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E-ASSESSMENT FOR FINAL EXAM (CASE STUDY: DEPARTMENT OF MATHEMATICS, SAM RATULANGI UNIVERSITY MANADO)

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ABSTRACT

The Department of Mathematics is one of the Departments in the Faculty of Mathematics and Natural Sciences at Sam Ratulangi University Manado. In the Department of Mathematics, conventional methods for final exam involve manual paper grading, which is not efficient. During seminar assessments, assessment sheets are collected, and grades are computed using Microsoft Excel during thesis exams. The resultant overall grade is recorded with the grade predicate in the official report. The purpose of this study is the creation of an e-Assessment for final exam which can facilitate the processing of the final exam grades of each student. The method used in this research is the waterfall method. The results of this study show that an e-Assessment has been created that helps improve efficiency in the Department of Mathematics in the process of final exam assessment and each feature that has been made runs according to its function and the results of the tests conducted by lecturers have good results.

Keyword: Assessment, Efficiency, Waterfall, Blackbox, Examination

INTRODUCTION

Assessment is concerned with collecting and understanding information related to the level of achievement of learning objectives by students [1]. Assessment is needed to determine the understanding and ability of students to the topic or idea under study [2]. The Faculty of Mathematics and Natural Sciences is one of the Faculties at Sam Ratulangi University Manado which consists of five Departments and the Department of Mathematics is one of them. At the Department of Mathematics, to be able to reach the final thesis examination stage, you must go through two stages, namely, the research proposal examination and the research results examination. In every stage of the exam that students go through, an assessment process is carried out by the supervisor and examiner. The problem that exists in the Department of Mathematics is that the final exam assessment process still uses conventional methods by writing grades on paper media manually.

The conventional assessment process is not efficient. For the seminar assessment, all the assessment sheets will be collected by the seminar commission and taken to the room of the department of mathematics and the seminar grade will be calculated during the thesis examination along with all the assessment sheets obtained from the thesis examination using Microsoft Excel by the overseer. After the calculation is complete, the overall grade that has been calculated will be written down along with the predicate grade obtained in the official report.

Problems regarding the conventional final exam assessment process have been faced by various parties. Ramadhan [3], 2019 in his research which discusses the creation of an information system for final project assessment to facilitate and accelerate the work of the assessment team in the final project assessment process. Furthermore, Ratna [4], 2020 in her research discussed the creation of an information system for website-based thesis proposal assessment to create a special information system that can facilitate assessment, maintain grade consistency and speed up report generation. Then Nurhaeni et al [5]., 2020 in their research discussed the creation of a comprehensive trial assessment system for final assignments and thesis to design a system that can optimize the processing of thesis and thesis trial results.

Based on the problems that exist in the Department of Mathematics at Sam Ratulangi University Manado, an e-Assessment is needed that can facilitate the process of assessing the final exam. The author conducted a study titled "e-Assessment for Final Examination (Case Study: Department of Mathematics, Sam Ratulangi University Manado). Where the use of e-Assessment can simplify the final exam assessment process, which initially still uses paper media and is calculated manually, into a system that can carry out the assessment process through efficient digital technology.

RESEARCH METHODS

A. Time and Place of Research

This research started in February 2023 to July 2023. Starting from collecting the required data to implementing it into the system and testing the system that has been made. The research location is at the Department of Mathematics, Sam Ratulangi University Manado.

B. Data Collection Method

1. Interview

   Interview were conducted directly with the Secretary of the Department of Mathematics and Coordinator of Information System Study Program to obtain data related to the final exam assessment process. Based on the interviews conducted, information was obtained in the form of the flow of the final exam assessment process and the assessment components to be assessed in the form of an assessment form during the exam [6].

2. Observation

   Observations were made while attending the research seminar to see the assessment process of results in seminars that use assessment sheets on paper media [7], [8].

3. Literature Study

   Literature study are carried out by collecting and reading books and journals that will be used as references to the objects discussed in this study [9], [10].

