

# Administrative Data Automation of Civil Engineering Study Program Using Progressive Web Apps at Riau University

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**Abstrack** - The Department of Civil Engineering, University of Riau has a Final Assignment Administration service. The Final Assignment Administration service procedure currently implemented is still done manually. Starting from the registration data collection for Proposal Seminars, Results Seminars, and Thesis Defence, data processing was carried out using Microsoft Excel. The amount of data that has been processed so that the processing is done too long. Likewise in Microsoft Excel where formula changes often occur so that the data is not readable. Therefore, the Thesis Administration System was built using the Progressive Web Apps (PWA) method. The system built facilitates administrative services in the Civil Engineering Study Program at the University of Riau. The built system can be accessed on various devices, using the add to home screen feature which speeds up installation, and can be accessed offline. Testing of this system uses the Black Box method, which is to prove that the functional system is running properly and correctly. The results of this test are 100% proven with features that run as expected.

**Keywords** - Administration, Data Automation, Progressive Web Apps, Thesis.

## I. INTRODUCTION

The development of information technology in the era of globalization affects aspects of human life, therefore information technology is very important and aims to make it easier for humans to live their lives and daily activities [1]. Information technology is a technology that is used to process data in various ways to produce quality information, namely information that is relevant, accurate and timely, which is used for various purposes and is strategic information for decision making [2][3]. Therefore, technological advances are very useful for everyone, both individuals and groups. Increasing information needs to get proper attention and handling so that the results achieved are as desired [4]. Recent technological developments have also resulted in many conveniences that can be felt, one of which is the ease of making and storing digital documents in text, audio, or video formats [5].

The university in Riau is Riau University which was founded in 1962. Riau University consists of 10 faculties, one of which is the Faculty of Engineering. The Faculty of Engineering consists of 7 majors, one of which is the Civil Engineering department. In the Civil Engineering department, Faculty of Engineering, University of Riau, there is a final project administration service. This service is in the form of Registration, Proposal Seminar, Results Seminar, and Final Project Session. All of them are regulated by the Final Project Administration section of the Civil Engineering study program at Riau University. In addition, the admin also recapitulates the schedule of seminars and student hearings. All of this data input is done one by one in Microsoft Excel or Microsoft Word.

The final project administration service procedures implemented today are still carried out manually. Starting from the data collection for registration for the Proposal Seminar, Results Seminar, and Final Project Session, data processing is carried out, which is still using Microsoft Excel. The amount of data that has been processed so that the processing process is too long. Likewise, in Microsoft Excel, there are frequent changes in formulas so that the data is illegible. In the management of the seminar letter of proposal the Final Project coordinator sends student data in the form of, name, nim, title, supervisor 1 and supervisor 2, examiner 1, examiner 2 and examiner 3, day, date, time and time. Then the admin inputs the data into Microsoft Excel and then the admin creates an invitation letter, event news, and zoom link. Furthermore, the invitation letter is signed by the head of the study program then stamped by the admin, and the admin sends the file to the thesis coordinator.

Furthermore, the Student Results Seminar makes a theory-free letter with conditions, approval for the seminar results from the two supervisors, watching the seminar results 10 times, assistance sheets at least 8 times, transcripts grades, toefl certificates, already Practical Work, already KKN, a maximum D score of 14 credits, no E grade (may E if the elective course is more than five). Students fill out google form and then will be checked by an admin, and the admin sends it back to the student. To make a list of seminars, students send their data in the form of, name, nim, title, supervisor 1 and supervisor 2, examiner 1, examiner 2, and examiner 3, day, date, time and time. Furthermore, the trial also made a theory-free letter.

From the existing management process, there are shortcomings, namely in the minutes the admin must create a separate file in the form of Microsoft Word, then in the minutes of the trial that require the grades and signatures of lecturers there are obstacles where students find it difficult to get signatures. So to overcome the above problems, a Thesis Administration system is needed in the Civil Engineering department of Riau University. This Administration System is a system that is useful for making it easier for admins of Final Project Administration services in the process of processing data related to the management of final project administration services and being able to process data quickly and accurately. The Final Project Administration System that will be built is by using the Progressive Web Apps (PWA) method.

