

Development of Mobile-Based Final Project Monitoring System Using Rapid Application Development (RAD) Method

Alexander Achmad Khan^{1*}, Diki Gita Purnama², and Wahyuningdiah Trisari

Harsanti Putri³

^{1,2,3}Informatics Study Program, Universitas Paramadina, Jakarta, Indonesia

*Corresponding author: alexander.khan@students.paramadina.ac.id

ABSTRACT

Based on the data from Paramadina University's academic statistics over the past 5 years, students are taking more than the ideal duration of 1 semester to complete their final projects, with 61% of students in regular classes surpassing this period and exceeding the threshold of 40%. To deal with this issue, this research proposes to develop a mobile-based application for monitoring the progress of students' final projects. The objective of this application development is to facilitate monitoring between students and professors concerning the progress of their final projects. The software development method used is Rapid Application Development (RAD), which involves phases such as requirement planning, where data is collected from Paramadina's students and faculty, design workshops documenting the results of UML diagram design, and implementation testing, including black box, unit, interface, and usability testing. The testing results show that all features for both students and professors function as expected, while usability testing resulted in a grade of D, indicating a need for further evaluation of the application. With this application, students and professors at Paramadina University can seamlessly monitor the progress of final projects.

Keywords: monitoring system, final project, android, mobile, RAD

1. INTRODUCTION

The final project serves a crucial role in evaluating and developing students conceptual understanding across various chosen fields of study (Pickering & Byrne, 2014). Students who produce final projects aim to produce graduates who not only possess a strong theoretical understanding but also have the ability to apply these concepts in real-world contexts and as skills for students in producing high-quality projects that can be accounted for (Utami et al., 2020). At Paramadina University, undergraduate students are required to participate in a scholarly project, typically in the form of a research paper, as an essential component of the university's academic curriculum (Kertamuda et al., 2022). In preparation for the final project, students have the opportunity to conduct research intended to solve problems in various areas of science, technology, or art with reliable validity (Mukri, 2020). In the stage of taking the final project course, students are given a form to decide the topic title to be researched. This stage involves consultation with academic advisors and supervising lecturers. Throughout the process of preparing the final project, communication or discussion between the supervising lecturer and the student is necessary until the student can complete their final project within the scheduled time (Da'awi & Nisa, 2021)

However, in reality, undergraduate students in regular classes are often unable to finish their final projects within the ideal period. Typically, students finish the final project course over one semester, which lasts approximately five months. This can be shown by graduation statistics from the past five years across all regular study programs.

Table 1. Data on the passing rates of undergraduate students in the final project program over the past five years in regular classes.

(Source: Academic Directorate of Paramadina University)

Study Programs	The number of students taking part in the final project program	Taking part more than one semester	Completing the final project
Visual Communication Design (DKV)	96	33	63
Product Design (DP)	29	15	14
Philosophy and Religion (FA)	56	26	30
International Relations (HI)	335	256	79
Informatics (IF)	47	30	17
Communication Science (IK)	378	211	167
Management (MJ)	102	56	46
Psychology (PS)	162	116	46
	1205	743	462

Based on the table, it is known that 61.66%, or 743 students, did not meet the criteria for completing the final project, while 38.34%, or 462 students, met the criteria for completing the final project over the past 5 years. Several limiting factors are experienced in completing the final project, both from the internal aspects of students and from external aspects, referring to the study by (Hartato & Aisyah, 2016), internal aspects of students include a lack of motivation or enthusiasm in preparation. Additionally, some students have not fully understood the concepts of their subject. Another internal factor is that the process of preparing the final project requires a considerable amount of time due to the need for in-depth research and meticulous data analysis. Furthermore, a few external aspects affecting students include economic limitations, leading students to seek additional jobs, which can affect their academic progress due to more responsibilities outside of their studies. Another indicator is the difficulty in connecting with supervising lecturers or having a mismatch with the supervising lecturer

assigned to them. (Budiatiningsih et al., 2023). Generally, the process of preparing the final project requires communication or discussion between the supervising lecturer and the student. In the current university system, the monitoring process between students who are getting ready for their final projects and their supervising lecturers is still done manually, typically by meeting them directly at scheduled times and places. This is evident from the previously mentioned external factor hindering students, which is the difficulty in connecting with supervising lecturers. However, monitoring should ideally be carried out digitally or using mobile devices for better accessibility and efficiency (Hapsari et al., 2017). Based on the problems described, this research will focus on developing a mobile-based final project monitoring system for both students and lecturers.

