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Development of Past Learning Recognition Assessment Data Processing System for Professional Engineer Program Using Scrum Method

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Abstract: The University of Lampung is one of the universities mandated to run the Professional Engineer Program (PPI) through the Past Learning Recognition (RPL) pathway. Individuals following this RPL path must have at least five years of experience in the engineering field, where their education, work, and training data from formal and informal institutions can be converted into six courses totaling 24 credits. The RPL data assessment process, if conducted manually, takes a long time and hampers the administrative process in PPI. Therefore, an effective and efficient assessment process is automated through a web-based application by developing an RPL data final grade processing system (E-RAPEL), which addresses common problems in PPI and facilitates grade administration. The system development adopts the Scrum method to enhance product performance, teamwork, and the work environment. Data collection in this study was conducted through interviews and direct observation, and the results indicate that the system facilitates the final assessment process of RPL data using black box testing. The findings show that all test components functioned as expected and reduced the time required for the RPL data final assessment process in PPI.

Index Terms: Web Application; Lifelong Learning Recognition; Engineering; Scrum; Assessment

1. Introduction

Engineering is an activity of using science and technology to advance civilization and improve the welfare of humanity as mandated in the 1945 Constitution of the Republic of Indonesia, which is contained in Law No. 11 of 2014 concerning engineering[1–4]. This law states that every engineer practicing engineering in Indonesia must have an Engineer Registration Certificate (STRI)[5]. To obtain the STRI, an engineer must follow the Professional Engineer Program to obtain Professional Engineer certification through a Higher Education Institution that has a mandate from the Ministry of Education, Culture, Research, and Technology[6]. The University of Lampung is one of 40 universities that have the mandate to open a Professional Engineer Program at the University of Lampung and is accompanied by a decision of the Director General of Institutional Science and Higher Education regarding guidelines for implementing the Professional Engineer Program Study Program to become the basis for implementing activities in the Professional Engineer Study Program. Since the operating license was granted in 2018, PS-PPI University of Lampung (Unila) has graduated more than 800 engineers. In its implementation, PS PPI Unila currently organizes the Recognition of Past Learning (RPL) learning program as regulated in Permenristekdikti No. 35 of 2016, which is presently replaced by Permendikbudristek No. 39 of 2022 with a total of 24 credits[7–9]. The RPL program is a process of recognizing a person's experience in the form of engineering experience, informal education, and engineering activities in the formal education sector based on the learning outcomes of PSPPI Unila[10–12]. The main requirement for completing the Engineer profession program through the RPL pathway at the University of Lampung is required to compile an RPL document in accordance with a predetermined format and will later be converted into six courses in PSPPI.

Currently, the final assessment of the RPL Document is still converted manually using number processing software or filled in on the sheet provided. Several problems arise with this condition, including not being efficient and effective because Lecturers need help reopening and searching for student data files one by one; most likely, the data can be lost or deleted so that it is not well documented. In previous research, the RPL data parser interface design was designed as an initial change so that these problems could be overcome. However, the design that has been designed still needs to improve, especially in Admin mobility, server management, and features that are still minimal and need to meet the standards set by PSPPI. Therefore, development is carried out on software designed with the scrum method, which can overcome product complexity with a flexible and adaptable team[13–19]. For this reason, research was conducted titled "Scrum Implementation on the Development of the RPL Data Value Processing System for the Professional Engineer Program (E-RAPEL)."

The uniqueness of the system developed in this study lies in the application of the Scrum methodology for processing Past Learning Recognition (RPL) assessment data, which has not been widely implemented in professional engineering programs. This system automates the assessment process, improving efficiency and accuracy in academic administration. By adopting a Scrum-based approach, the system can adapt to user needs and facilitate better monitoring and documentation of assessment results. Compared to manual methods, this approach enables faster, more transparent, and more integrated data processing within an academic environment, thereby enhancing the user experience in managing RPL information. The main objective of this research is to build a value processing system from the admin side that can input and display student data, document assessment for monitoring the implementation of professional exams, and from the user side, be able to input and store data on the results of the RPL document assessment, print the minutes, and perform related tasks. Another objective is to develop the interface design that has been created into an integrated application from both the backend and frontend sides to ensure seamless functionality. Additionally, this research aims to develop the existing design with the addition of key features that support the processing of document results assessment, improving the system's overall performance and usability. Lastly, the research seeks to achieve the release of software for the RPL data value processing system, ensuring that the final product is functional, efficient, and ready for implementation.