At this time it is developing very rapidly, one of the technologies used in this study is Progressive Web Apps Web Apps Technology developed by Google [6]. Progressive Web Apps (PWA) Web applications that load like web pages but can offer user functionality that can work offline, notifications, and hardware access [7]. PWA has the characteristics of being reliable fast and attractive [8]. PWA is designed with the concept of a single application for all platforms both android iOS and windows. PWA is reliable fast and attractive, offering instant loading and even offline push notifications [9][10].

According Richard & LePage (2018) [11] Progressive Web Application (PWA) is a Web application that uses several modern technologies, making user experiences such as using Native App is an application that can run offline, send push notifications, load quickly, and can be opened via the home screen. In order for PWA to run offline, add icons on the home screen and perform push notifications, PWA utilizes Service Worker technology [12] [13].

Based on previous research conducted by Noer Hikmah [14], using the Progressive Web Application (PWA) method on server and local data storage of computers or smartphones, the process of forming puns becomes more due to the larger amount of storage. By creating an application where there is a feature, direct search using speech recognition the process of forming puns will be carried out in real time. By giving the conditions when creating the application program, the process of forming a pun will provide the right accuracy to be accepted as a condition of punning.

Furthermore, the research conducted by A. Faisol dan S. Noertjahjono [15] , by implementing the Progressive Web Application (PWA) system, residents do not need to have

difficulty installing applications, just visit the village service site and will get a notification to add applications on the device.

Based on the background problems above, the author conducted a Final Project research entitled Automation of Administrative Data for the S1 Civil Engineering Study Program Using Progressive Web Apps (PWA) at Riau University.

## II. SIGNIFICANCE OF THE STUDY

### A. *Study of literature*

Progressive Web App (PWA) is a website built using modern web technology, but can act like a Mobile App. In 2015, Google Engineers Alex Russel and Frances Berimann coined the term PWA for the concept of web apps that can provide a user experience in terms of reliability, speed, and user engagement.

PWA states that "Progressive Web Apps are a website technology built using modern web technology, but can act like a mobile app". PWA is the concept of implementing website creation that applies service worker technology, web manifest, and API cache. By building applications using the PWA concept, web applications will run on various platforms such as websites, desktops, and mobile or Android platforms.

PWA is a trend that shows where web development is growing. Therefore, it is important to become familiar with this technology and take the time to learn about it. PWA is the intersection between web interaction and mobile application user experience [16]. Some of the features that you will find in PWA are as follows:

1. Progressive: runs well for all users, regardless of the browser used, because it is built with progressive enhancement of a core application.
2. Responsive: renders well on all devices of all sizes: desktop, tablet, mobile, and whatever new device is next.
3. Connectivity independent: with service workers the application can work in offline or weak network conditions.
4. App-like: feels like an application, because of the app shell model that separates the functionality of the application from its content.
5. Fresh: always up to date thanks to updates through service workers.
6. Safe: the application is served via HTTPS to prevent snooping and ensure content is not modified.
7. Discoverable: can be identified as "application" because of the W3C manifest and service worker registration scope, and allows search engines to find it.
8. Re-engageable: makes it easier to invite users to reuse applications through features such as push notifications.
9. Installable: allows users to add applications to the homescreen without having to bother with the app store.
10. Linkable: can easily share the application by sharing the URL, and does not require complicated installation

### B. *Research material*

This study uses interview data and observation results as research material. Interviews and observations were conducted with informants from the Department of Civil Engineering, Faculty of Engineering, University of Riau.

C. *Research methods*

At this stage are the stages carried out by the author in designing and building the Civil Engineering Final Project Administration system at the University of Riau. The details of the research methodology can be seen in Figure 1.