The purpose of developing the monitoring system in this research is to digitize the process of monitoring the progress of final projects between supervising lecturers and students. Lecturers will also be able to monitor and manage the progress of students' final projects, such as by changing statuses, approving titles, and creating progress submission forums. The focus of the development will mainly be on the Android platform. This decision is based on data from GlobalStats StatsCounter titled "Mobile Operating System Market Share Indonesia," which indicates that the Android platform dominates the mobile market in Indonesia, comprising approximately 88.35% of the population, while the iOS platform accounts for about 11.56% (Statcounter, 2023).

In the study conducted by (Apriliya et al., 2023), they developed a final project monitoring system using the DevOps method. Previously, the monitoring process involved face-to-face meetings, but it shifted to online meetings for monitoring the final projects. However, in their development, they did not integrate the capability to upload files for users. Therefore, in this research, the focus will be on implementing file uploads in any format for students.

The development method used in this research is the Rapid Application Development (RAD) model. According to (Mandang et al., 2020), using the RAD model compared to other models in developing small-scale projects offers several advantages. It can be done relatively quickly because in RAD, users may engage in the entire system development process by making decisions at each level (Sutjiadi et al., 2022). RAD can also produce a system quickly because the developed system can meet user requirements, thereby reducing the time for redevelopment after the implementation stage.

The result of this research will be developed in digital form on a mobile platform to facilitate both students and supervising lecturers in monitoring the progress of final projects. This digital method will replace the previous manual process and enable timely guidance and monitoring of the final project's progress.

2. METHODS

The planning of the research involves several stages, as depicted in Figure 1 below.

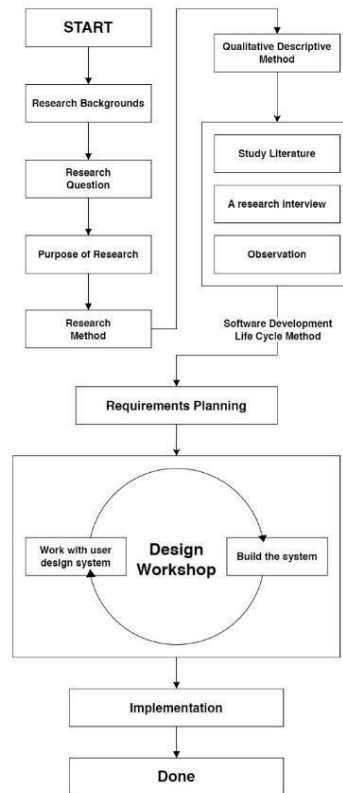


Figure 1. Research Steps in System Design.

2.1. Problem Formulation

The research phases begin with the background of the problem, which originates from academic data over the past 5 years indicating that many students are taking more than the ideal duration of 1 semester to finish their final projects. Additionally, the final project monitoring services have yet to offer mobile-based digital solutions. The subsequent research stage involves formulating research questions and focusing on how to develop an application capable of monitoring the progress of student's final projects. Lastly, the research seeks to develop a mobile-based digital monitoring system application.

2.2. Data Gathering

The phases of developing a mobile-based final project monitoring application in this research are divided into two phases. The first phase involves using a descriptive study method. The descriptive method aims to systematically, factually, and accurately describe the facts and characteristics of a population in a specific area (Wahid, 2020). This method involves collecting 20 literature review studies on the same topic, then obtaining interview documents from both students and lecturers, either directly or indirectly, by using Google Forms survey tools. Finally, it includes observation during involvement in final project lessons on campus.

2.3. Software Development Life Cycle

The method used in software development in this research is the Rapid Application Development (RAD) method to develop the final project monitoring system application. According to (Susilo et al., 2023), the RAD process consists of three phases: requirement planning, design workshop, and implementation. An explanation of each phase can be shown as follows:

2.3.1 Requirement Planning

In the requirement planning phase, the priority is gathering data from previous data collection efforts, which consists of figuring out the information requirements needed to achieve the application's objectives. This includes functional requirements, system requirements, and user requirements. The documents produced from requirement planning include interview responses and analysis from observations.

2.3.2. Design Workshop

The next stage is the design workshop phase, which involves creating the system and working with users to design the system. The documents produced from this design workshop include the creation of UML diagrams such as use case diagrams, activity diagrams, sequence diagrams, deployment diagrams, and ER diagrams, as well as interface design. The interface displays all the application screens for both lecturers and students. The design workshop iteration process may occur multiple times until the user requirements are met.