C. Hardware and Software

1. Hardware
   a. HP 14s-dk1xxx laptop with AMD Athlon Silver 3050U Radeon Graphics
   b. 4GB RAM
   c. 256GB SSD
   d. Mouse and Keyboard
   e. Printer
2. Software
   a. Operating system Windows 10

b. XAMPP (MySQL and PHP servers)
c. Visual Studio Code
d. CodeIgniter Framework
e. Visual Paradigm
f. Draw.io

D. Research Method

The method used in this research is the waterfall method. The waterfall method is a method in which each step must wait for the previous step to complete and execute sequentially. The next step cannot be performed if the previous step is not completed, and it is not possible to go back or repeat from the previous step [11], [12], [13]. The waterfall method is an example of a planned process, where all processes are planned before software development begins [14]. There are five stages in the waterfall method according to Sommerville [14], 2016 and can be seen in Figure 1.

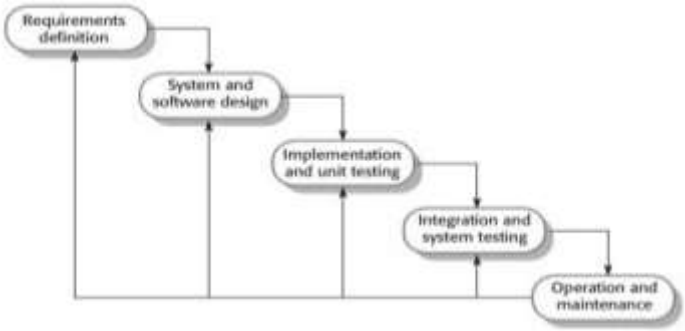

Figure 1. Waterfall Method

1. Requirements Analysis and Definition
   This stage is the stage of determining the features, constraints and objectives of the system in consultation with the system users. All these elements will be defined in detail and will serve as system specifications [15], [16].
2. System and Software Design
   At this stage, the system architecture will be formed based on the identified requirements. Software design involves identifying and describing the fundamental abstractions of a software system and their relationships.
3. Implementation and Unit Testing
   At this stage, software design is performed according to a set of programs or program units. Each unit will be tested to see if it meets the specifications.
4. Integration and System Testing
   In this stage, each program unit will be integrated with each other and tested as one complete system to ensure that the software requirements have been implemented. After testing, the software system will be delivered to the user.
5. Operation and Maintenance
   In this stage, the system will be installed and put into practical user. It will also fix errors that were not found in the creation stage and develop the system such as adding new features and functions.

E. Requirement Analysis and Definition

The assessment for final exam has two users who will use the system including:

1. Staff of Department of Mathematics

Serves as an admin who will manage data on students who will carry out results seminars and thesis examinations and manage data on all lectures in the Department of Mathematics.

2. Lecturers of Department of Mathematics

   Serves as an user who will carry out the assessment process for students through the assessment features in the assessment for final exam.

There are several requirements that will be used in the assessment for final exam including:

1. Input Requirements Analysis

   Input requirements define the data that will be entered into the system, where with the data entered, the system can run according to its purpose.

2. Process Requirements Analysis

   Process requirements describe what actions can be perfomed on data that has been entered from input.

3. Output Requirements Analysis

   Output requirements are the final results of the process that has been carried out by the system.

F. System and Software Design

1. Use Case Diagram

   Use case diagram emphasize what the system will do and represent the interaction between actors and the system [17]. Descripstion of the use case diagram used in the assessment for final exam can be seen in Figure 2 and Figure 3.