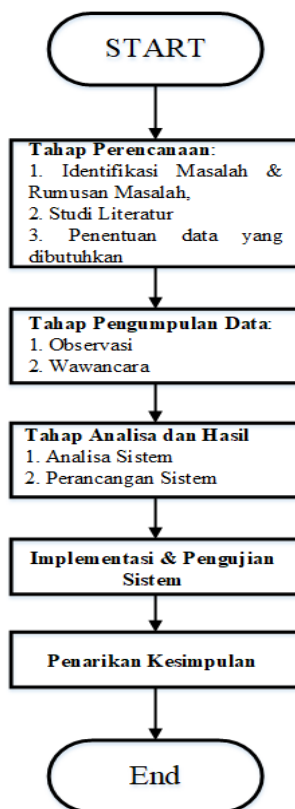


Figure 1. Research Method

Figure 1 describes the details of the author's stages in building the system, namely starting with carrying out the planning stage containing the author's steps in identifying problems in the field then making problem formulations to simplify the topics studied in accordance with the case studies done by the author. Furthermore, the author conducts literature studies from various journals and books to be able to obtain supporting information for writing reports related to the topics / issues raised. Then the authors conducted observations and interviews by going directly to the field to collect data for processing the required data. After that, an analysis was carried out and the results were in the form of system analysis and system design using the analytical method used in this study, namely OOA (object oriented analysis), namely by making a description of the system that is currently running and in system design, the OOD (object oriented design) method is used to make UML diagrams namely use case diagrams, activity diagrams and class diagrams. The next stage is the implementation and testing of the system using the Black Box method for testing system functionality, from these results it can be concluded that the research has been carried out by the author.

**III. RESULTS AND DISCUSSION**

This chapter consists of an analysis of the ongoing system and an analysis of the proposed system, namely in the form of an analysis of functional needs (Use Case Diagrams, class diagrams) and non-functional needs.

A. *Analysis of The Current System*

Analisis sistem yang sedang berjalan merupakan tahapan yang dilakukan sebelum memberikan usulan sistem, analisis ini adalah untuk mengidentifikasi dan mengevaluasi permasalahan dan hambatan yang akan dipecahkan sehingga dapat diusulkan perbaikan. Pada proses Tugas Akhir diprogram studi Teknik Sipil UNRI terdapat beberapa tahapan yaitu:

1. *Final Assignment Registration Flow*

Prior to offering a system proposal, ongoing system analysis is a stage that is completed. The goal of this analysis is to recognize and assess issues and challenges that must be overcome so that improvements can be suggested. There are numerous steps in the thesis procedure for the Civil Engineering study program at Riau University, including:

- 1) Students sign up for the Study Program through the Thesis Coordinator by registering through google classroom, Thesis with class code 2t2skhx, which is also accessible via a link at <https://classroom.google.com/c/NDk4MDEzNDUwMlpa?cjc=2t2skhx>, and uploading proof that the thesis requirements are met in the following format:
  - a. Draft proposal/outline
  - b. KRS for the current semester (can be completed if the proposal seminar is going to be held)
  - c. Proof of having been or is currently working on practical work
  - d. Transcripts of the latest grades
- 2) Have completed at least 75 credits (excluding KKN, Practical Work, and Thesis.
- 3) If the requirements are complete, then the thesis outline will be reviewed by the field chairman if approved, then the student provides proposal guidance to the supervisor obtained, otherwise the thesis outline is repaired again.
- 4) Furthermore, for students who have been approved for the draft proposal, they will provide proposal guidance to be able to proceed to the next stage, namely the proposal seminar. If the proposal has been accepted and approved by the supervisor to conduct a proposal seminar, the student registers for the proposal seminar.
- 5) The study program issues a proposal seminar schedule
- 6) Students conduct proposal seminars

The following is the registration flow and seminar for the Final Project proposal, which can be seen in Figure 2.

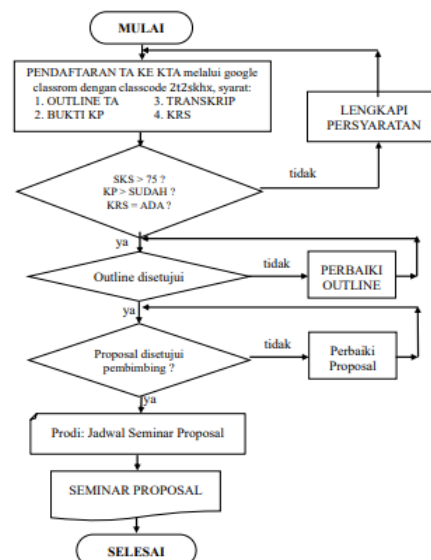


Figure 2. Thesis Registration Flow

2. *Thesis Results Seminar Registration Flow*

Students apply to the Study Program to carry out a results seminar with the following requirements below, provided that:

