DESIGNING LEARNING MONITORING AND EVALUATION MANAGEMENT SYSTEMS FOR LECTURER PERFORMANCE IN INFORMATICS STUDY PROGRAM (Case Study: Universitas Sarjanawiyata Tamansiswa)

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***Abstract*--The main responsibilities of a lecturer is to transform, to develop and to transfer knowledge through teaching and learning process. Assessment by students for their lecturers to provide input for lecturers and study program quality is needed so that the teaching and learning process can be controlled and in accordance with the established quality standards. In carrying out the process of monitoring and evaluating on lecturer performance, the Informatics Study Program, Faculty of Engineering, Universitas Tamansiswa is currently using Google form to distribute questionnaires. This is considered ineffective and produces invalid data. Therefore, the use of technology can be a solution to this problem. The purpose of this research is to design a management information system model for monitoring and evaluating learning that can facilitate the software development stage. The design of this learning monitoring and evaluation processing system uses the Unified Modeling Language (UML) model. While the software development method proposed by the author is Agile Software Development. The result of this research is a design model with UML in the form of use case diagrams, activity diagrams, and class diagrams, where the results of this design model can facilitate the next stage of software development. In addition, PIECES analysis is used to assist in identifying weaknesses in the current system to facilitate the mapping of system requirements. Needs mapping is used to identify the proposed new system, in which this proposed new system has 4 user levels, namely: administrator, GMP (*Gugus Mutu Prodi)*, lecturers and students. Each user has its own authority in the proposed system.**

***Key words*: Information System, System Design, Agile Software Development, lecturer monitoring and evaluation system, Unified Modeling Language, activity diagrams, use case diagrams, PIECES analysis.**

I. INTRODUCTION

Higher education is a part of an educational institution to assist the nation's next generation in developing and disseminating science and technology to the community. The rapid development of technology requires universities to be able to take advantage of technology, one of which is the information system. Information system is a system that provides information for management in making decisions and also for carrying out company operations, in which a combination of humans, information technology, and structured procedures [1]. The implementation of this information system can facilitate an institution, one of which is a higher education institution, in carrying out various activities, including teaching and learning activities, academic activities, processing data of both students and lecturers, and so on.

Lecturer plays important roles in a university. Lecturer is a professional educator with the main duties of transforming, developing, and disseminating science, technology, art, as well as teaching to the students through education, research, community service, and noble culture[2]. The tasks of a lecturer are divided into main task and supporting task. The main task is to carry out *Catur*

Dharma of higher education which consists of education, research, community service, and noble culture. While the supporting task is to carry out additional activities that can be conducted either inside or outside the campus, these activities should support the implementation of the lecturer's main tasks. With that being said, it is necessary to carry out learning monitoring and evaluation activities and also to report the performance of the lecturer [3]. The benefit of monitoring and evaluating lecturer performance is that it can increase a lecturer's sense of professionalism in carrying out their duties, as an evaluation of educational activities in tertiary institutions, and can improve the quality of national education [4].

The Informatics Study Program, Universitas Sarjanawiyata Tamansiswa, has *Gugus Mutu Prodi* (GMP) that is assigned to assist the quality assurance of working programs at the Study Program level. One of GMP's tasks is to monitor and to evaluate learning activities. The function of monitoring and evaluation is to assess the performance of lecturers so that they are in accordance with the standards. This monitoring and evaluation activity is the implementation of the Research, Technology and Higher Education Ministerial Regulation No. 44/2022 concerning SNPT and realizing the vision of and mission Universitas Sarjanawiyata Tamansiswa in ensuring the implementation of *Catur Dharma*.

Currently, monitoring and evaluation of lecturer performance is still carried out in a semi-computerized system using the Google Form. The use of Google Form is very ineffective since there are possible cases of data redundancy and can result in invalid data. This is what underlies the authors of this study to design a monitoring and evaluation management system in evaluating the performance of lecturers of the Informatics Study Program, Universitas Sarjanawiyata Tamansiswa.

II. METHOD

A. Data

Two data collection methods were used for this study, those were observation and interview. The observation method is a technique of collecting data or information by making direct observations on the object under study to obtain data or information related to the problems that are currently happening to the object [5]. The object of this research is the Informatics Study Program, Faculty of Engineering, Universitas Sarjanawiyata Tamansiswa. The results of the observation state that the use of Google Form to evaluate performance of lecturer is considered ineffective and the data produced is invalid. Moreover, there is possibility that data manipulation might occur, and the data does not cover the whole population. For example, 1) students might fill out a questionnaire for several times, 2) lecturers themselves might fill out the questionnaire, and 3) not all students might have filled out the questionnaire.