2.3.3. Implementation Phase

In the final stage of the RAD process, which is implementation, the developed system is implemented in the form of a program (Sekar Puranti et al., 2021). This implementation includes testing. The first test conducted is unit testing, which checks all small functional elements of the program code, specifically on the login page. The next test is black box testing, which is performed to test all functional features of the system (Alda, 2023). The interfaces tested include the login interface, the student interface, and the lecturer interface. The final test is usability testing. This testing method was introduced in 1986 by John Brooke and can be used for many different product and service evaluations, including software, hardware, websites, mobile devices, and various other applications (Nasrulloh Isnain et al., 2021). In usability testing, 5 lecturer respondents and 5 student samples are involved, filling out a questionnaire with 10 questions on the application using a scale from 1 to 5 to determine the usability score of the system. In the last stage, after testing, the application system is published or deployed to the Google Play Store platform for use by students and lecturers.

3. RESULTS AND DISCUSSIONS

3.1. First Iteration (Students features)

3.1.1. User Design System

In the first iteration process, the author works together with users to design the system, with a priority given to students as the primary users. The documentation results include requirement analysis and UML diagram designs. Based on the requirement analysis, the functional features prioritized for students are shown in the following Table 2:

Table 2. Functional Features

Requirements	User
In-app sign-in feature	
Application registration feature	
The system is able to upload progress	Students
Submit the final project proposal	
Exit the system	

The documents from the first iteration, which include UML design, specifically the use case diagram for students using the application system, can be seen in the following Figure 2.

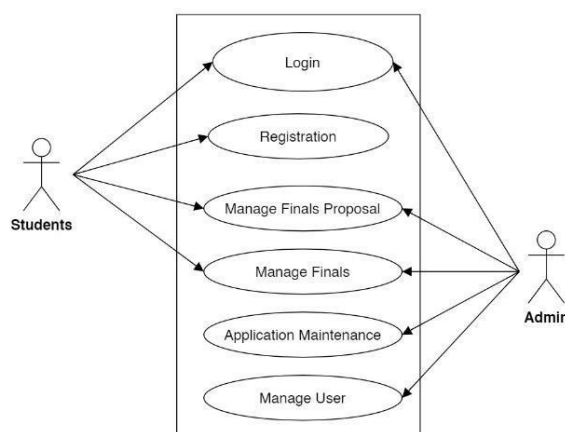


Figure 2. Student and admin use cases

The use case explanation in Figure 2 shows the student and admin as users of the monitoring system application. The related activities performed by the application can be seen in the explanation given in Table 3 below:

Table 3. Use case explanation

ID	Use case	Description
UC01	Login	In this use case, it represents the activities that can be performed by students to log in and exit the application.
UC02	Registration	In this use case, it represents the activity performed by students to register inside the system.
UC03	Manage Finals Proposals	In this use case, it represents the activity performed by students, which is to submit a proposal for their final project topic.
UC04	Manage Finals	For this use case, it represents the activity performed by students to upload their final project tracking progress.
UC05	Application Maintenance	In this use case, it represents the activity performed by the admin to maintain the system
UC06	Manage Users	In this use case, it represents the activity performed by the administrator to manage student and professor data.

The next document is the activity diagram, where the user is the student. It can be seen in the following Figure 3.

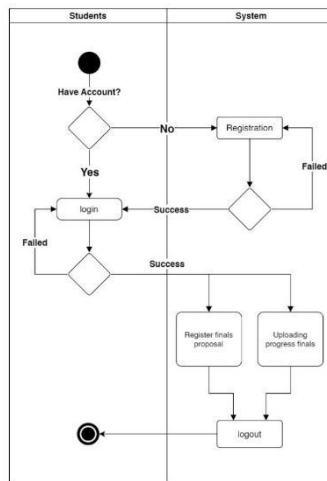


Figure 3. Student activity diagram

From the activity diagram in Figure 3, the activities engaged in by the student include logging into the application, showing the student dashboard, which consists of uploading their final project progress and filling out the final project form, until finally leaving the application. The next document is the sequence diagram for the student. The sequence diagram depicts a sequence of actions between system objects and other objects. The sequence diagram for the student can be shown in the following Figure 4.

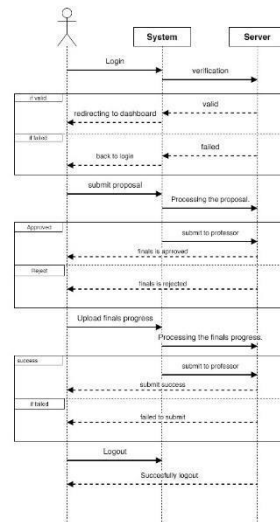


Figure 4. Student sequence diagram

In the sequence diagram in Figure 4, the student starts the application by either logging in or registering. If the submitted data is validated and the role is that of a student, they will navigate to the student dashboard screen, where activities such as uploading weekly final project progress can be performed if the lecturer has created a submission forum. The next design document is the ERD design, which is used to represent the database schema of the application. This can be shown in the following Figure 5.