- 1) Preparing the requirements for a theoretical free letter, if it meets the requirements, the Study Program will issue a theoretical free letter which is a condition that the student can already carry out a result seminar.
- 2) Students will coordinate with supervisors and examining lecturers to set the date for the implementation of the results seminar.
- 3) Furthermore, students can conduct a results seminar and ask for an invitation letter for the result seminar to the study program admin.
- 4) Make revisions to the examiner and supervisor to be able to proceed to the final stage, namely the Final Project session.

The following is the registration flow for the seminar results of the Final Project which can be seen in Figure 3.

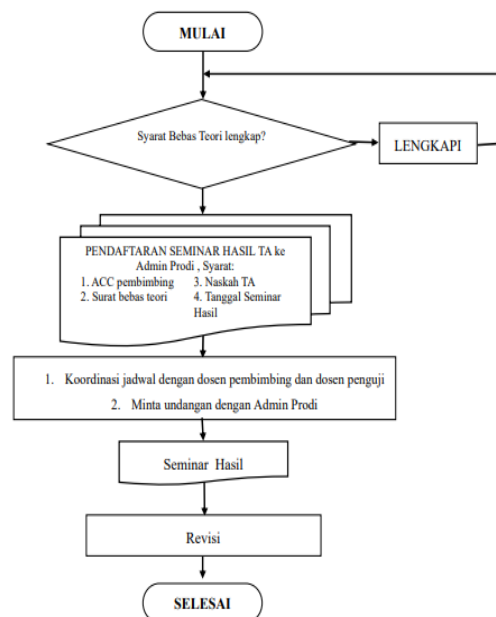


Figure 3. Thesis Results Seminar Registration Flow

3. *Thesis Defence Registration Flow*

The final steps that students must take for the Thesis Defence are:

- 1) Students have completed the revision of the seminar on the results of the Final Project, and have been acc supervisor for improvement continued to the final stage, namely the Thesis Defence.
- 2) Prepare evidence of free theory and transcripts, if it is finished, students must prepare 5 copies of TA manuscripts.
- 3) If the requirements are complete, then students can carry out the Final Project session and ask for an invitation letter to the study program.
- 4) Finally, students conduct a Thesis Defence.

The following is the registration flow for the Thesis Defence which can be seen in Figure 4.

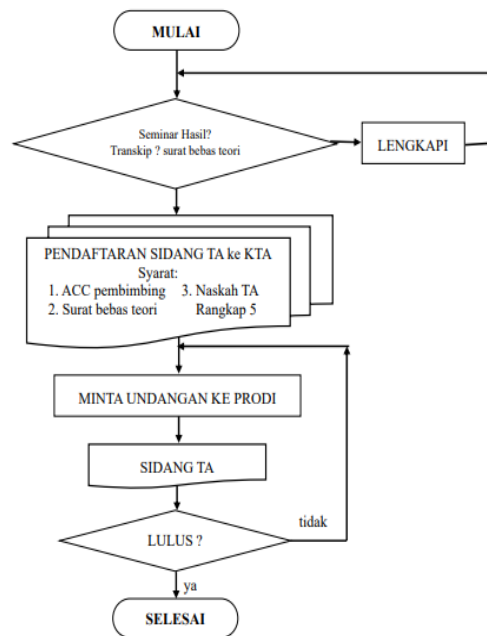


Figure 4. Thesis Defence Registration Flow

*B. Proposed System Analysis*

In the analysis, information system design will be carried out using an object-oriented approach using UML (Unified Modeling Language) tools. The UML diagram used is as follows:

*1. Use Case Diagram*

Use Case diagrams are stages for visualizing, specifying, and documenting system behavior needs. Here is the Use Case Diagram that can be seen in Figure 5.