   a. Use Case Diagram Admin

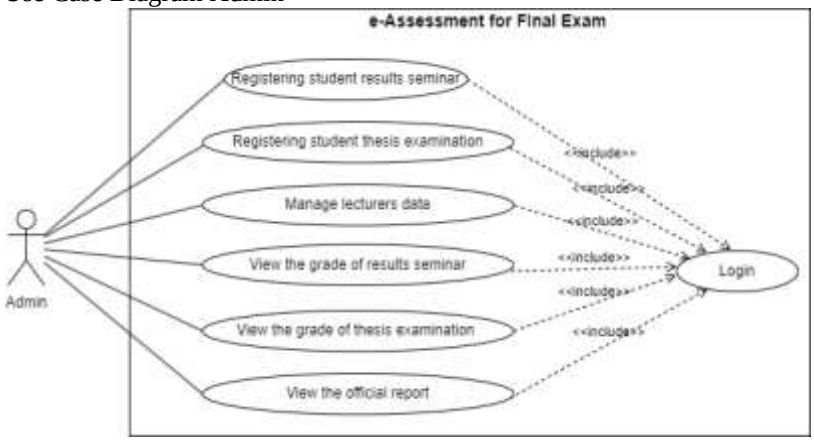

Figure 2. Use Case Diagram Admin

   b. Use Case Diagram Lecturer

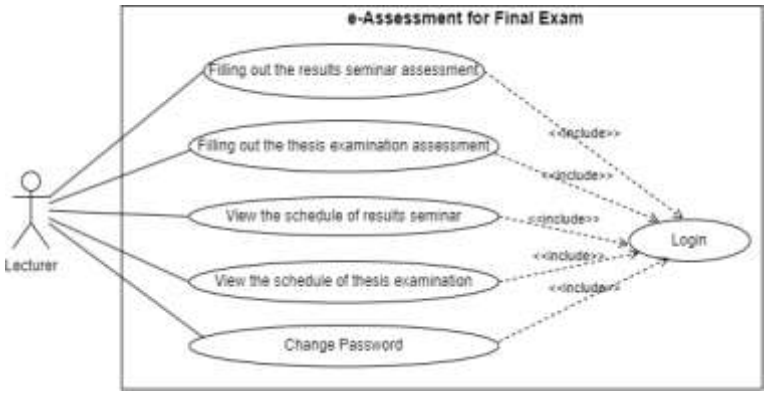

Figure 3. Use Case Diagram Lecturer

2. Activity Diagram

Activity diagram are used to describe the steps in a system, where in each existing use case, there is at least one activity diagram [17]. Activity diagrams for some processes can be seen in the figures below.