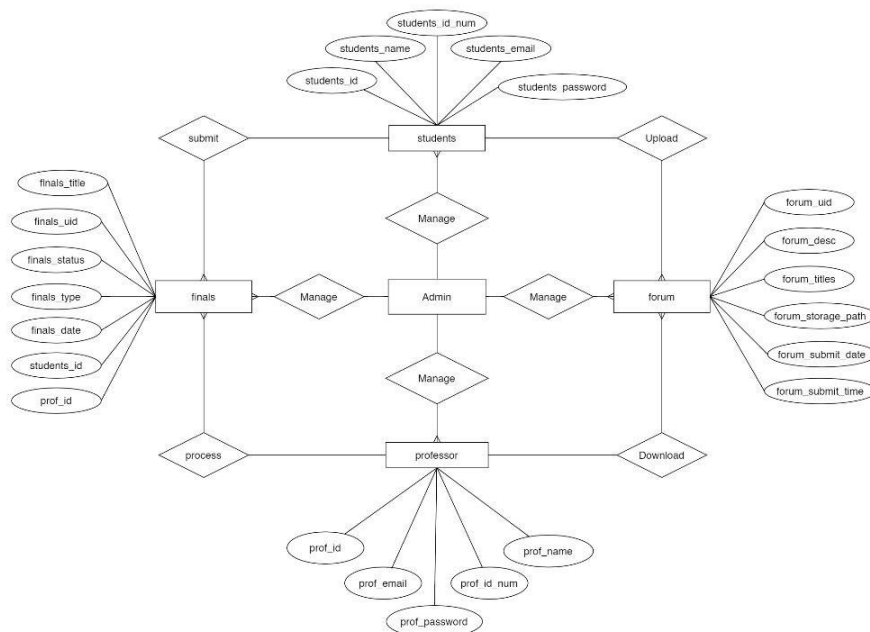


Figure 5. ER diagram design

The ER diagram in Figure 5 above shows the entities for the database structure, which consists of students, lecturers, admins, final projects, and forums. Each entity has specific

relationships with its associated attributes. Here is an explanation of the attribute tables 4 and 5 obtained:

Table 4. Student database attributes

Item name	Data type	Data Length	Description
students_id	int	10	Students ID, PK
students_name	varchar	50	Students name
students_id_number	int	10	Students ID number
students_email	varchar	50	Students email
students_pass	varchar	50	Students' password

Table 5. Attributes of the final work database

Item name	Data type	Data Length	Description
finals_uid	int	10	Project ID, PK
finals_title	varchar	50	Student Project Proposal
finals_type	varchar	50	Project Type Students
finals_status	varchar	50	Project Status
finals_date	date	-	Project Submitted

3.1.2. Build the System

The second phase of the design workshop in the first iteration is to build the system, and this phase involves implementing the previously designed application interface. The user interface system built for students consists of functionalities such as login, registration, uploading, registering, and logging out of the application. Below is the image of the application interface on the student screen in the first iteration.

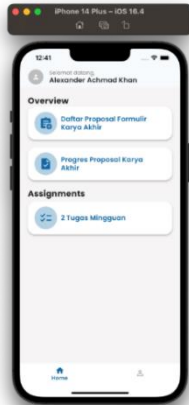


Figure 6. Student dashboard interface

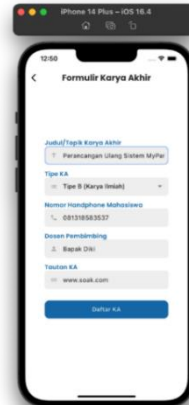


Figure 7. Register final project proposal interface



Figure 8. Student proposal progress interface



Figure 9. Student final project upload interface

3.2. Second Iteration (Professors features)

3.2.1. User Design System

In the second iteration of the RAD phase, the focus shifts to the second user, which is the professor. The resulting documents are similar to before, consisting of the analysis of lecturer requirements and the design of diagrams. The first diagram shown is the use case diagram, which can be seen in the following Figure 10.