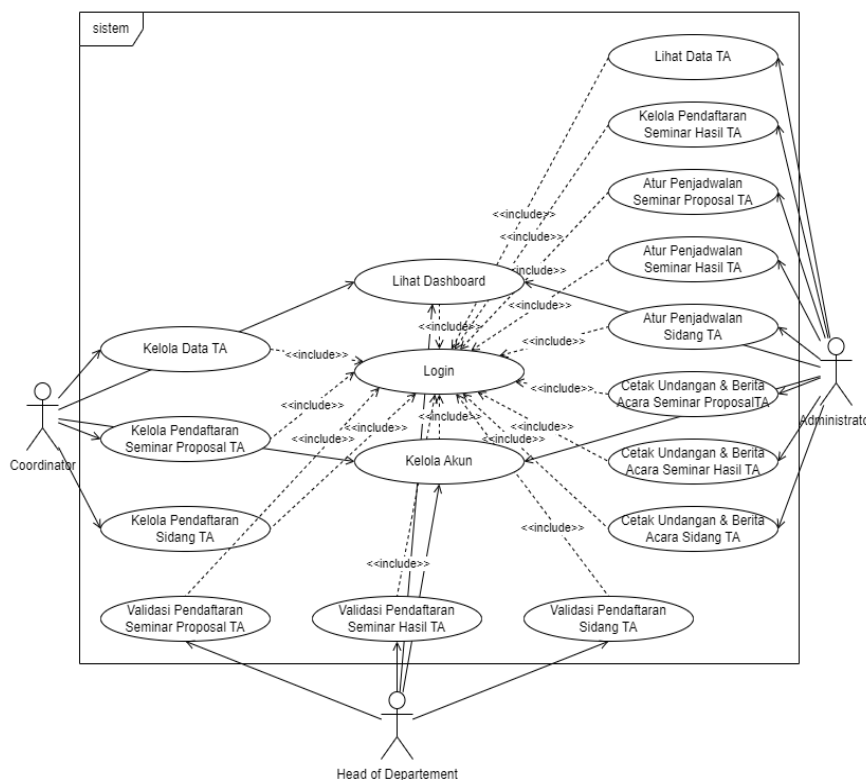


Figure 5. Use Case Diagram Proposal System

In the Use Case Diagram picture above, it can be seen that there are 3 actors, namely coordinator, administrator, and head of department. Each user to be able to enter the dashboard to log in first and can perform its functions. The coordinator performs the functions of managing TA data, registering for proposal seminars, registering for TA sessions, and managing accounts. The administrator performs the functions of viewing data, managing accounts, managing registration of thesis seminar results, arranging scheduling of thesis proposal seminars, thesis result seminars, and thesis defence, printing invitations and minutes. The head of department performs functions, manages the validation account of thesis proposal seminars, thesis result seminars, and thesis defence hearings.

2. *Class Diagram*

The class diagram of the proposed system in this study can be seen in Figure 6.

