



Student Performance Monitor

CSE 307

SYSTEM ANALYSIS AND DESIGN

Final Report

Group - 02

Jannat Khair Chowdhury	1830105
Muhammad Talha Hassan	1830698
Abdullah Al Nayem	1820507
Md. Zahidul Islam	1721883
Ashraful Islam Tuhin	1820144
Moeen Ahmmed	1821775
Sinthya Sinthya	1810309

Originality Statement

Title: Students Performance monitoring system

Author (Jannat Khair, Muhammad Talha Hassan, Abdullah Al Nayem, Md. Zahidul Islam, Ashraful Islam Tuhin, Moeen Ahmmed, Sinthya Rahman)

As the corresponding author, we certify that this report is original and its publication does not infringe any copyright.

As the corresponding author, we declare that the report has not been previously published, in whole or in part, in any other journal of a scientific publishing company. Also, the report does not participate in any other publishing process. We also declare there is no conflict of interest.

Acknowledgment

We have taken a lot of effort into this project. However, completing this project would not have been possible without the support and guidance of a lot of individuals. We would like to extend our sincere thanks to all of them.

We would like to express our deep appreciation and indebtedness to our respected Faculty Dr Mahady Hasan and our group leader Mr. Talha Hasan for his endless support, kindness, and understanding during the project duration.

We would also like to thank everyone involved in this project and helping us with their suggestions to make the project better.

Finally, Thank you to all the people who have willingly helped us out with their abilities.

Abstract:

Assessment as a dynamic process produces data that reasonable conclusions are derived by stakeholders for decision making that expectedly impact on students' learning outcomes. The data mining methodology while extracting useful, valid patterns from higher education database environments contribute to proactively ensuring students maximize their academic output. This paper develops a methodology by the derivation of performance prediction indicators to deploy a simple student performance assessment and monitoring system within a teaching and learning environment by mainly focusing on performance monitoring of students' continuous assessment and examination scores in order to predict their final achievement status upon graduation. Based on various data mining techniques and the application of machine learning processes, rules are derived that enable the classification of students in their predicted classes. The deployment of the prototyped solution integrates measuring, 'recycling' and reporting procedures in the new system to optimize prediction accuracy.

Contents

CSE 307	2
Originality Statement	3
Acknowledgment	3
Abstract:	4
Contents	5
CHAPTER 1	
INTRODUCTION	8
BACKGROUND OF THE PROJECT	8
SCOPE OF THE PROJECT	9
OBJECTIVE OF THE PROJECT	10
CHAPTER 02	11
SYSTEM DESCRIPTION	11
Current Business Processes With Rich Picture: (As Is)	12
Problem Statements (PS)	13
Proposed System With Rich Picture: (To Be)	15
Analyzing proposed system with respect to IS(TPS(Transaction Processing System), MIS(Management Information System), DSS(Decision Support System), EIS(Executive Information System)	17
CHAPTER 03	20
REQUIREMENT ANALYSIS	20
Details of Fact-Finding Techniques selected with justification	21
Sampling	21
Questionnaires	21
Interviews	22
Detail plan of the requirement analysis	22
Business Requirement Document	28
Purpose	28
Overview	28
Customer and Primary Stakeholders Analysis:	29
1. Stakeholders with their responsibilities	29
Primary Stakeholders Analysis:	29
Additional Stakeholders Analysis:	29

2. Stakeholder analysis based on interest, knowledge, power.	30
SCOPE	31
Goals, Objectives, and Outcome Measures	32
Enterprise Need/Justification	34
List of Features:	36
Feature-wise Business Requirements	37
Business Needs/Owner Requirements	37
Additional Reporting Requirements	41
Related Project and Work Effort	41
Other Considerations	42
Alternatives:	42
Assumptions:	42
Dependencies:	42
Constraints	42
Business Risks and Mitigation	43
Chapter 04:	44
Feasibility Analysis	44
Purpose	45
Candidate Matrix (Technical Feasibility & Operation Feasibility)	45
HP 24mh monitor,	46
Economical Feasibility	48
Feasibility Analysis Matrix:	57
CHAPTER 5	59
SYSTEM REQUIREMENT SPECIFICATION	59
FUNCTIONAL REQUIREMENTS	60
NON- FUNCTIONAL REQUIREMENT	66
CHAPTER 6	68
LOGICAL DESIGN	68
USE CASES	68
CONTEXT LEVEL	68
USE CASES WITH SUBSYSTEMS AND BOUNDARY	69
NARRATIONS	70
CLASS DIAGRAM	75
SEQUENCE DIAGRAM	76
ACTIVITY DIAGRAM	83
CHAPTER 7	87
CONCLUSION	87