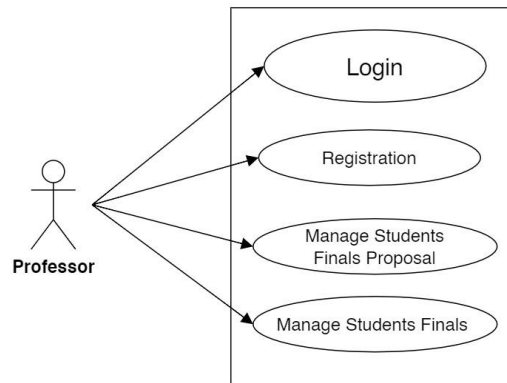


Figure 10. Professor use case diagram

The use case in Figure 10 shows the professor as the user of the monitoring application system. The associated activities performed by the application can be seen in the explanation provided in Table 6 below:

Table 6. Professor use case description

ID	Use case name	Description
UC07	Login	In this use case, it represents the activities that can be performed by professors to log in and exit the application.
UC08	Registration	In this use case, it represents the activity performed by professors to register inside the system.
UC09	Manage Finals Proposals	In this use case, it represents the activity by professors, namely to approve or change final project topic proposals.
UC10	Manage Finals	For this use case, it represents the activity performed out by professors to download the tracking progress of final projects.

The next diagram, to meet the user requirements, is designing an activity diagram for the professor. The design diagram can be shown in the following Figure 11.

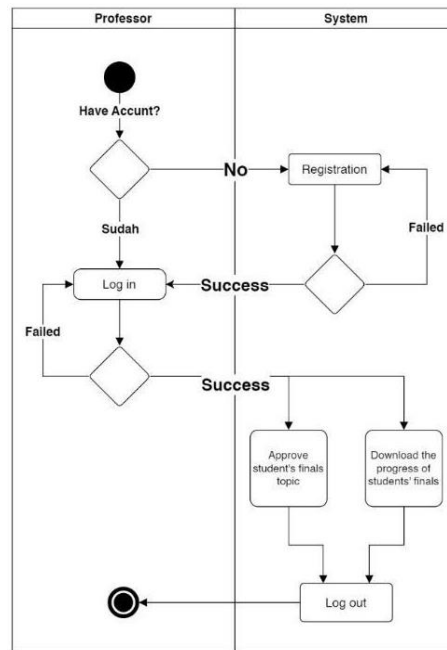


Figure 11. Activity diagram of Professor.

From the activity diagram in Figure 11, it indicates the activities performed by the professor in using the monitoring system. The lecturer starts by logging into the application. If the login credentials fail, it returns to the initial state, but if successful, it directs to the dashboard, which consists of two options: approving the topic of students' final projects project and downloading the progress of students' final projects. Finally, after performing both activities, the lecturer quits the application. The next design is the sequence diagram for the lecturer user, which can be shown in the following Figure 12.

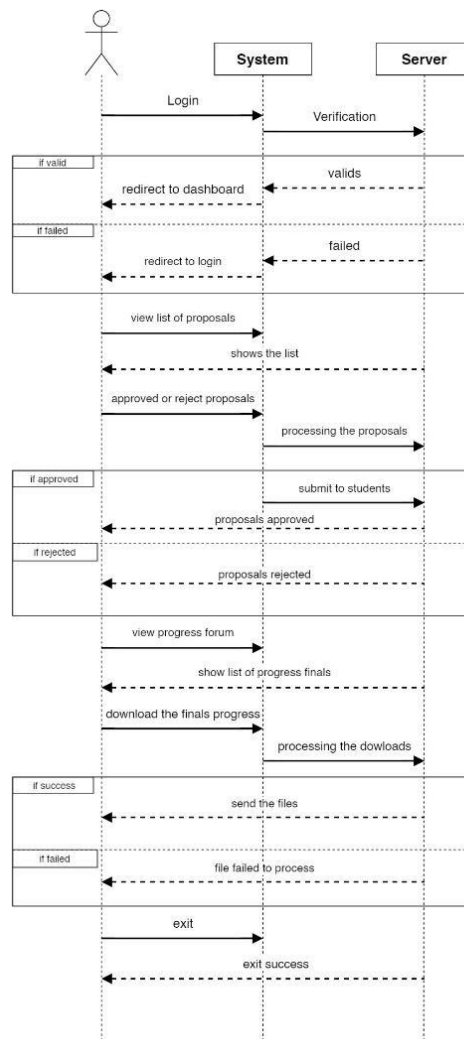


Figure 12. Sequence diagram of Professor

3.2.2. Build The System

The results of the second phase and iteration of the design workshop in building the system consist of the user interface pages for the functional features of professors, such as registration, login, approving or revising, and creating forums, as well as the developed database tables. Below is an image of the developed user interface pages for the features of professors in the system.