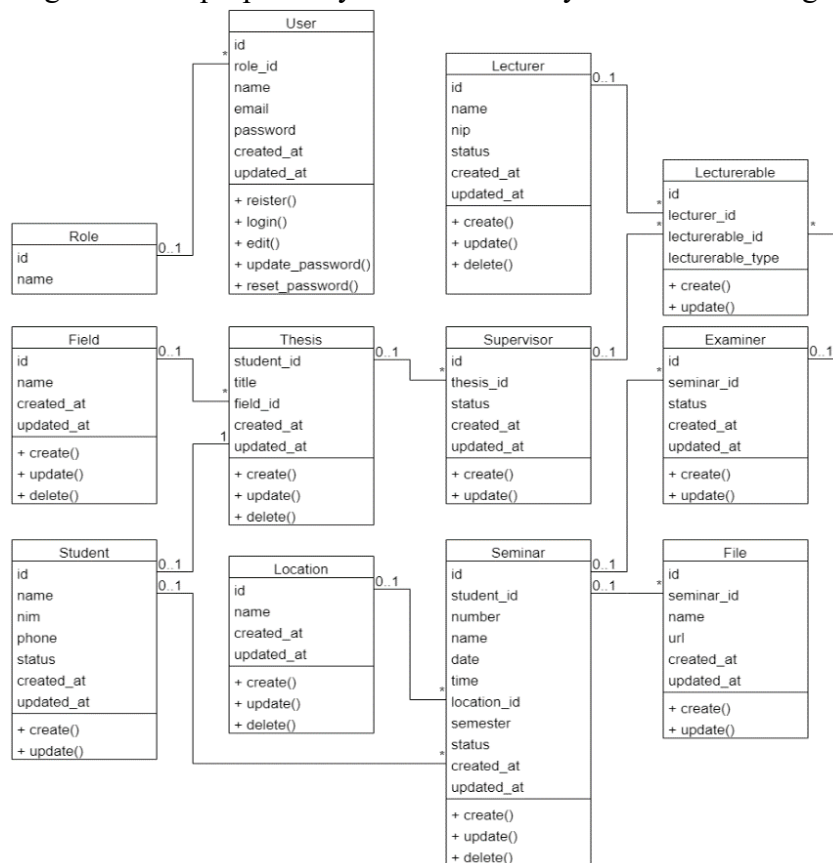


Figure 6. *Class Diagram*

In order for a system to be created and implemented by design, it requires hardware, software, and users.

1. *Hardware Needs (Hardware)*

The specifications required by the system are:

TABLE I.  
HARDWARE NEEDS

Hardware	Recommendation (Minimum)
<i>Processor</i>	Intel Pentium
<i>Memory</i>	RAM 2GB DDR 2
<i>Harddisk</i>	80GB

2. *Software Needs (Software)*

The specifications required by the system are:



TABLE II.  
SOFTWARE NEEDS

Software	Recommendation (Minimum)
Operating system	Windows 10
Programming language	PHP 7.4, JavaScript
Database	MySQL 5.7
Tools	Laragon, Chrome, Visual Studio Code

3. Brainware Needs (Brainware)

The needs of the user are the people who will be involved in this system, including:

TABLE III.  
BRAINWARE NEEDS

Actor	User
<i>Coordinator</i>	Final Assignment Coordinator
<i>Head of Department</i>	head of the study program
<i>Administrator</i>	Study Program Admin

C. System Implementation

System implementation is a stage of changing a previously designed system into a system that can be run. The following is the implementation of the system:

1. Add To Home Screen

The PWA Add to Home Screen feature, or often called the web app install prompt, makes it easy for users to install Progressive Web App on all devices.

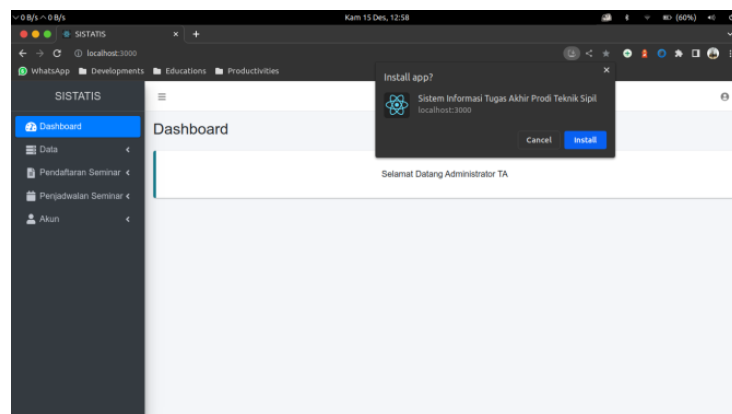


Figure 6. Add To Home Screen

2. Add Page End Assignment

This page view contains a thesis registration form maintained by the TA coordinator.

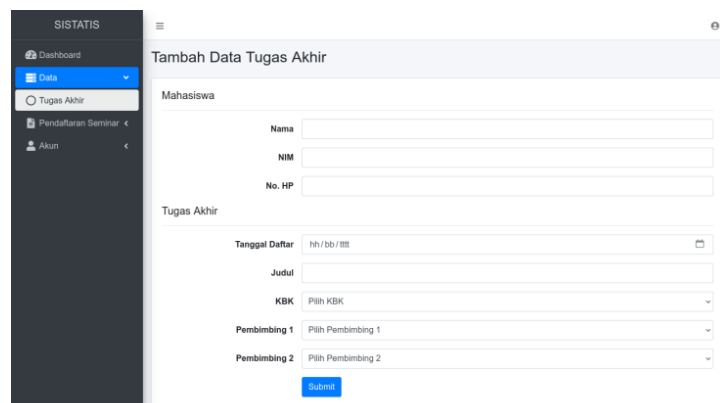


Figure 7. Page Add Final Project

3. TA Page Proposal Seminar Registration

This page display contains a thesis proposal seminar registration form managed by the TA coordinator.