a. Activity Diagram for Login

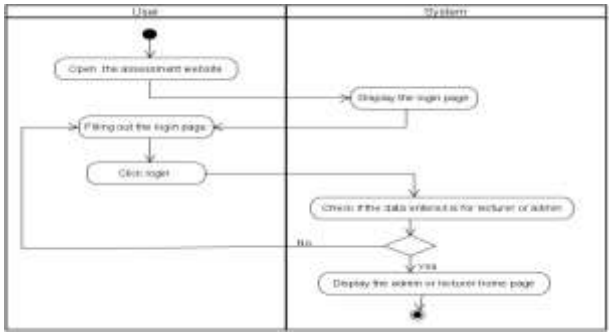

Figure 4. Activity Diagram for Login

b. Activity Diagram for Registering Student Results Seminar

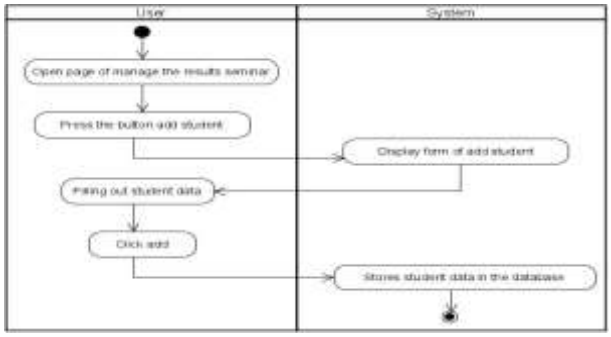

Figure 5. Activity Diagram for Registering Student Results Seminar

c. Activity Diagram for Registering Student Examination Thesis

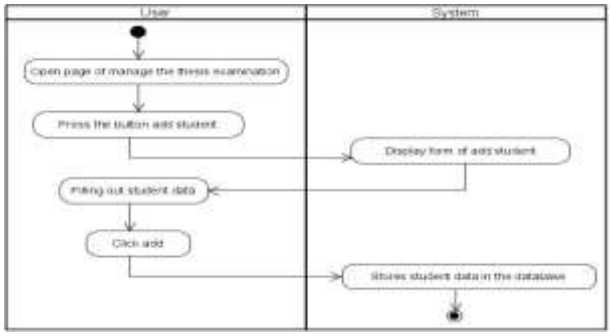

Figure 6. Activity Diagram for Registering Student Thesis Examination

d. Activity Diagram for Filling Out The Results Seminar Assessment

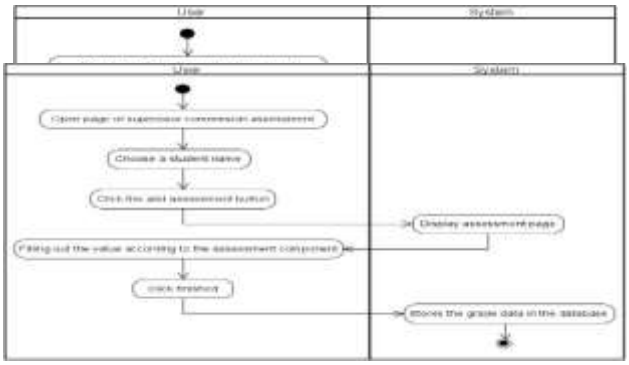

Figure 7. Activity Diagram for Filling Out The Results Seminar Assessment

e. Activity Diagram for Filling Out The Thesis Examination Assessment For The Supervisor Commission

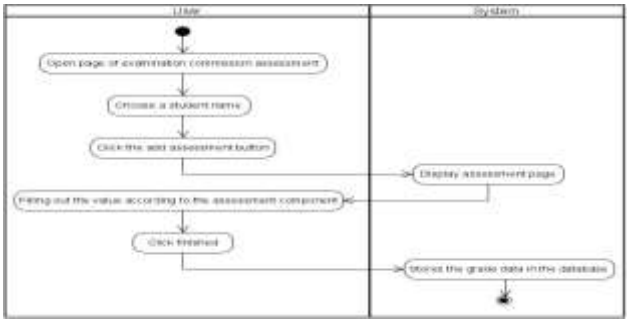

Figure 8. Activity Diagram for Filling Out The Thesis Examination Assessment For The Supervisor Commission

f. Activity Diagram for Filling Out The Thesis Examination Assessment For The Examination Commission

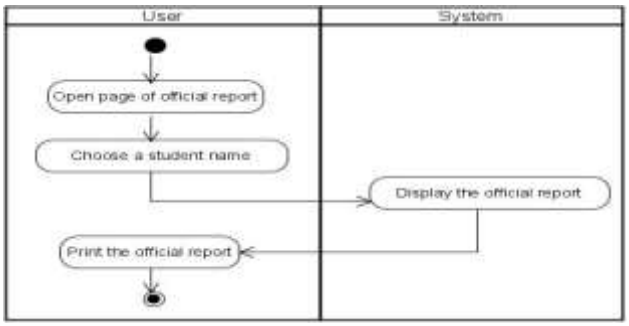

Figure 9. Activity Diagram for Filling Out The Thesis Examination Assessment For The Examination Commission

g. Activity Diagram for View The Official Report

Figure 10. Activity Diagram for View The Official Report

3. Sequence Diagram

Sequence diagrams describe the behavior of objects in use cases by describing the lifetime of objects and the messages sent and received between objects [18]. Sequence diagrams for some processes can be seen in the figures below.