2. Methodology

Identification of the causes of problems in the development of software RPL data value management system for the Professional Program in detail is described in the following fishbone (see Fig. 1).

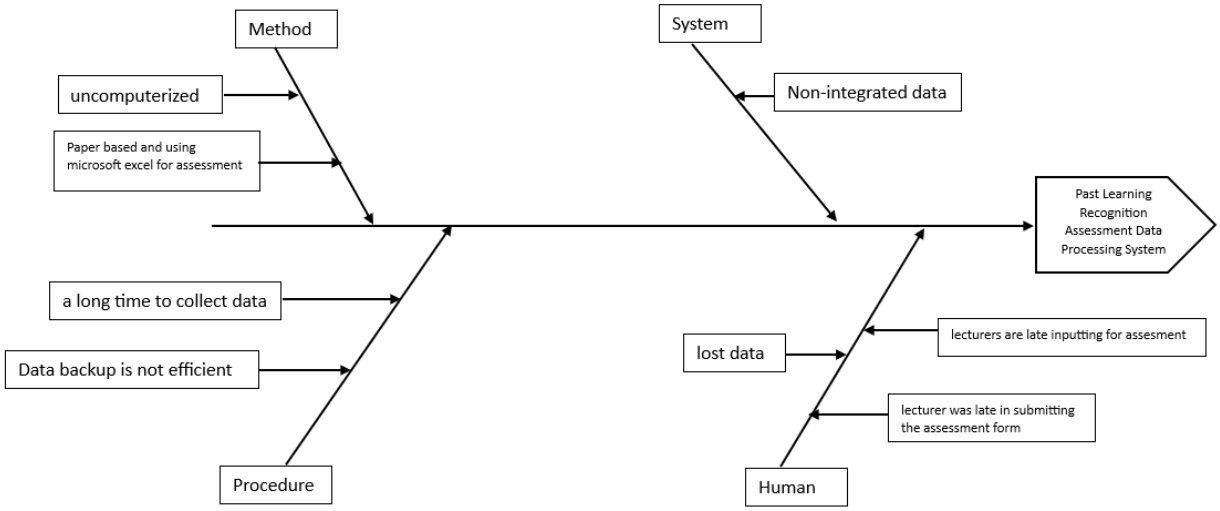

Fig. 1. Fishbone Research

From identifying the causes of the problem, software development is carried out on the RPL data value processing system for professional programs using the Scrum method[20–22]. The system can be accessed via a web browser and performs a query to request data through the web server so that the system can be displayed. Every incoming data is stored on the database server as shown on Fig. 2.

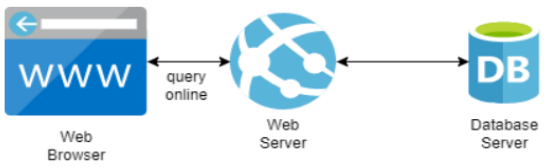

Fig. 2. Information Data Flow

To be able to implement the existing system in PPI, software development is carried out using the scrum method, which consists of User Stories, Product Backlog, Sprint Backlog, and Daily Meetings, and results are shown in Fig. 3.

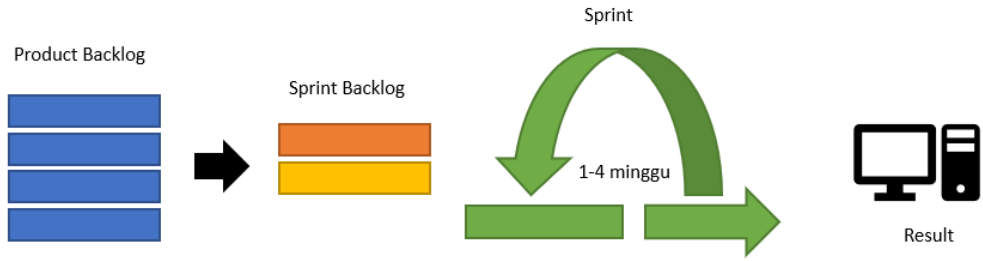

Fig. 3. Scrum Method

1. User Stories

The initial stage contains the features, material, purpose, and function of the features to create a product backlog obtained from the product owner. The user, in this case, is the product owner. The product owner wants a system that can facilitate the processing of documented RPL data values effectively and efficiently. At this stage, an overview of the desired business processes in value processing is given and minimizes the implementation of processes that are still carried out manually.