Important data obtained from interviews with stakeholders, including data on user needs, student data, course data and lecturer data. The data would be used to design databases and system flows as well as to design features in the system dashboard. After completing the observation and interview stages, the author continued with a literature study by collecting related studies and comparing existing software development methods to find the most suitable method to be used in this research.

B. Method

Software development method used in this research is the *Agile Software Development*. The Agile method is a conceptual framework using an iterative and incremental development approach [6]. Software development using the agile method is adaptive with planning, development, testing, continuous integration, and flexible in response to changes. The Agile method is a system development approach that focuses on the speed of delivery and allows for changes at any time. Software developers will get feedback (customers/stakeholders) in advance for the system being developed. Agile method is suitable for software development that requires a short of time, and it is also suitable for academic software development projects [7]. As the development of software for evaluating the performance of lecturers

in the Informatics Study Program must be developed immediately while the time required for its development must be relatively short, the Agile method is the most suitable method for this research. Moreover, Agile is a project management method that uses short development cycles and focuses on continuous improvement in the development of a software product [8]. This approach has the advantage of having a better success rate in project development than the structured design approach [9]. Another advantage is that it allows for fast decision-making, good quality, and has good potential in handling any desired changes [10]. The use of the Agile Software Development method can minimize the value of losses incurred in the event of a failure [11]. The stages in system development with agile methods are shown in Fig. 1.

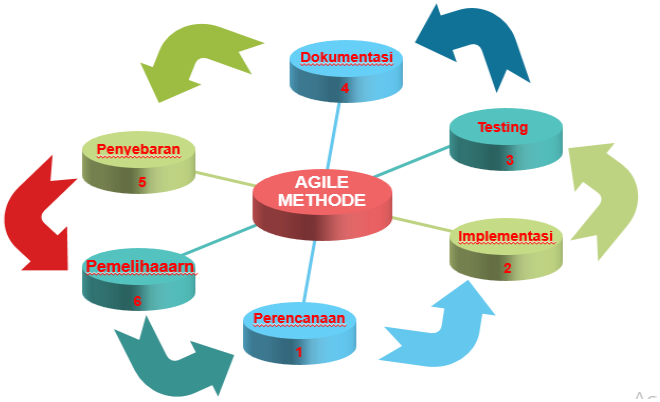

Fig. 1. Software Development Stage with Agile Method

1. Planning

At this stage, the author and the object (UST Informatics Study Program) make a plan regarding the needs of the software to be developed. The author analyzes the problems of the current system and identifies the needs of the proposed system. Based on the identification of these needs, the authors propose a new system design using the UML (Unified Model Language) model. In the UML model, several UML diagrams can be used for developing a system, they are: Use Cases, Activity Diagrams, Sequence Diagrams, and Class Diagrams [8]. The UML diagram designs used in this study are Use Case Diagrams, Activity Diagrams and Class Diagram. Use Case Diagram describes the expected functionality of a system and represents the interaction between actors and the system. In this design, some actors are used to represent human entity or a system that carries out the processes in it. Meanwhile, Activity diagrams are used to describe various activities between system users as a whole menu that is on the system and describe how each functionality works and how it ends [12].

2. Implementation

The implementation phase is the stage where the developer represents the results of the model planning into program codes. The ultimate goal of this stage is to create a software. Meanwhile, application development can use the OOP (Object Oriented Programming) programming language. One of the advantages of using the OOP concept is being flexible and modular [13]. The modular nature makes it easy to solve problems. The concept of OOP is very suitable for developing software using Agile methods since it is fast and flexible with rapid changes.

3. Testing

The testing phase is the stage of checking/testing the software being made to ensure that the existing system is running as expected. This checking is also intended to find any bugs. If a bug is identified, it will be fixed immediately in order to maintain system quality. Testing can be done by testing the functionality of the system being developed.

4. Deployment

In this stage, the software can be used by the users. Developers conduct training on how to use this software. In this stage, User Acceptance Testing can also be carried out by involving the end users. The purpose of this test is to see the feasibility of the software built [14].