ADVANTAGES	88
RECOMMENDATIONS	88
CONCLUSIONS	88
REFERENCE	89

CHAPTER 1

INTRODUCTION

- BACKGROUND OF THE PROJECT
- OBJECTIVE OF THE PROJECT
- SCOPE OF THE PROJECT

1.1 BACKGROUND OF THE PROJECT

The aim of our project is to analyze and design software that we believe will help universities everywhere to promote a more productive and effective way of evaluating students. At the very core of our project, we have introduced the idea of Course Outcomes (COs) and Program Learning Outcomes (PLOs), where each CO is mapped to a PLO and each PLO represents a specific valuable skill that the students are expected to gain or enhance at the end of that course, such as problem analysis, design, implementation of a skill, etc. To evaluate the students efficiently the project intends to check whether the PLOs that are mapped to the COs requirement are fulfilled or not for each student. The system allows input from IEB to set PLO requirements. The faculties then input the COs for each of their students so that the system can map the COs to PLO accordingly. Through the implementation of this project, it was found that the efficiency did not only save time but also improve quality. The PLOs are chosen carefully and specifically to ensure the student gains the most skills out of a course - students can keep track of their progress in each sector and pinpoint the areas that need self-improvement and self-growth. In addition, our software hopes to benefit the institutional bodies as well – faculty members, administrative bodies, and departmental bodies – to track the progress of students, departmental performance and help them distribute and allocate resources better.

1.2 SCOPE OF THE PROJECT

The scope is to assist in the efficient and effective implementation of the project through the following tasks:

- Facilitate the implementation, including planning and management
- Conduct monitoring of the project
- Support for review and improvement of the project implementation
- Project initiation
- Data Collection
- Requirement Analysis

- Feasibility Analysis
- Program Analysis
- Reporting

1.3 OBJECTIVE OF THE PROJECT

The objective of our project is to create user-friendly software that will act as a platform for students, faculties and other members of the university to help improve the quality of education and revolutionize the way we integrate technology into our education. We believe the data we have collected, evaluated, and arranged will unlock opportunities for massive advancements in our educational sector and will also contribute significantly to the field of Computer Science. Such being the case, SPM will enhance the project scope so that it will bring about benefits to all of the departments.