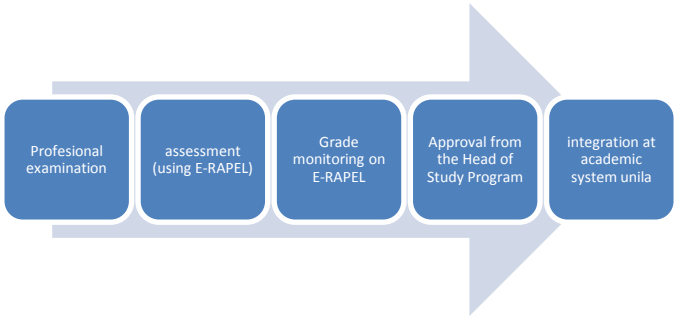

Fig. 4. Proposed Flow

During the initial coordination with the Product Owner, the results conveyed the need for further development of value processing and management of access rights from system users, including:

a. Admin is responsible for monitoring, updating the system, adding student data, courses, and maintaining the system.
b. Users are responsible for inputting student assessment data by choosing a role as an examiner or supervisor, users can view all final grades that have been inputted and view and print minutes. Users can enter through the username and password that have been determined by the admin.

2. Product backlog

The product backlog was conducted directly with the product owner and users in the research to determine the features developed according to user needs[23–25]. As shown in Table 1, as the sprint progresses, there may be some additional features added to this system.

Table 1. Product Backlog

No.	Feature Description	Priority
1	Login Feature	Very High
2	Dashboard page	High
3	Display the list of students	High
4	Assessment Form	Very High
5	Overview of inputted values	Very High
6	Display a list of student grades	High
7	Display the list of MK grades	High
8	Printing the minutes of the Assessment	Very high

3. Sprint Backlog

The identification and analysis process on the product backlog then created a sprint backlog containing a detailed list and time requirements for each of these details[17], [26–29]. Table 2 describes the sprint backlog.

Table 2. Sprint Backlog

Backlog Item	Task	Owner	Estimation
Analysis & Design Stages	Problem Analysis	Analyst	2
	Functional and Non-functional system requirements	Analyst	2
Sprint 1			
	E-RAPEL Database Design	Programmer	4
	System Wireframe Design	Programmer	4
	Backend Design and Integration of Frontend and backend	Programmer	7
Sprint 2			
	System Implementation	Administrator	4
	Software Testing	Administrator	3
	Release	Administrator	3

4. Scrum Meeting

Meetings are held with team members to discuss progress in the data processing system for the Recognition of Prior Learning assessment, which is allocated for 15 minutes each. This meeting is held to share information on achieving sprint goals guided by the scrum master in providing direction.

3. Result and Discussion

3.1 Product Development

The development of the Past Learning Recognition Value (E-RAPEL) data management system facilitates assessment based on practical experience, which demands an objective, easy, and precise assessment system[30, 31]. The development of RPL assessment model and system is a website-based system that contains activity assessment columns related to courses at PSPPI. Each entry in the RPL report is converted to a course based on the substance that fulfills the course's learning outcomes. So, this research needs to be done to be able to realize the RPL Assessment System.

3.1.1. Use case diagram.

The development of this system is modeled visually in describing the relationship between the system and the actors involved. The following use case diagram modeling is Fig. 5.