5. Maintenance

This is the stage of system maintenance which should be carried out periodically so that the software is safe from system gaps. At this point, system updates are also carried out to support the increasing needs of the users.

III. RESULT AND DISCUSSION

A. Current System Analysis

In this planning stage, the author studies the current system so that it can carry out software requirements planning. This current system is considered as semi-computerized since it still uses Google Form in distributing student monitoring and evaluation forms to assess lecturer performance. The current system is ineffective and the resulting data is invalid. The causes of invalid data can be seen in Table 1.

TABLE I
Table of Causes of Invalid Data in Current Systems

No	Causes of Invalid data in the Current System
1	Some students might fill out the questionnaire repeatedly
2	Some students do not fill out the questionnaire
3	Lecturers themselves might fill out the questionnaire
4	Students might fill out a questionnaire for lecturers who do not teach in their class

The current system flow is shown in Fig. 2.

Fig. 2. The current system flow

In the current system, the process of creating a list of questions still uses the Google Form. GMP (*Gugus Mutu Prodi*) is in charge of designing the list of questions using the Google Form. After the list of questions is ready to be distributed, each course teaching lecturer would inform students to fill out the questionnaire. In this way, there are many possibilities of data manipulation, either by lecturers or students, as shown in Table 1. These issues are the basis for designing a new system with computerized and can reduce fraud that occurs. PIECES method is shown in the Table 2.

TABLE 2
Analysis PIECES Table

Type of Analysis	Weakness of Current System
Performance	GMP takes a long time to design and create a questionnaire with Google forms and the questionnaire result need to recapitulated.
Information	The questionnaire might not be filled out by all students, and it results in lack of information.
Economics	Use of internet data to create a questionnaire with Google Forms
Control	There are data redundancy because there are students who fill out more than once
Efficiency	The procedure of filling out the questionnaire is still inefficient because students have to write down their names, NIM, the taken courses, and name of lecturers.
Service	The inefficiency procedure of filling out the questionnaire using the Google form have made the students reluctant to fill it out.

B. Functional Requirements Analysis

Functional requirements analysis is the stage of determining the system requirements that will be developed. This analysis refers to the existing system requirements and business processes. In this study, functional requirements are mapped based on user levels including administrators, GMP, Lecturers, and Students. Functional requirements based on user level are shown in Table 3, 4, 5, and 6.

TABLE 3
Table of Functional Needs Analysis for Administrator Level

No	Main Needs	Purpose
1.	Displays Student, Lecturer, Class, Subject, Semester, and Academic Year Data.	Ensuring that student, lecturer, class, course, semester and academic year data are correct
2.	Carry out the process of relating students, classes, courses and lecturers	Ensuring that student, class, subject and lecturer relations are correct

TABLE 4
Table of Functional Needs Analysis for GMP
(*Gugus Mutu Prodi*)

No	Main Needs	Purpose
1.	Displays personal data	Ensuring that personal data entered is correct
2.	Displays data for all lecturers	Ensuring that every lecturer teaches the course
3.	Manage Question Lists and answer choices	Ensuring that a list of questions and answer choices for students to fill out
4.	Manage the results of monitoring and evaluation of Questionnaire Answers from students who fill in all lecturers	Ensuring that all students have filled out the questionnaire, display the results of the Monitoring and evaluation Questionnaire to all lecturers
5.	Manage the monitoring and evaluation period of Lecturer Performance Assessment	Activate the monitoring and evaluation period of lecturer performance evaluation.

TABLE 5
Table of Functional Needs Analysis for Lecturer

No	Main Needs	Purpose
1.	Displays personal data	Ensuring that the lecturer personal data entered is correct
2.	Manage the results of Monitoring Questionnaire Answers and evaluation of student filling	Ensure that all students have filled out the questionnaire, displaying Questionnaire result and evaluating student's submissions for all courses taught

TABLE 6
Table of Functional Needs Analysis for Students

No	Main Needs	Purpose
1.	Displays personal data and courses taken	Ensuring that personal data, classes and courses taken are correct
2.	Filling out the questionnaire for each lecturer according to the course taken	Filling out the questionnaire by selecting lecturers who teach the courses

C. Proposed System Design

After analyzing the current system and identifying the functional requirements of the system, the next step is designing the proposed system with use case diagrams, activity diagram and class diagram. The following is the use case diagram design shown in Figure 3 and the activity diagram in Fig. 4 and 5.