a. Sequence Diagram for Admin Login

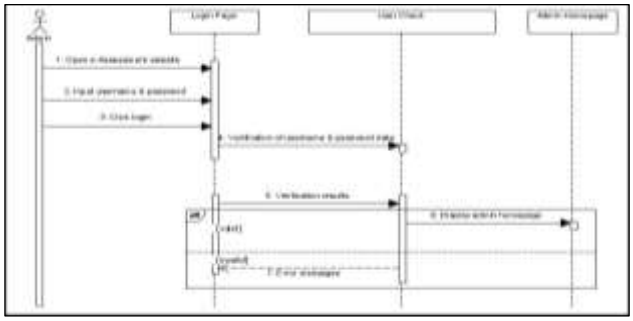

Figure 11. Sequence Diagram for Admin Login

b. Sequence Diagram for Lecturer Login

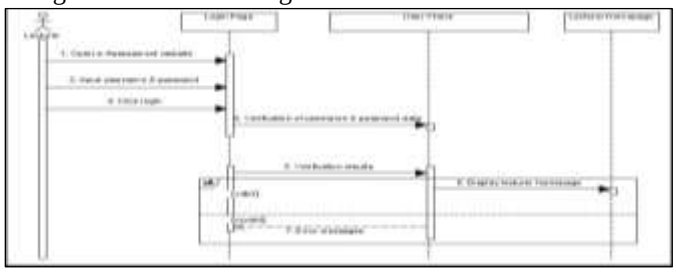

Figure 12. Sequence Diagram for Lecturer Login

c. Sequence Diagram for Filling Out The Results Seminar Assessment

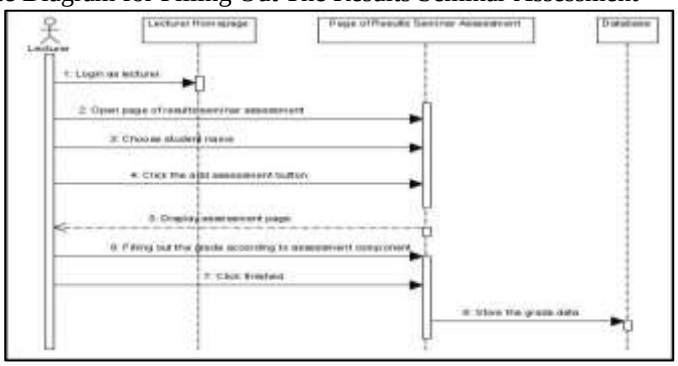

Figure 13. Sequence Diagram for Filling Out The Results Seminar Assessment

d. Sequence Diagram for Filling Out The Thesis Examination Assessment For The Supervisor Commission

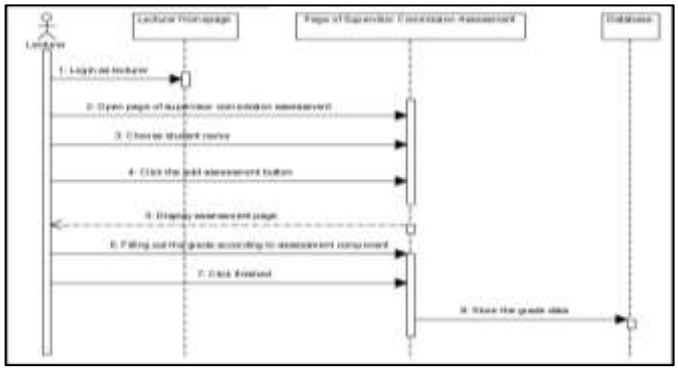

Figure 14. Sequence Diagram for Filling Out The Thesis Examination Assessment For The Supervisor Commission

c. Sequence Diagram for Filling Out The Thesis Examination Assessment For The Examination Commission

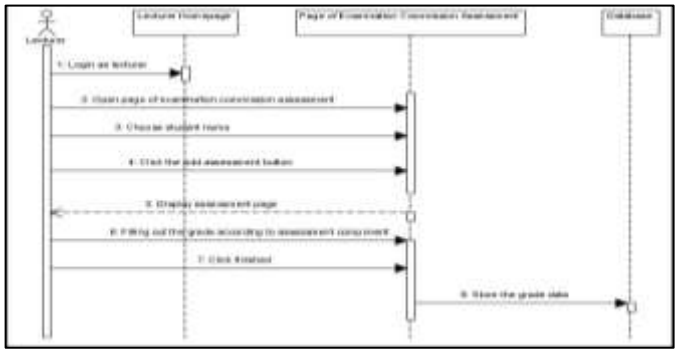

Figure 15. Sequence Diagram for Filling Out The Thesis Examination Assessment For The Examination Commission

d. Sequence Diagram for View The Official Report

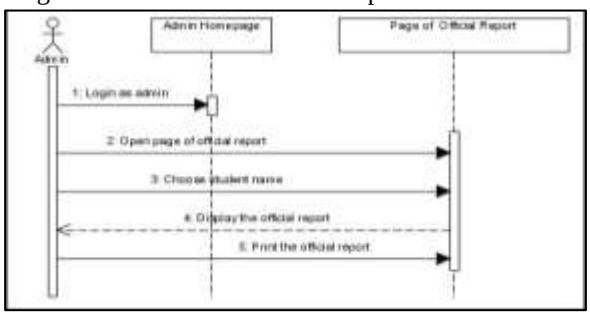

Figure 16. Sequence Diagram for View The Official Report

4. Class Diagram

A class diagram is a diagram that shows the relationship between classes in which there are attributes and functions of an object [19]. This class diagram explains the flow of the process that will be implemented on the system. Class Diagram on the system can be seen in Figure 17.