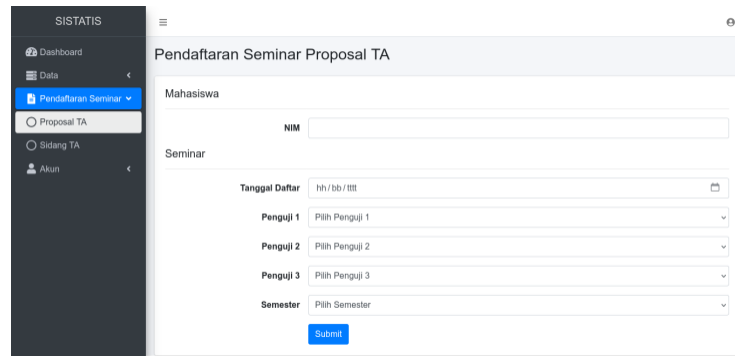


Figure 8. Page Add Registration Seminar Proposal TA

4. See Scheduling Seminar Proposals TA Page

This page display contains information about the registration of the thesis proposal seminar and the thesis proposal seminar scheduling form managed by the study program admin.

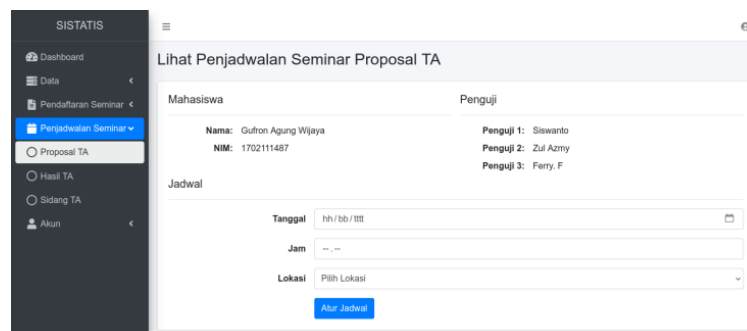


Figure 9. View Page Seminar Schedule for TA Proposals

5. See Seminar Proposal Validation TA Page

This page display contains information about the registration of the thesis proposal seminar which will be validated by the head of the department.

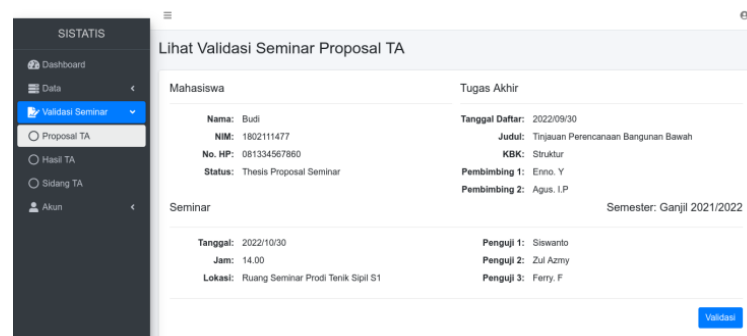


Figure 10. Page View Validation of TA Seminar Proposal Registration

6. See Seminar Proposal Data TA Page

This page display contains information about the thesis proposal seminar that will be printed on event news and invitations by the study program admin.

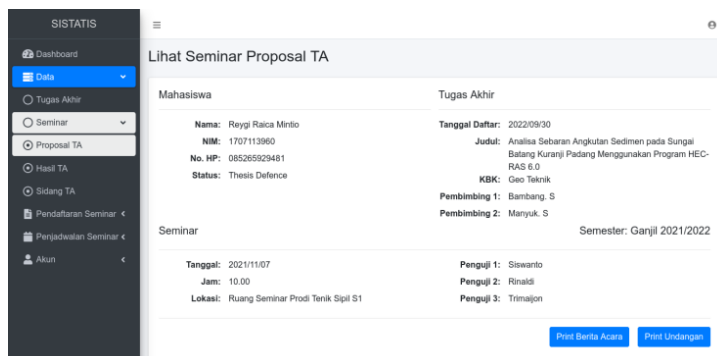


Figure 11. Page View Data Seminar Proposal TA

The advantages of the thesis information system of the civil engineering study program using this PWA are as follows:

1. The system can be accessed on all devices
2. Quick Installation, which is by using the add to home screen feature users can add or install the application or website.
3. Can be accessed with an unstable or offline connection. With PWA, all data already viewed will be cached. Those visitors can still see some previously accessed data.

