in Figure 10.

Some features that become the solutions to problems in the guidance process are chat rooms, guidance schedule pages, review pages after conducting the guidance process, guidance books pages that are generated automatically, important schedule pages, and announcement pages. The

chat room is provided to overcome the difficult coordination between supervisors and students. The chat room can be seen in Figure 11.



Figure 9 Head of Study Programs's Homepage



Figure 10 Final Project Coordinator's Homepage

The guidance schedule deals with the difficulties of the supervisor in supervising the student's final assignment writing progress. Every progress made by students is recorded in the system to produce a valid guidance book. The guidance schedule can be seen in Figure 12. Meanwhile, the guidance book is in Figure 13.

Application testing is done by testing the functions. The test looks for the errors or bugs in the system. There are two testing techniques, namely alpha and beta testing. Alpha testing is the application test made by application developers and people who help in making. Alpha testing in this research uses the Black box method. It tests the application functions directly without regarding the program execution flow. The test results from the mobile application are shown in Table 1.

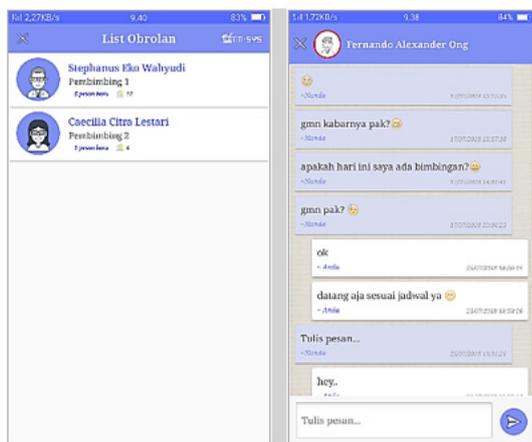


Figure 11 Chat Room Page

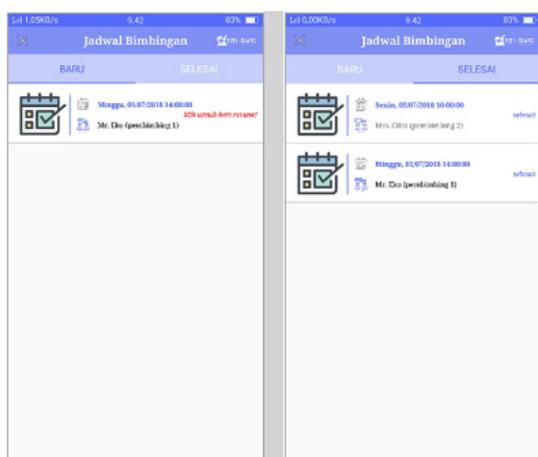


Figure 12 Guidance Schedule Page

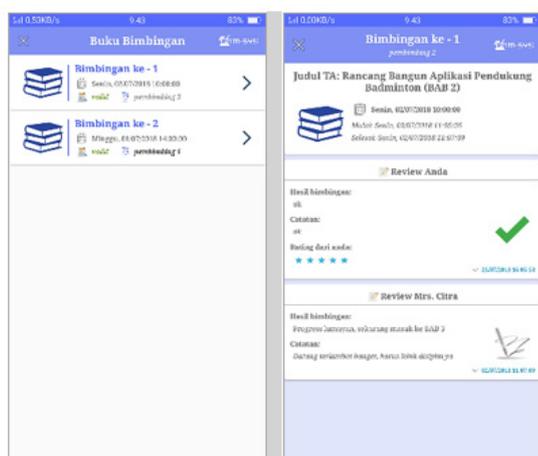


Figure 13 Guidance Book Page

Table 1 Alpha Testing Results

Tested Function	Conditions	Expected Output	Generated System by System	Status
Login	Username and password are right	Login succeeds	Login succeeds	
	Username and password are wrong	Login fails	Login fails	Valid
Chat	Write an empty message	Post nothing	Post nothing	
	The message is not empty	Real-time message delivers	Real-time message delivers	Valid
	Message is received	Push notification shows	Push notification shows	
Guidance Schedule	Supervisor adds the new schedule	Wait for the new guidance schedule	Wait for the new guidance schedule	
	Supervisor gives a review after the guidance process	Review is saved	Review is saved	Valid
	Guidance process is done	Guidance result is saved as a valid guidance book	Guidance result is saved as a valid guidance book	
Guidance Book	Click on one of valid guidance booklist	Go to the selected guidance book details page	Go to the selected guidance book detail page	Valid
Important Date / Schedule	Click on one of unimportant date	There is no important list	There is no important list	Valid
	Click on one of the important date	There is an important list	There is an important list	
Announcement	Click on one of the announcements	Selected announcement shows the detail	Selected announcement shows the detail	Valid
Logout	Click on Log out button, and choose CANCEL option	Logout is canceled	Logout is canceled	Valid
	Click on Log out button, and choose OK option	Logout succeeds. Go back to Login page	Logout succeeds. Go back to Login page	

Based on the testing, it can be seen that the test status of each function is valid. The process of input and output produced by the system is as expected. It can be concluded that this application has been running as well as expected.

Then, beta testing is carried out by people who do not participate in the application making process. It includes the supervisors, students, head of study program, and final project coordinator. After the beta testing is finished in 2 weeks, an interview is conducted for 30 related respondents. Based on the beta testing, regarding convenience, the thesis mentoring system or application has a system that is easy to use. It consists of easy-to-understand menus. Through this application, all documentation or records regarding the guidance process data can be processed, and stored properly and safely by the system. Regarding benefits, this application accelerates and streamlines the time that the students conduct the mentoring process with their supervisors. It also integrates all announcement and important final project schedules in real-time. The interview result can be seen in Figure 14.

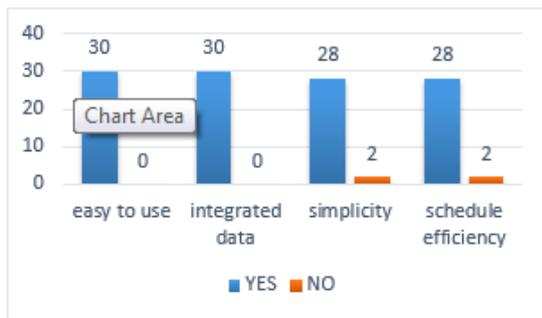


Figure 14 Interview Results

#### IV. CONCLUSIONS

The Android-based thesis mentoring system designed and built using Google Firebase technology has answered the needs of the thesis mentoring process in the Informatics Engineering and Information Systems study program in Ciputra University. The final project students agree that this system makes easier for them to carry out the guidance process and give more motivation to complete the final project. Furthermore, the supervisor also says that they can easily contact and coordinate with the students to carry out the guidance process. After going through the process of analysis, this system is very helpful in scheduling guidance, monitoring the progress of student thesis work, and managing announcement and important date. All students use this system on their thesis, all supervisors, heads of study programs and final project coordinators.

There are several limitations in this research. The research conducted is an implementation process of the final project mentoring system only. It does not reach decision making in determining a student who is eligible for advanced examinations. Specific algorithms and logic are not included in this research. Product testing is only done in limited trials and does not reach the mass production of the system products produced.

Further research should be added with methods or algorithms to help in determining and making decisions whether students who will do the thesis are eligible to advance to the thesis hearing. It can maintain the quality of the process and final thesis results.

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