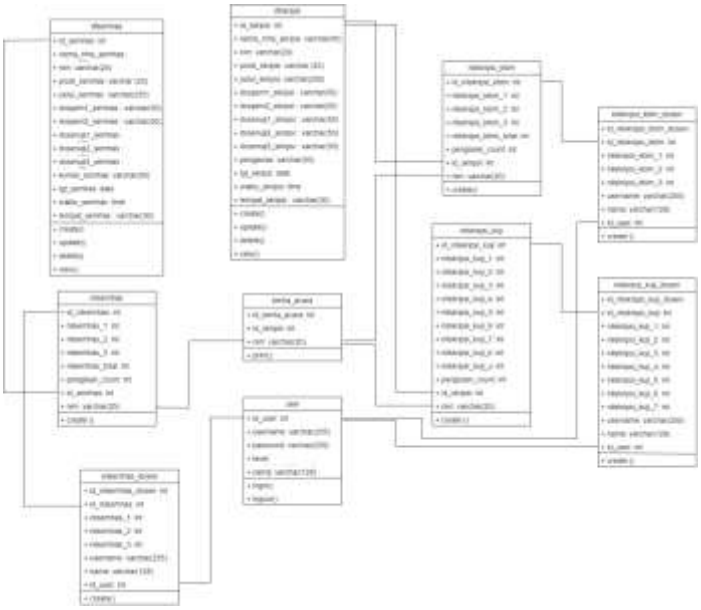

Figure 17. Class Diagram

RESULTS AND DISCUSSION

1. Implementation

In the implementation section, the system that has been designed previously, will be operated and it will be seen whether the system is running according to its function for each feature. Some forms of implementation on e-Assessment for Final Exam are as follows:

a. Login Page

On the login page, there are two input forms, namely username and password input. The display of Login Page can be seen in Figure 18.

Figure 18. Login Page

b. Admin Dashboard

On the admin dashboard page, there is a time statement and a welcome greeting. The display of Admin Dashboard page can be seen in Figure 19.

Figure 19. Admin Dashboard

c. Lecturer Dashboard

On the lecturer dashboard page, there is a time statement and a welcome greeting. The display of Dashboard page can be seen in Figure 20.

Figure 20. Lecturer Dashboard

d. Add Student Data for Registering Results Seminar

On the add student page, the admin can perform the results seminar registration process for students by clicking the add student button on the results seminar management page. Then the system will display a form to fill in all the required student data. The display of Add Student Data for Registering Results Seminar page can be seen in Figure 21.

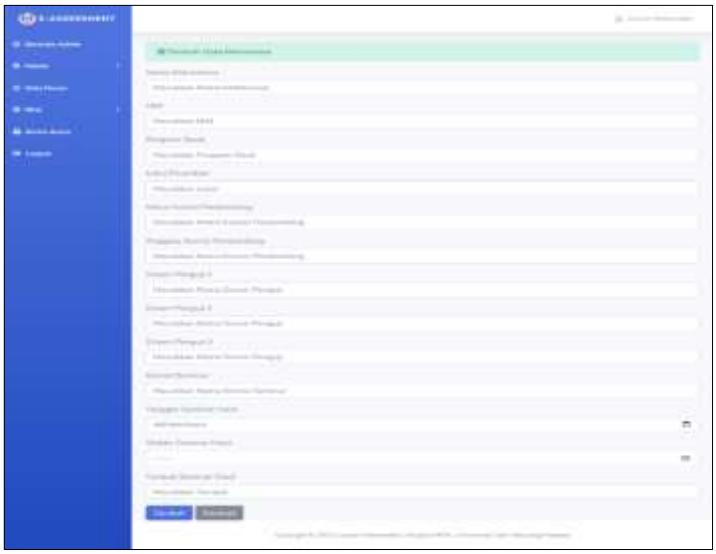

Figure 21. Add Student Data for Registering Results Seminar

e. Add Student Data for Registering Thesis Examination

On the add student page, the admin can carry out the thesis examination registration process for students by clicking the add student button on the manage thesis examination page. The display of Manage the Thesis Examination Registrationpage can be seen in Figure 22.