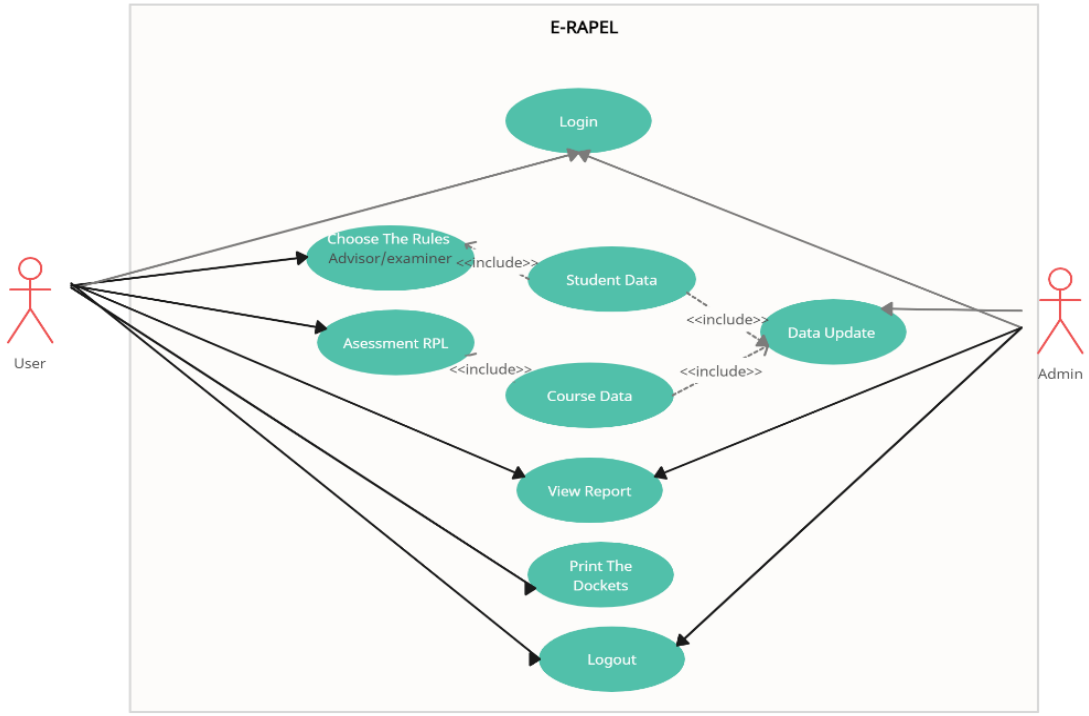

Fig. 5. Use Case Diagram

Based on the use case above, two actors play a role in this system, including the admin and the user. Admins can log in to further update student and course data and view reports on all student assessments that have been inputted. Meanwhile, users can log in and select rules as supervisor or examiners to create an assessment on the RPL assessment menu, marked by filling out the assessment form. In addition, the user can also see all the scores that have been inputted and print the exam minutes. After the admin and user perform their tasks, they can exit the system by pressing the logout button on the system.

3.1.2. Activity Diagram

The following is an overview of the concept of data flow (activities) of the E-RAPEL system including the following:

a. Fig. 6 explains the flow to enter the system, where users and admins are asked to input the username and password that has been given. If successful, the system will authenticate and move to the Home / Main page, if there is an input error found, an error message appears.

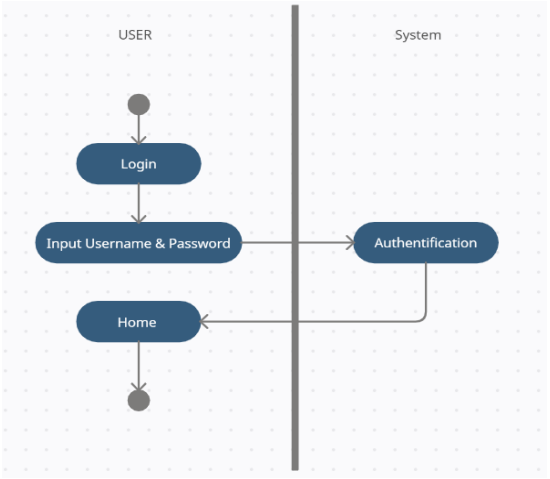

Fig. 6. Login Activity Diagram

b. Fig. 7 explains the flow to input an assessment where previously, the user chose the rules as a supervisor or examiner. After making an assessment and ensuring that all fields on the form are filled in, the user can submit the assessment.

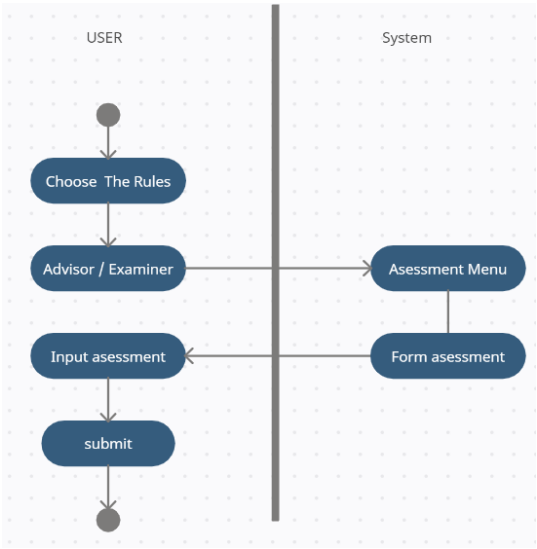

Fig. 7. Activity Diagram of RPL Assessment

c. Fig. 8 explains the flow of the menu reporting all student score data that has been input consisting of 6 converted courses, and then the user can print the exam minutes.