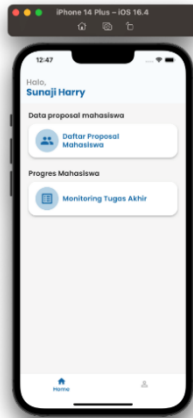


Figure 13. Professor dashboard page



Figure 14. Students proposal card

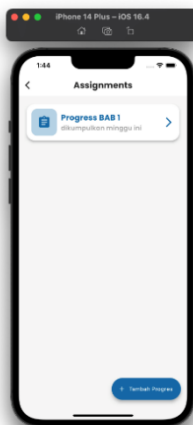


Figure 15. Create forum page

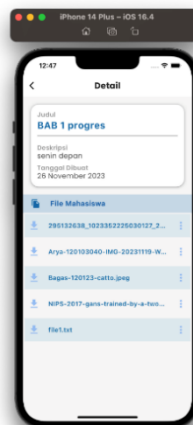


Figure 16. Forum collection interface

Once the user interface results have been built, the database tables in the system, which are the sequel to the ER diagram in the previous Figure 5, can be shown in Tables 7 and 8 as follows:

Table 7. Professor database

Item name	Data type	Data Length	Description
prof_id	int	10	Professor ID, PK

Item name	Data type	Data Length	Description
prof_name	varchar	50	Professor Name
prof_id_num	int	10	Professor ID Number
prof_email	varchar	50	Professor Email
prof_password	varchar	50	Professor Password

Table 8. Forum database

Item name	Data type	Data Length	Description
forum_uid	varchar	50	Forum ID, PK
forum_titles	varchar	50	Forum Titles
forum_submit_date	date	-	Forum submits date
forum_desc	varchar	50	Forum description
forum_submit_time	datetime	-	Forum submits date
forum_storage_path	varchar	50	Forum submits path storage

3.3. Implementation

The document for the implementation phase in this writing consists of unit testing implementation, black box testing, usability testing, and application deployment. The following is the output of the unit testing implementation shown in Figure 17.

```
group("Users api testing", () {
  // Login testing as students
  test('Login as Students', () async {
    var user = await UserAPI().loginUsers('120103048');
    expect(user.uid, isNotNull);
  });

  // Login testing as professor
  test('Login as Professor', () async {
    var user = await UserAPI().loginUsers('420699');
    expect(user.fullname, isNotNull);
  });

  // fetch all users test
  test('Fetch all users data', () async {
    var user = await UserAPI().getAllUser();
    expect(user.length, 5);
  });
});
```

Figure 17. User login unit testing

The results of unit testing and their explanations in Figure 17 can be shown in the following table 9:

Table 9. Unit test results log into the program

Test Case ID	Test case description	Expected result	Test results	Status
TC01	Entering in using the student ID number, with the number "120103048"	Returning a value indicating that the data is not empty.	Passed	Success
TC02	Logging in using the professor's ID number, with the number "420699"	Returning a value indicating that the data is not empty.	Passed	Success
TC03	fetch all the total user data.	Returning the total amount of user data in the database is roughly "5"	Passed	Success

After performing unit testing, the following implementation testing is black box testing of the entire login and registration feature pages. This can be shown in the following table 10:

Table 10. Black box test results load into the system

Test Case ID	Test case description	Expected result	Test results	Status
TC04	Enter the registered ID number and password, then press the “login” button.	Navigating to the student/professor page and showing the dashboard.	Passed	Success
TC05	Choosing the user role to register for the system	Redirecting to the registration form page for professors or students.	Passed	Success
TC06	Register for the system by entering your name, ID number, email, and password.	Navigating to the login page.	Passed	Success
TC07	Clicking the login button without completing out the registration or login form.	The system shows an error message on screen.	Passed	Success

The upcoming black box testing is performed on the student interface page. It can be demonstrated in the following Table 11:

Table 11. Black box test results student page

Test Case ID	Test case description	Expected result	Test results	Status
TC08	Register the final project proposal by filling out the form with the title, type, phone number,	The data is submitted and displayed on the student's final project topic progress page, and a notification is sent.	Passed	Success

Test Case ID	Test case description	Expected result	Test results	Status
	professor, and URL.			
TC09	Clicking the "Register Final Project" button without completing the project proposal form.	The system displays an error on the page.	Passed	Success
TC10	Accessing the final project proposal results on the final project progress page after submitting the proposal form.	The system displays the student's final project topics, types, and the status of final project approval.	Passed	Success
TC11	The student uploads the progress file of the final project by pressing the "upload progress" button and selecting the file option.	The system submits the final project upload data to the server and displays a notification.	Passed	Success

Next, black box testing on the professor's interface screen can be shown in the following Table 12:

Table 12. Test results of the Professor's interface

Test Case ID	Test case description	Expected result	Test results	Status
TC12	The professor views the progress assessment of the student's final project proposal in the "student guidance" feature menu.	Displaying all the data on student proposals.	Passed	Success
TC13	The professor approves or updates the student's topic title on the student's final project topic.	The system sends the final project status to the student. And displays a notification.	Passed	Success
TC14	The professor searches for the student's name to track the progress of their research topic.	The system displays a list of research topics proposed by the students.	Almost Passed	Failed
TC15	The professor fills out the progress forum form on the forum page, then clicks the "add progress" button.	The system creates a new forum on the forum page.	Passed	Almost Success
TC16	The professor chooses and downloads the list of progress files consisting of images and PDFs on the assignment detail page.	The system displays the progress files for the student.	Passed	Success

The remaining testing in the implementation phase is usability testing, which involves 5 students and 5 lecturers responding to a survey form. Below are the results of the survey scores presented in Table 13:

Table 13. Respondent answer results

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	Scores	Total
4	0	4	0	4	0	4	0	4	0	20	50
3	1	1	2	2	1	3	2	2	0	17	42,5
4	1	2	2	4	1	3	1	3	0	21	52,5
4	1	3	1	4	0	4	0	4	0	21	52,5
3	2	1	2	3	1	3	1	3	1	20	50
3	2	3	2	2	1	3	1	3	1	21	52,5
3	1	2	1	3	3	4	0	3	1	21	52,5
4	2	2	2	4	4	2	1	3	1	25	62,5
4	0	3	0	4	3	4	1	3	0	22	55
2	2	2	2	3	1	1	3	1	1	18	45
Average Score										51,5	

Based on the average score collected from the system development, which is 51.5, it indicates that the system falls into the D quality category. D quality, or marginal quality, indicates that the system still needs evaluation in terms of usability or user interface aspects for both students and professors. In the final stage of RAD development, which is deployment or distribution, the monitoring system application is published on the Google Play Store after going through a review process by the Google team. Therefore, this application can be used by both students and lecturers.

4. CONCLUSION

The research results in the development of the monitoring system have successfully implemented a monitoring system that initially involved manual interaction with professors but has now been digitized. Also, the software development implementation using the RAD method worked well, with two iterations of workshops executed, eventually meeting the user's needs.

REFERENCES

- Alda, M. (2023). Pengembangan Aplikasi Penggajian Karyawan Dengan Menggunakan Metode Agile Berbasis Mobile Android. *Komputika : Jurnal Sistem Komputer*, 12(1), 43–51. <https://doi.org/10.34010/komputika.v12i1.8030>