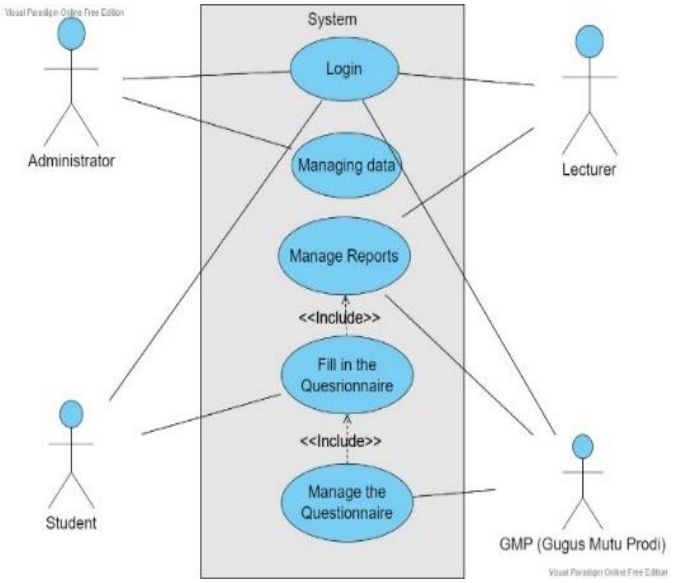

Fig. 3. Use case diagram on proposed system

In Fig. 3 the use case diagram above consists of 4 actors who interact with the system; they are the administrators, GMP, lecturers, and students. Administrators have the authority to manage student data, classes, courses, lecturers, and academic year. GMP has the authority to manage the questionnaires and to report on the results of questionnaires completed by the students. Lecturers have the authority to see reports of the questionnaire filled out by students. Meanwhile, students have the

authority to fill out performance evaluation questionnaires for each lecturer who teaches the courses they take.