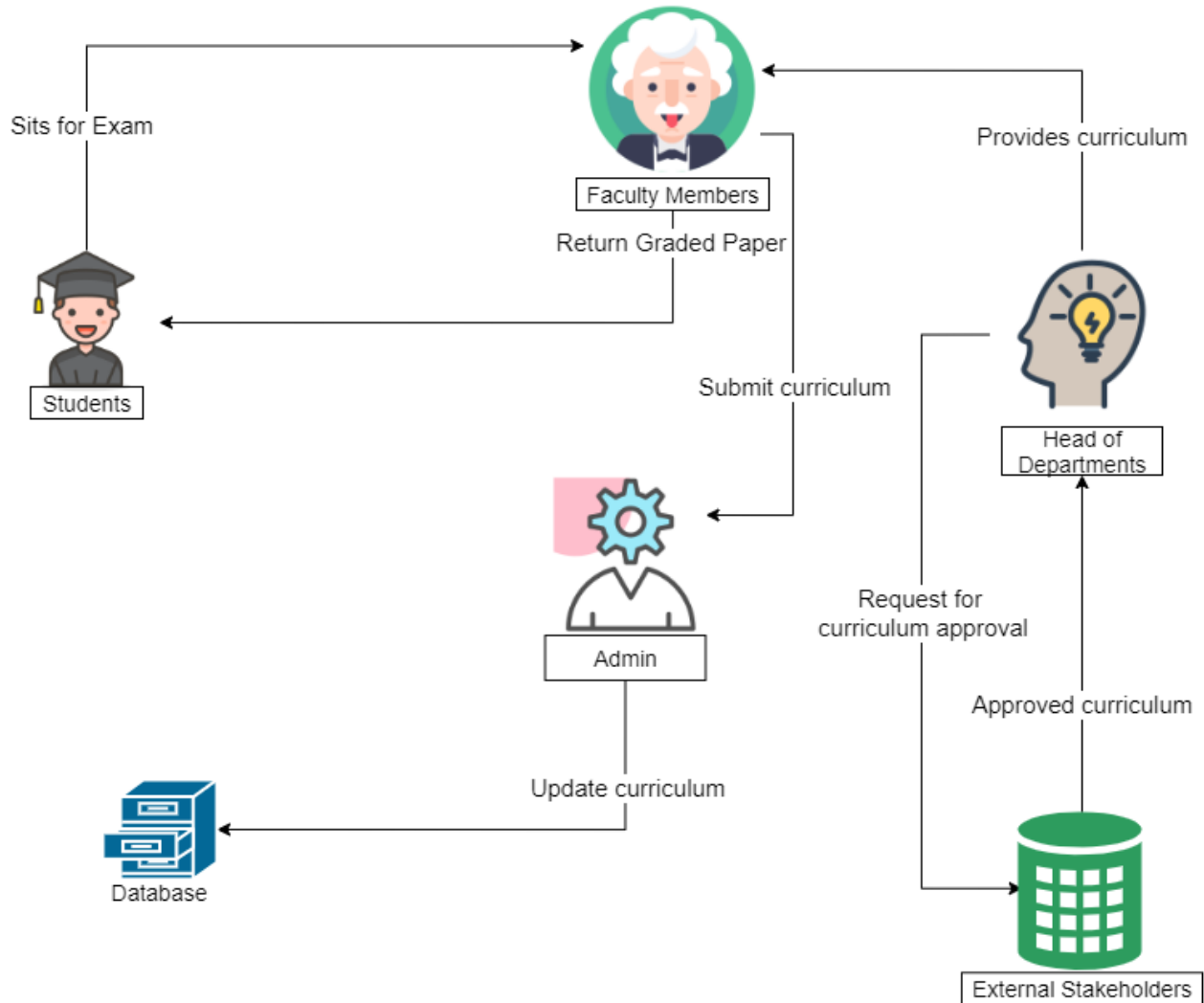
CHAPTER 02

SYSTEM DESCRIPTION

- Current Business Processes With Rich Picture: (As Is)
- Problem Statements (PS)
- Cause-Effect Analysis (Fishbone Diagram)
- Analyzing proposed system with respect to IS(TPS(Transaction Processing System), MIS(Management Information System), DSS(Decision Support System), EIS(Executive Information System))

2.1 Current Business Processes With Rich Picture: (As Is)

The current system is fully manual-based, by this we mean when the PLOs are sorted, a course outline is created by the head of each department. That is given to the faculty members who then create COs and map them individually to PLOs. Then the faculty members map COs to each assessment question and give them to the students to answer. The faculty members evaluate the students and the marks obtained are stored in Excel files for each individual course.



2.2 Problem Statements (PS)

2.2.1 Possible Cause of the Problems:

PS-01: Don't know Program Learning Outcomes (PLO) and Course Outcome (CO).

PS-02: Don't know which Program Learning Outcome (PLO) to focus on.

PS-03: They don't know how to achieve PLO through CO.