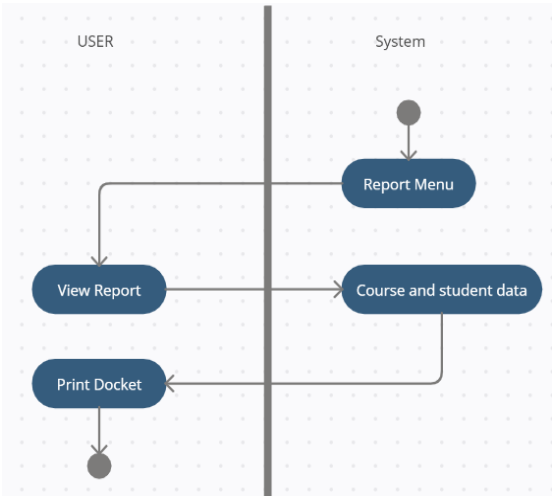

Fig. 8. Activity Diagram of Report and Minutes

3.1.3. Entity Relationship Diagram (ERD)

Fig. 9 explains the ERD on the past learning recognition assessment data management system developed with eight entities: master user, master student, mentor, master module, sub-course, classification, sub-sub-course, and sub-sub-course classification. Each entity has several attributes and one primary key.

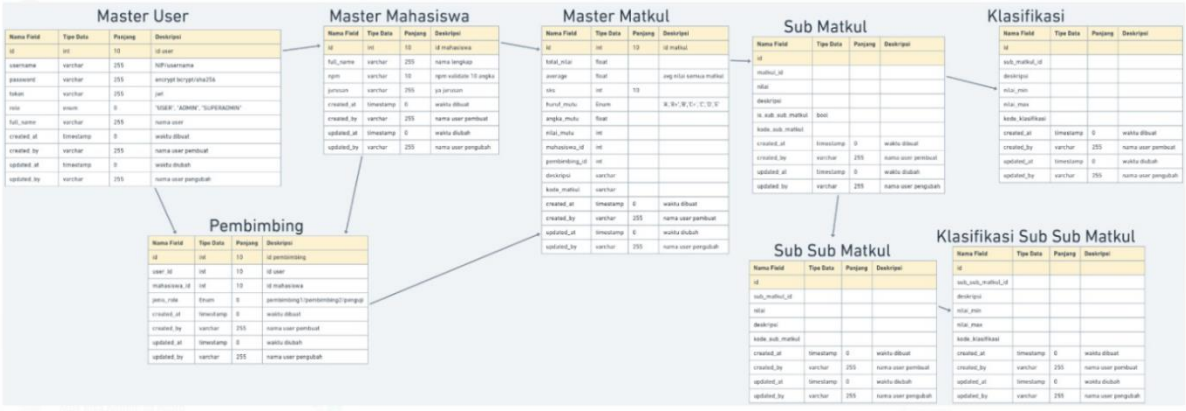

Fig. 9. ERD

3.2 User Interface

Fig. 10 shows the login display on E-RAPEL, which functions to enter the system by entering the username and password that have been given.

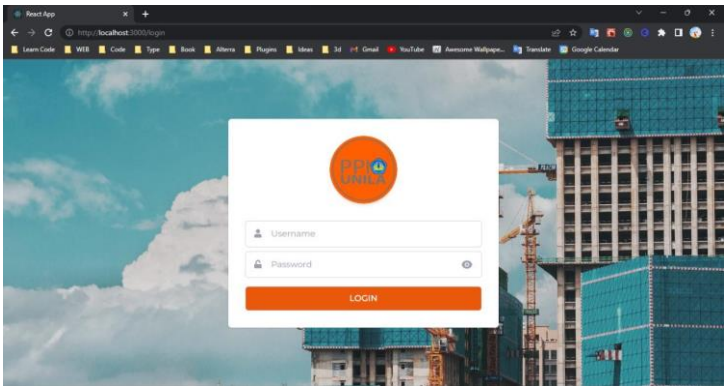

Fig. 10. Login View

Fig. 11 shows the system dashboard display after the user logs in and selects the name of the student being assessed. Users will select students who are assessed based on supervisors or examiners contained in the system. To create an assessment, the user can press the edit button on the right, marked in blue. If the value has been inputted, the edit mark will change to a delete mark.