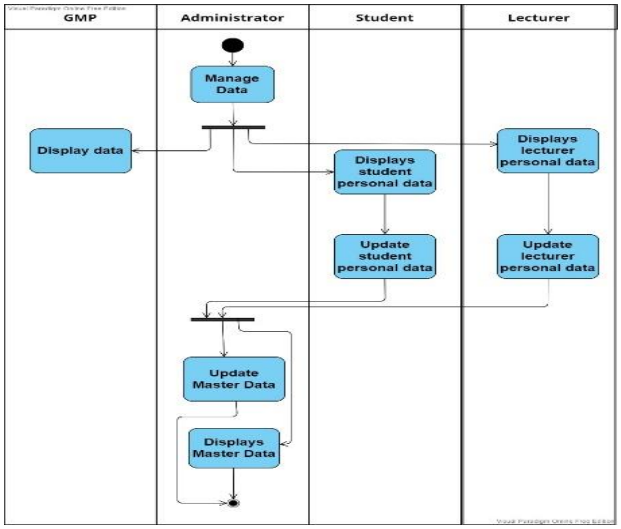

Fig. 4. Activity diagram for process managing data on proposed system

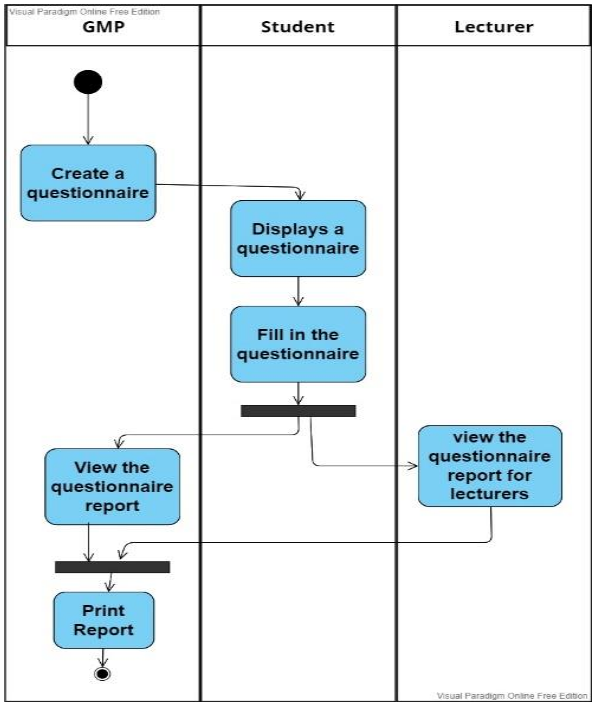

Fig. 5. Activity diagram for process questionnaire data on proposed system

Fig. 4 describes the activities carried out in data management. Meanwhile, Fig. 5 describes the activities in designing and filling out the questionnaire. GMP makes a list of questions following lecturer performance assessment standards. On the student dashboard, a list of lecturers will be displayed according to the course that the students are taking. Then students choose the lecturers to be evaluated. After completing the performance assessment for the selected lecturer, the questionnaire cannot be filled out anymore. After the deadline for assessing lecturer performance, GMP and lecturers can see the results of the filled out questionnaires for evaluating lecturer performance.

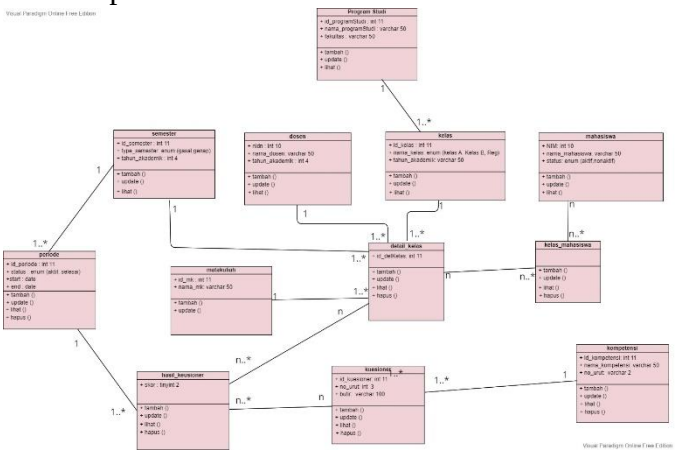

Fig. 6. Class diagram on proposed system

Fig. 6 describes a class diagram analysis of the proposed system. Class diagram is an overview of the structure of the system in terms of defining classes to assist programmers in building systems. The class diagram shows the relationship between classes in the system being built and how they collaborate to achieve a goal. In this study, the class diagram consists of 12 classes, namely *program_studi*, *semester*, *dosen*, *mahasiswa*, *kelas*, *detail_kelas*, *kelas_siswa*, *matakuliah*, *periode_kuesioner*, *kompetensi*, *kuesioner*, and *hasil_kuesioner*. Each class has a method to abstract something that can be done on an object of that class.

On the dashboard, students have the authority to manage personal data and assess monitoring and evaluation of lecturer's performance. Fig. 7 describes the interface design for the lecturer assessment list on the student dashboard. This page provides a list of lecturers' names who are in charge of the course taken by the student. If the button is still red, that means the student has not assessed the

lecturer and vice versa. Students can see the results of the assessment of monitoring and evaluation for each lecturer by pressing the show button. Evaluation of lecturer performance is done at a certain of time. Therefore, the lecturer's assessment list page will be available only during that period of time.

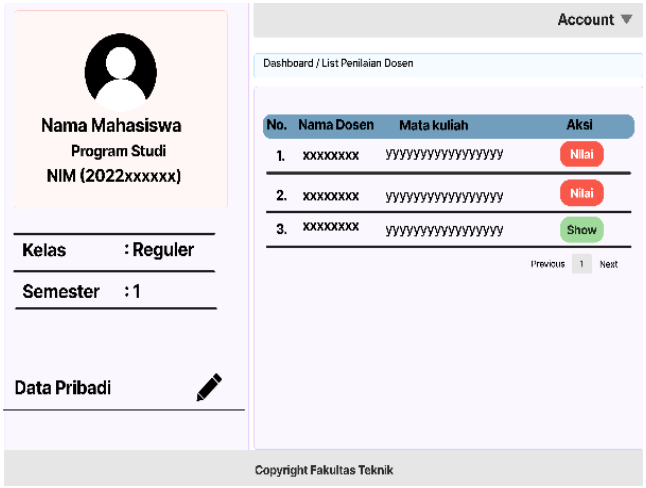

Fig. 7. Lecturer assessment list interface design

Fig. 8 describes the interface design for the lecturer performance monitoring and evaluation filling page on the student dashboard. Several competency tabs must be filled by students. The next competency tab cannot be opened if the previous competency tab has not been filled. However, you can return to the previous competency tab that has been filled out.