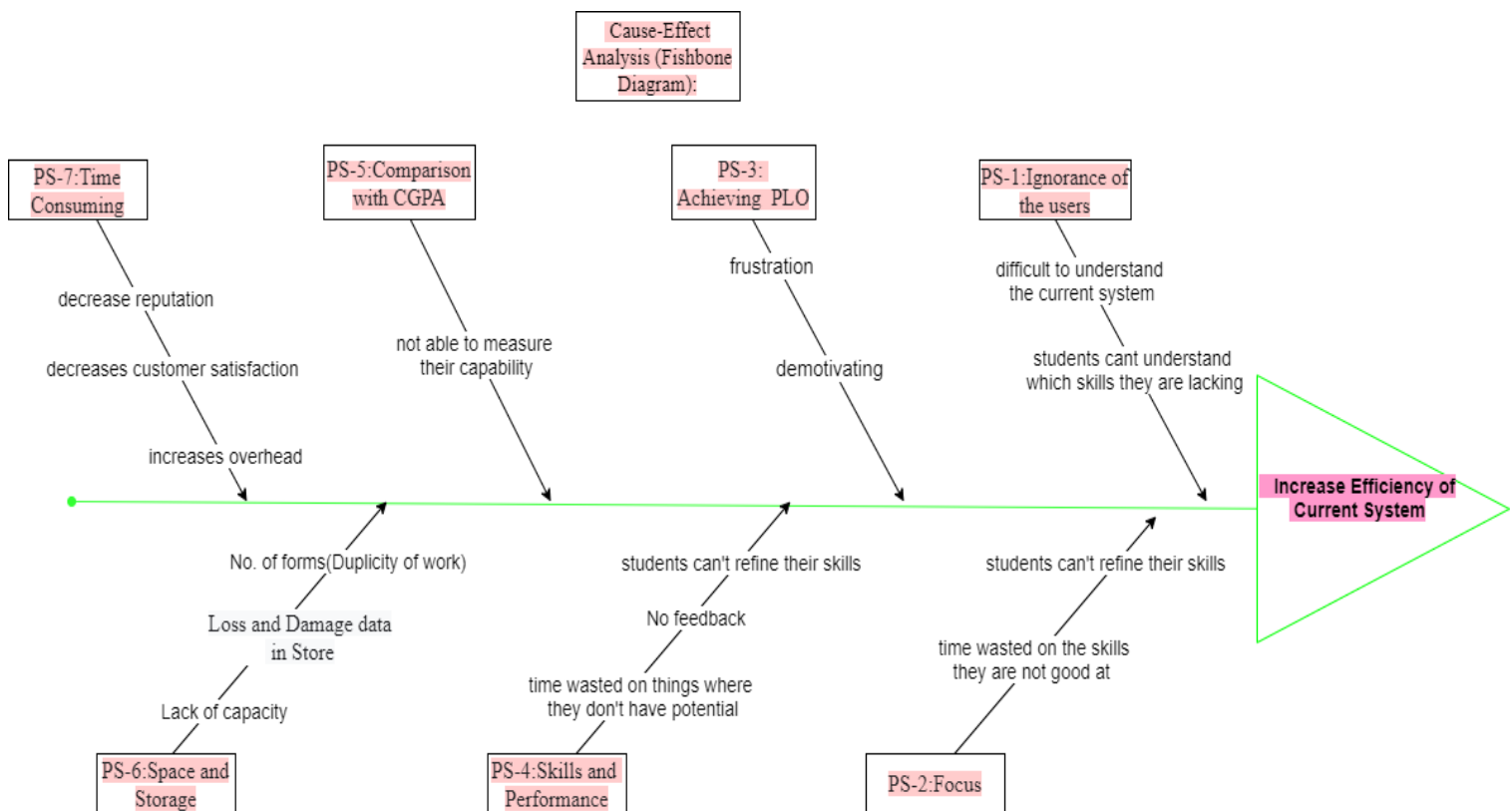
PS-04: The current system doesn't easily show a student in which segment they have skills.

PS-05: They can't compare their CGPA with the average CGPA in IUB and understand if they are doing well or falling behind.

PS-06: Takes a lot of space to store manual data.

PS-07: Manually storing data takes a lot of time.