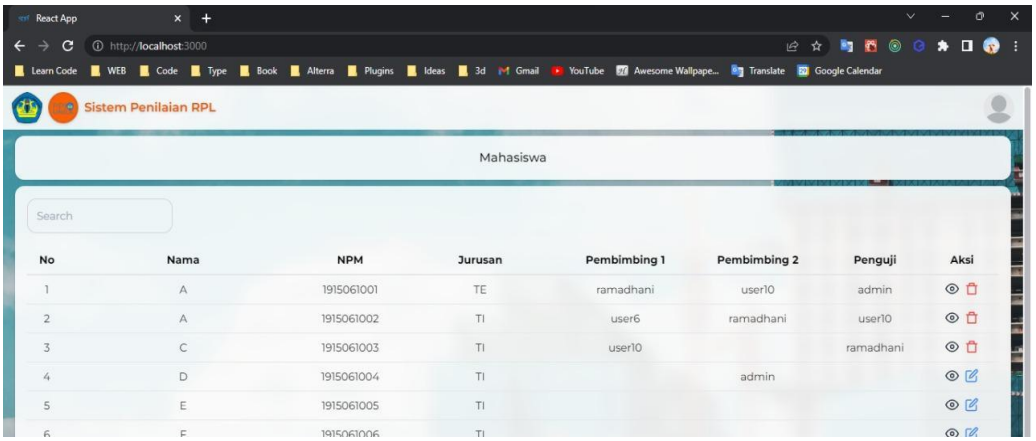

Fig. 11. Dashboard view

Fig. 12 shows the appearance of the assessment menu after the user selects the name of the student being assessed and selects the rule as a supervisor or examiner. After inputting the entire value, the user is directed to the submit button at the bottom.

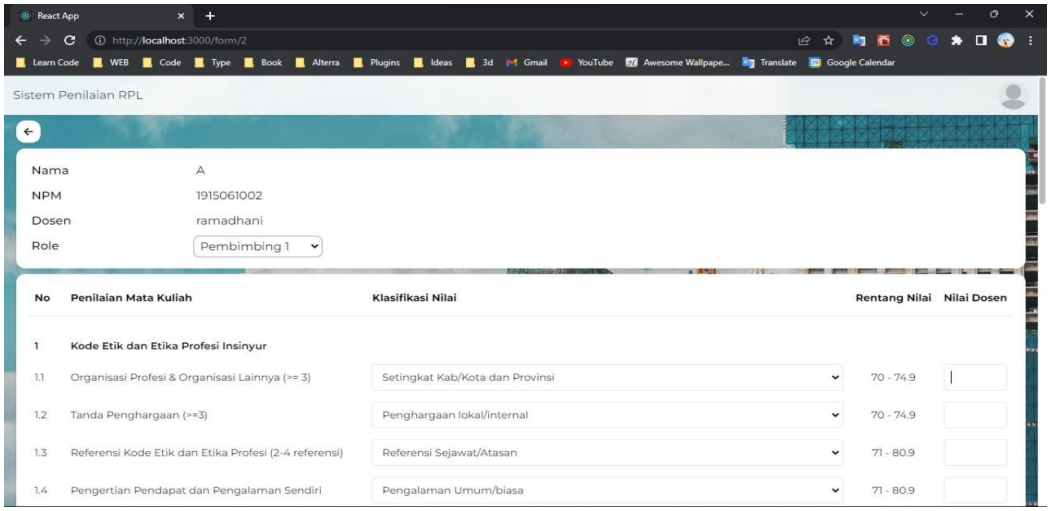

Fig. 12. Assessment Menu Display

Fig. 13 shows the grades that have been inputted for both supervisor 1, supervisor 2, and examiners. The final score can be displayed if all users have completed the assessment data.