GMP has the authority to manage personal data, activate lecturer performance appraisals, and manage the performance appraisal results for all lecturers in their study programs. Fig. 9 is the interface design of the data page for the monitoring and evaluation period of lecturer's performance. Firstly, GMP inputs the start date and end date of the lecturer monitoring and evaluation, then GMP chooses the semester and academic year. Lastly, GMP press the ACTIVE button, then the monitoring and evaluation of lecturer performance evaluation would be active and can be filled out by students. After the period of monitoring and evaluation of the lecturer performance is up, the GMP would be able to manage reports on the results of monitoring and evaluation of performance for each lecturer. The design of the monitoring and evaluation results report page is shown in Fig. 10.

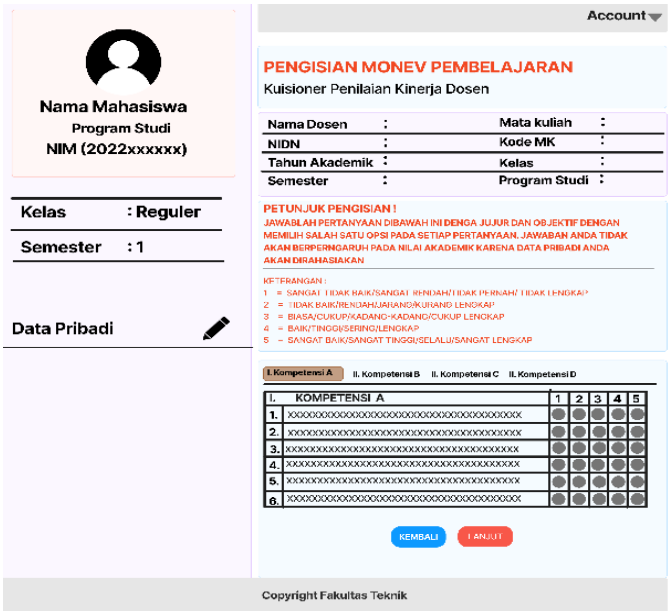

Fig. 8. Lecturer performance assessment form interface design

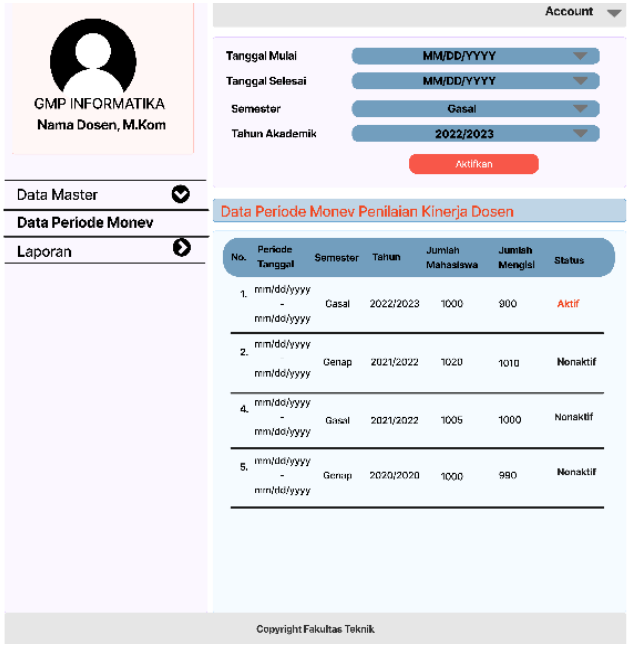

Fig. 9. Interface design period of lecturer performance evaluation of data page

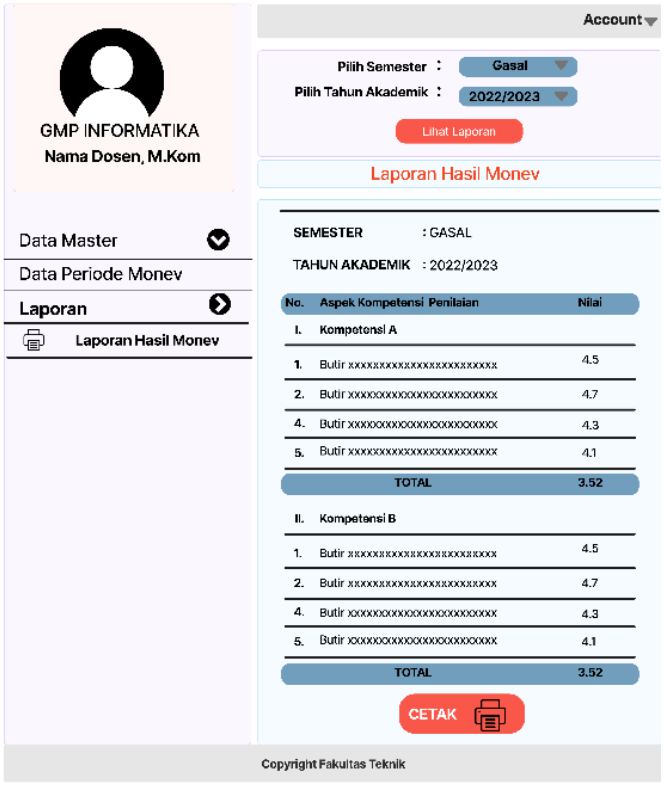

Fig. 10. Design for the monitoring and evaluation results page on the gmp dashboard

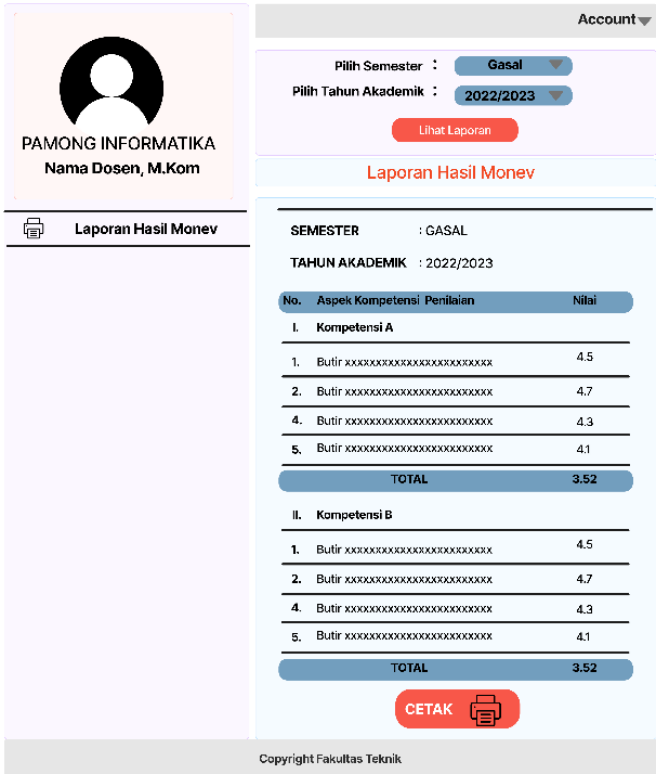

Fig. 11. Design for the monitoring and evaluation results page on the lecturer dashboard

Lecturers have the authority to manage their data and also see the results of monitoring and evaluation of performance assessments in each period. The process of viewing the performance monitoring and evaluation report is, first the lecturer