*D. Testing*

In this study, system functionality testing will be carried out using black box testing.

TABLE IV.  
BLACK BOX TESTING RESULTS

No	Test Class	Testing Description	Expected Results	Result
1	Login	Email: admin.sistatis@gmail.com Password: adminsis1	The system displays a dashboard page	Valid
2	Tambah Data Tugas Akhir	Nama: Ade Hasmy AH NIM: 9411945 No. HP: 082234567890 Tanggal Daftar: 2022/09/30 Judul: Tinjauan Perencanaan Bangunan Bawah KBK: Struktur Pembimbing 1: Enno. Y Pembimbing 2: Agus. I. P	The system displays the final project data page and a notification of successfully added data.	Valid
3	Edit Data Tugas Akhir	Nama: Ade Hasmy NIM: 94119451 No. HP: 082234568769 Tanggal Daftar: 2022/09/29 Judul: Tinjauan Perencanaan Bangunan KBK: Struktur Pembimbing 1: Enno. Y Pembimbing 2: Agus. I. P	The system displays a thesis data page and a data notification is successfully updated	Valid
4	Hapus Data Tugas Akhir	Klik button Hapus	The system displays a thesis data page and the data notification is successfully deleted	Valid
5	Tambah Pendaftaran Seminar Proposal TA	NIM: 9411945 Penguji 1: Siswanto Penguji 2: Ferry. F Semester: Ganjil 2022/2023	The system displays a thesis proposal seminar registration page and data notifications are successfully added	Valid
6	Edit Pendaftaran Seminar Proposal TA	NIM: 94119451 Penguji 1: Ferry. F Penguji 2: Siswanto Semester: Ganjil 2021/2022	The system displays the thesis proposal seminar registration page and the data notification is successfully updated.	Valid

No	Test Class	Testing Description	Expected Results	Result
7	Hapus Pendaftaran Seminar Proposal	Klik button Hapus	The system displays the thesis proposal seminar registration page and the data notification is successfully deleted.	Valid
8	Atur Penjadwalan Seminar Proposal TA	Tanggal: 2022/10/30 Jam: 14.00 Lokasi: Ruang Seminar Prodi Teknik Sipil S1	The system displays a thesis proposal seminar scheduling page and data notifications are successfully set up	Valid
9	Validasi Pendaftaran Seminar Proposal TA	Klik button Validasi	The system displays the validation page for the thesis proposal seminar registration and notification of successfully validated data	Valid
10	Print Berita Acara Seminar Proposal TA	Klik button Print Berita Acara	The system displays a pdf preview of the official report to be printed.	Valid
11	Print Undangan Seminar Proposal TA	Klik button Print Undangan	The system displays a pdf preview of the invitation to be printed.	Valid
12	Profil	Email: admin.sistatis@gmail.com Nama: Admin Prodi	The system displays a notification of the profile being successfully updated.	Valid
13	Update Password	Current Password: Adminsis1 New Password: Admin290765 Confirm Password: Admin290765	The system displays a notification of the password being updated successfully	Valid

#### IV. CONCLUSION

The Final Assignment Administration System which was built using the PWA method facilitates final assignment administration services in Civil Engineering study program, University of Riau. The advantages of the civil engineering study program final project information system using PWA are, first, the system can be accessed on various devices. Second, fast installation, namely by using the add to home screen feature, users can add or install the application or website. Third, it can be accessed with an unstable or offline connection. With PWA, all data that has been viewed will be cached. The visitor can still see some of the previously accessed data. Testing of this system uses the Black Box method, which is to prove that the functional system is running properly and correctly. The results of this test are 100% proven with features that run as expected. Suggestions that can be given are that this system can be further developed by adding student users, so that the final assignment administration process can be more effective and efficient.

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