- Apriliya, K., Al Fauzan, M. N. I., & Ma'rifatul Azizah, L. (2023). IMPLEMENTASI DEVOPS PADA PENGEMBANGAN IMPLEMENTASI SISTEM MONITORING PEMBIMBING TUGAS AKHIR BERBASIS ANDROID. *Jurnal Cahaya Mandalika*, 3(3). <https://doi.org/10.36312/jcm.v3i3.1380>
- Budiatiningsih, M., Furkan, L. M., Singandaru, A. B., Hulfa, I., Minanda, H., Rojabi, S. H., Ulya, B. N., Kurniansah, R., Putra, T. H., & Rahman. (2023). PENDAMPINGAN PENYUSUNAN KARYA TULIS ILMIAH MAHASISWA D III PARIWISATA UNRAM. *Jurnal Abdimas Sangkabira*, 4(1), 65–71. <https://doi.org/10.29303/abdimassangkabira.v4i1.845>
- Da'awi, M. M., & Nisa, W. I. (2021). Pengaruh Dukungan Sosial terhadap Tingkat Stres dalam Penyusunan Tugas Akhir Skripsi. *Psikodinamika: Jurnal Literasi Psikologi*, 1(1), 67–75. <https://doi.org/10.36636/psikodinamika.v1i1.556>
- Escudier, M., & Atkins, T. (2019). *A Dictionary of Mechanical Engineering (2 ed.)*. Oxford University Press. <https://doi.org/10.1093/acref/9780198832102.001.0001>
- Hapsari, W., Wibawanto, H., & Sudana, I. M. (2017). Pengembangan Mobile Learning Teknik Digital Bagi Mahasiswa Pendidikan Teknik Elektro. *Journal of Vocational and Career Education*, 2(1), 28–36. <https://doi.org/10.15294/jvce.v2i1.10979>
- Hartato, U., & Aisyah, M. N. (2016). SKRIPSI MAHASISWA PENDIDIKAN AKUNTANSI UNIVERSITAS NEGERI YOGYAKARTA ANGKATAN 2011. 14(1), 64–73. <https://doi.org/10.21831/jpai.v14i1.11368>
- IBM. (2023). *Monitors*. <https://www.ibm.com/docs/en/i/7.1?topic=navigator-monitors>
- Kertamuda, F. E., Risza Idris, H., Sudiarto, T. D., Iin, M., Cempaka, G., Hendrowati, R., Subagio, A., & Nisrinah. (2022). *Panduan penulisan Karya Akhir Revisi Keempat 2022*.
- Mandang, C., Wuisan, D., & Mandagi, J. (2020). Penerapan Metode RAD dalam Merancang Aplikasi Web Proyek PLN UIP Sulbagut. *Jointer - Journal of Informatics Engineering*, 1(02), 49–53. <https://doi.org/10.53682/jointer.v1i02.18>
- Mukri, P. D. H. M. (2020). *Pedoman Penulisan Tugas Akhir Mahasiswa Program Sarjana Universitas Islam Negeri Raden Intan Lampung 2020*.
- Nasrulloh Isnain, Sulaiman, H., & Rahmatika, R. (2021). Pengujian Usability Pada Aplikasi Auto Reply For Messenger Menggunakan SUS. *EXPLORER Journal of Computer Science and Information Technology*, 1(2), 71–80. <https://doi.org/10.47065/explorer.v1i2.97>
- Naz, R., & Khan, M. N. A. (2015). Rapid Applications Development Techniques : A Critical Review. *International Journal of Software Engineering and Its Applications*, 9(11), 163–176. <https://doi.org/10.14257/ijseia.2015.9.11.15>
- Nowicki, K., Kaczmarek, M., & Czarnul, P. (2023). The Idea of a Student Research Project as a Method of Preparing a Student for Professional and Scientific Work. In J. Mikyška, C. de Mulatier, M. Paszynski, V. V Krzhizhanovskaya, J. J. Dongarra, & P. M. A. Sloot (Eds.), *Computational Science -- ICCS 2023* (pp. 691–706). Springer Nature Switzerland.

- Pickering, C., & Byrne, J. (2014). *Higher Education Research & Development The benefits of publishing systematic quantitative literature reviews for PhD candidates and other early-career researchers*. September 2014, 37–41. <https://doi.org/10.1080/07294360.2013.841651>
- Salamah, I., Lindawati, L., & Sitompul, H. Y. (2019). Aplikasi Bimbingan Tugas Akhir Menggunakan Notifikasi Berbasis Android. *Jurnal Media Informatika Budidarma*, 3(3), 232. <https://doi.org/10.30865/mib.v3i3.1216>
- Sekar Puranti, Z., Yuwono, W., & Asmara, R. (2021). Monitoring Proyek Akhir Mahasiswa Berbasis Android Pada Sistem Informasi Manajemen PENS. *Technomedia Journal*, 6(2), 138–151. <https://doi.org/10.33050/tmj.v6i2.1702>
- Statcounter. (2023). *Mobile Operating System Market Share Indonesia*. <https://gs.statcounter.com/os-market-share/mobile/indonesia/#monthly-202206-202306-bar>
- Susilo, B., Kusuma, G. H., Fikri, M. H., & Saputri, R. (2023). RANCANG BANGUN SISTEM INFORMASI KEUANGAN PADA KANTOR LURAH KOTABARU RETEH DENGAN METODE RAPID APPLICATION DEVELOPMENT (RAD). *Jurnal Testing Dan Implementasi Sistem Informasi*, 1(1), 17–28.
- Sutjiadi, R., Rahmawati, T., & Halim, E. (2022). Pengembangan Website Marketplace Binatang Peliharaan dengan Fitur Lelang Menggunakan Metode Rapid Application Development. *Jurnal Sistem Informasi Bisnis*, 02(2021), 152–160. <https://doi.org/10.21456/vol11iss2pp152-160>
- Utami, P. S., Asmaroini, A. P., & Cahyono, H. (2020). Pelatihan Pemanfaatan Program Mendeley Dekstop dalam Pembuatan Citasi Karya Ilmiah bagi Mahasiswa di Kabupaten Ponorogo Perkembangan era revolusi. *Jurnal Pengabdian Masyarakat: Darma Bakti Teuku Umar*, 2(2), 248–256. <https://doi.org/10.35308/baktiku.v2i2.2642>
- Wahid, A. A. (2020). Analisis Metode Waterfall Untuk Pengembangan Sistem Informasi. *Jurnal Ilmu-Ilmu Informatika Dan Manajemen STMIK*, Oktober, 1–5.