selects the semester and academic year, then presses the view report button. The design of the performance monitoring and evaluation report page for each lecturer can be seen in Fig. 11 below. The results of the assessment of each question from each competency are calculated using the following formula:

$$\bar{B} = \frac{\sum Q_n}{n} \quad (1)$$

$\bar{B}$: The average score on each question (in each competency).
Q : Question Items.
$\sum Q_n$: The total number of Q scores on all students who have filled out.
n : Number of students who filled out.

Meanwhile, the formula for calculating scores for each competency is as follow:

$$\bar{K} = \frac{\sum B_n}{n} \quad (2)$$

$\bar{K}$: Average score on each competency.
B : Question Items.
$\sum B_n$: The sum of all scores in each competency.
n : The number of question items for each competency.

IV. CONCLUSIONS

Based on the discussion above, system design using UML produces a system of actors (GMP, lecturers, and students), use case diagrams, activity diagrams and class diagrams. The class diagram consists of 12 classes, namely *program_studi*, *semester*, *dosen*, *mahasiswa*, *kelas*, *detail_kelas*, *kelas_siswa*, *matakuliah*, *periode_kuesioner*, *kompetensi*, *kuesioner*, and *hasil_kuesioner*. Creating a system design using UML can facilitate software development to minimize errors between the perceptions of system design analysts and

software developers. Software developers and stakeholders can understand system process visualization with use cases and activity diagrams.

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