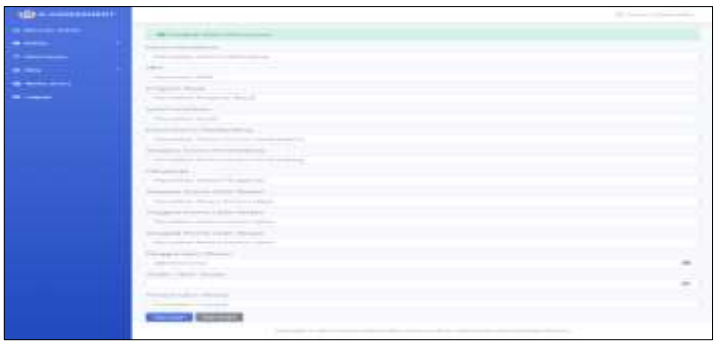

Figure 22. Add Student Data for Registering Thesis Examination

f. View the Official Report

On the view and print the official report page, the admin can print the official report by clicking the print icon on the official report page. Then the system will display the official report in pdf form and ready to be printed. The display of View the Official Report can be seen in Figure 23.

Figure 23. View the Official Report

g. Filling Out the Grades of Results Seminar

On the filling out the grades of results seminar page, the system will display a form for filling out grades consisting of three assessment components along with descriptions and value weights for each component. Filling in grades can only be done once by each lecturer, so lecturers need to fill in grades carefully and before being able to press the save value button, the lecturer must fill in the calculation and verify the captcha. The display of Filling Out the Grades of Results Seminar page can be seen in Figure 24.

Figure 24. Filling Out the Grades of Results Seminar

h. Filling Out the Grades of Thesis Examination by Supervisors

On the filling out the grades of thesis examination page, the system will display a form for filling in grades consisting of three assessment components along with descriptions and value weights for each component. Filling in grades can only be done once by each supervisors, so supervisors need to fill in grades carefully and before being able to press the save value button, the supervisors must fill in the calculation and verify the captcha. The display of the Filling Out the Grades of Thesis Examination by Supervisors page can be seen in Figure 25.

Figure 25. Filling Out the Grades of Thesis Examination by Supervisors

i. Filling Out the Grades of Thesis Examination by Examiners

On the filling out the grades of thesis examination page, the system will display a grade filling form consisting of two assessment parts, namely thesis assessment which consists of five assessment components and thesis examination assessment which consists of two assessment components with each value weight for each component. Filling in grades can only be done once by each examiners, so examiners need to fill in grades carefully and before being able to press the save value button, the examiners must fill in the calculation and verify the captcha. The display of the Filling Out the Grades of Thesis Examination by Examiners can be seen in Figure 26.

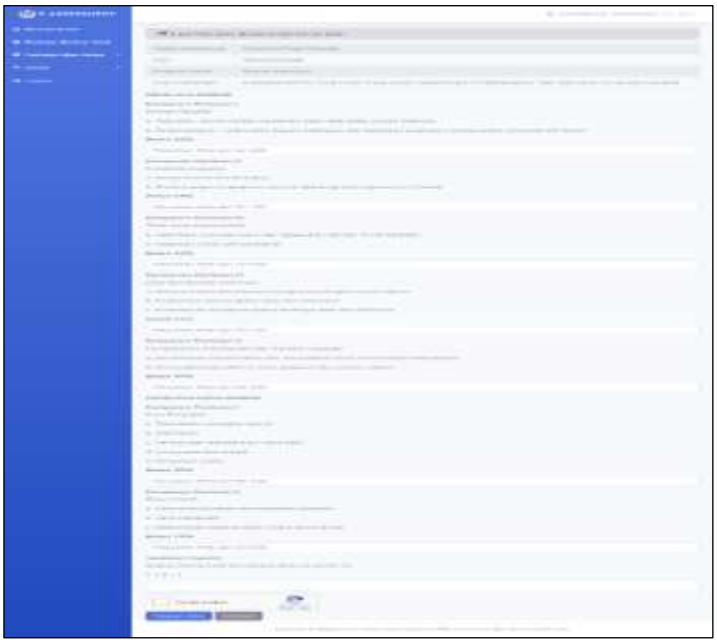

Figure 26. Filling Out the Grades of Thesis Examination by Examiners

2. Testing

Blackbox testing is done by trying the program that has been made by trying to enter data on each form. This test is needed to find out whether the program runs according to its function [20]. In this study, system testing was carried out using blackbox testing beta version. The testing was carried out by department of mathematics lecturers who will later use the system created in this study and developer of this system.