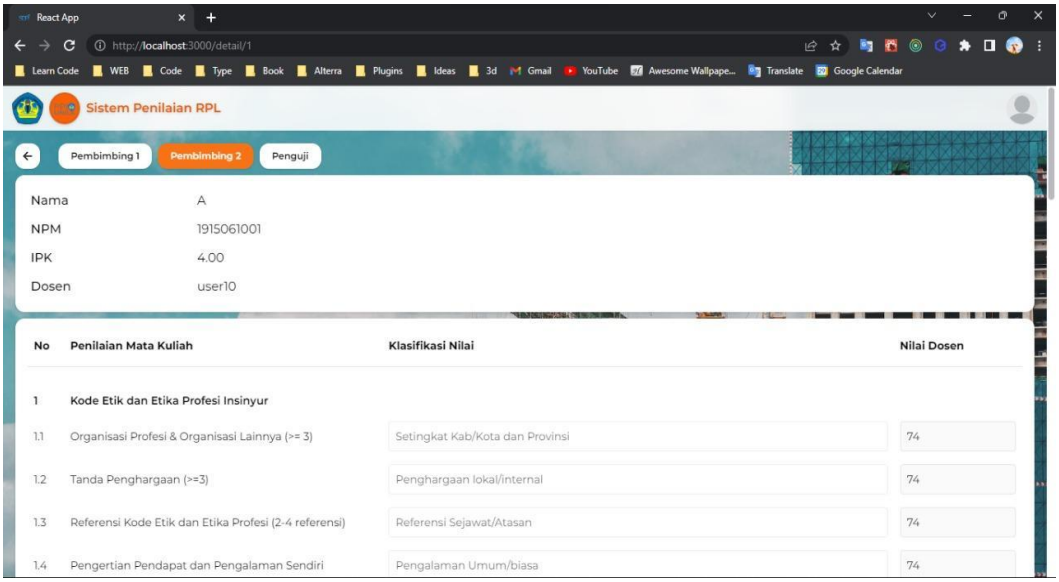

Fig. 13. Display of input values

3.3 Testing Activity

Testing on this RPL document assessment system uses black box testing[32–34]. Black box testing or it can also be called Behavioral Testing, is a test conducted to observe the input and output results of the software without knowing the code structure of the software. This test is carried out at the end of making software to find out whether the software can function correctly. Table 3 shows the Black box testing on this system is carried out by functional testing of page responses and user features.

Table 3. Testing Activity

No.	Functional ID	Description	What to expect	Results
1	SI-RPL-01	Enter the RPL document assessment system	Users can input the username and password that the admin has given	Compatible
2	SI-RPL-02	Student data display	Can display student data and grades that have not or have been inputted	Compatible
3	SI-RPL-03	Choose an appraisal position	The user selects the role of 3: examiner, supervisor one, and supervisor 2	Compatible
4	SI-RPL-04	Inputting course assessments based on grade qualifications	Users can fill in course grades based on grade qualification options	Compatible
5	SI-RPL-05	Display data that has been inputted	The values that have been input can be viewed as a whole	Compatible
6	SI-RPL-06	Display student's final grade	Users can see the display of final grades obtained by students	Compatible
7	SI-RPL-07	Printing Minutes	Users can print the minutes by pressing the Print button	Compatible

Based on the results of the product owner's Focus group discussion (FGD), E-RAPEL has been approved and can be used in the Professional Engineer Program. Obtaining the system makes it easier for lecturers to conduct assessments for PPI students, the admin and Head of Study Program can monitor student assessments, and assessment administration can be adequately managed effectively and efficiently.

4. Conclusion

The development of the Past Learning Recognition (RPL) assessment data processing system using the Scrum method has successfully simplified and automated the assessment administration process for Professional Engineer Program (PPI) students at the University of Lampung. The system effectively replaces the manual assessment method with a digital solution, reducing administrative errors, improving data accessibility, and enhancing assessment efficiency. The system development process, guided by the Scrum framework, ensured an iterative and collaborative approach, involving regular feedback from stakeholders, which contributed to the refinement and enhancement of system features. The use of black-box testing verified the system's functionality and usability, demonstrating that all features operated as expected. The implementation of E-RAPEL (Electronic RPL Assessment System) has positively impacted various stakeholders, including lecturers, administrators, and students, by streamlining the assessment process, enabling real-time monitoring, and facilitating better documentation and reporting. This research highlights the effectiveness of the Scrum methodology in developing web-based assessment systems and provides a model for future system developments within educational institutions. Continuous improvements and system updates are recommended to ensure the system remains adaptable to evolving requirements and technological advancements. The successful deployment of this system contributes to the broader goal of enhancing the quality of professional engineering education and serves as a valuable reference for similar projects in other academic and professional certification programs.

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