Table 1. Testing for Lecturers Login

Scenario	Test Case	Expected Outcome	Test Result	Validation
Positive Case: Input valid username (NIP) and password	Enter valid username and password	Login is created successfully	Login is successfully	The login process of the lecturers is successful.
Negative Case: Missing required fields	Leave some fields blank or incomplete	Login process fails	Login process fails	The system properly rejects incomplete data.

Negative Case: Missing required fields	Leave all fields blank or incomplete	Login process fails	Login process fails	The system properly rejects incomplete data.

Table 2. Testing for Manage the Results Seminar

Scenario	Test Case	Expected Outcome	Test Result	Validation
Positive Case: Enter valid exam data of results seminar	Input valid student data	Data are recorded successfully	Data recorded	The entry of data is successful.
Negative Case: Existing student ID	Enter a student ID that exist	Data entry fails	Data entry fails	The system does not accept existing student ID
Negative Case: Missing required fields	Leave some fields blank or incomplete	Data entry fails	Data entry fails	The system properly rejects incomplete data.
Negative Case: Missing required fields	Leave all fields blank or incomplete	Data entry fails	Data entry fails	The system properly rejects incomplete data.

Table 3. Testing for Manage the Thesis Examination

Scenario	Test Case	Expected Outcome	Test Result	Validation
Positive Case: Enter valid exam data of thesis examination	Input valid student data	Data are recorded successfully	Data recorded	The entry of data is successful.
Negative Case: Existing student ID	Enter a student ID that exist	Data entry fails	Data entry fails	The system does not accept existing student ID
Negative Case: Missing required fields	Leave some fields blank or incomplete	Data entry fails	Data entry fails	The system properly rejects incomplete data.
Negative Case: Missing required fields	Leave all fields blank or incomplete	Data entry fails	Data entry fails	The system properly rejects incomplete data.

Table 4. Testing View the Official Reports

Scenario	Test Case	Expected Outcome	Test Result	Validation
Positive Case: Generate student official reports	Select a valid student ID from the list	Official reports is generated successfully	Official reports is generated successfully	The generation of the student official reports is successful.
Negative Case: Non-existing student	Select a non-existing student ID	Report generation fails	Report generation fails	The system handles non-existing student IDs properly.

Table 5. Testing for Filling out the Results Seminar Assessment

Scenario	Test Case	Expected Outcome	Test Result	Validation
Positive Case: Enter valid grades	Input valid grades	Grades are reco rded successfully	Grades recorded	The entry of grades is successful.
Negative Case: Missing required fields	Leave some fields blank or incomplete	Grades entry fails	Grades entry fails	The system properly rejects incomplete data.
Negative Case: Missing required fields	Leave all fields blank or incomplete	Grades entry fails	Grades entry fails	The system properly rejects incomplete data.
Negative Case: Entering grades less than 50 and more than 100	Input grades less than 50 and more than 100	Grades entry fails	Grades entry fails	The system properly rejects grade less than 50 and more than 100

Table 6. Testing for Filling out the Thesis Examination Assessment

Scenario	Test Case	Expected Outcome	Test Result	Validation
Positive Case: Enter valid grades	Input valid grades	Grades are recorded successfully	Grades recorded	The entry of grades is successful.
Negative Case: Missing required fields	Leave some fields blank or incomplete	Grades entry fails	Grades entry fails	The system properly rejects incomplete data.
Negative Case: Missing required fields	Leave all fields blank or incomplete	Grades entry fails	Grades entry fails	The system properly rejects incomplete data.
Negative Case: Entering grades less than 50 and more than 100	Input grades less than 50 and more than 100	Grades entry fails	Grades entry fails	The system properly rejects grade less than 50 and more than 100

CONCLUSIONS AND SUGGESTIONS

Based on the results of the research and its implementation into the form of a website, the conclusion in this study is that an e-Assessment has been created that helps improve efficiency in the Department of Mathematics in the process of final exam assessment and each feature that has been made runs according to its function and the results of the tests conducted by lecturers have good results.

Features that are still lacking or still do not exist in the system created in this current research can be added, such as the lecturer attendance list feature and the login feature for students so that students can register themselves into the e-Assessment system without having to go through the admin.

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