2.2.2 Cause-Effect Analysis (Fishbone Diagram):



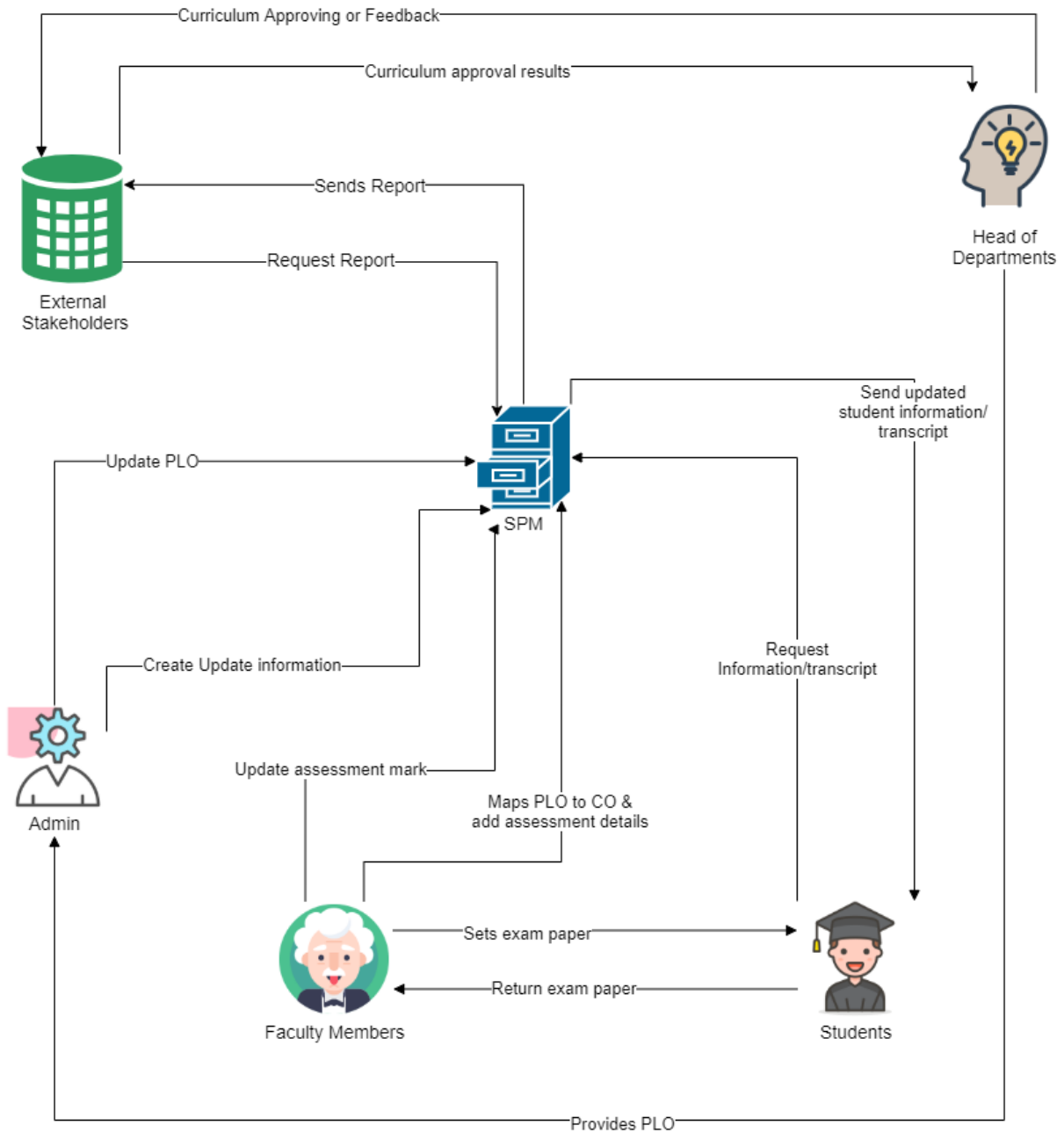
2.2.3 System Improvement Analysis:

PS	CAUSE	PROPOSED SOLUTION
01	<ul style="list-style-type: none">● Difficult to understand the current system● Students can't understand which skills they are lacking	<p>In the first class of each course, the teacher would explain about PLOs and COs in detail along with the course outline.</p> <p>The system will show a students CO for each course</p>
02	<ul style="list-style-type: none">● Students can't refine their skills● Time wasted on other skills	<p>In the new system, there will be a radar chart that will show in which PLOs a student is performing poorly.</p>
03	<ul style="list-style-type: none">● Frustration● Demotivating	<p>In the first class of each course, the teacher would explain about PLOs and COs in detail along with the course outline.</p>
04	<ul style="list-style-type: none">● Students can't refine their skills● Time wasted on things where they don't have potential● No feedback	<p>In the new system, the student will be able to check their performances in a graph/bar chart which will indicate how they are performing in all the PLOs.</p>
05	<ul style="list-style-type: none">● Not able to measure their capability	<p>In the new system, the students would have the option to compare their performance with the rest of the class/department.</p>

06	<ul style="list-style-type: none"> ● Damage in data ● Loss of data 	The new system would take very little space as it will store all the data digitally.
07	<ul style="list-style-type: none"> ● Increases Overhead ● Decreases Customer Satisfaction ● Decrease Reputation 	The new online system can be used to process all the data in a very short time as the process is automated.

2.3 Proposed System With Rich Picture: (To Be)

The new system(SPM) would allow the Faculty Members to directly access the PLOs, and they will be able to map their COs according to the PLOs and add it into the system. Throughout the term faculty members can take assessments where each question will be assigned to a CO and a PLO as well. After all the conducted assessments the faculty members update total CO marks for each student for each course into SPM. The new system (SPM) will be able to generate various charts and graphs for Students and Faculty Members and Head of the department.



2.4 Analyzing proposed system with respect to IS(Transaction Processing System), MIS(Management Information System), DSS(Decision Support System), EIS(Executive Information System)

Process of the System	Type of Information System(IS)	Justification
Student Enrollment Information	Transaction Processing System(TPS), Management Informations System (MIS)	The System will be able to update, view and compare the data of the students enrollment in every semester.
Curriculum level mapping with possible COs of the courses with the PLOs	Transaction Processing System(TPS), Management Informations System (MIS)	The data is being updated and viewed by the head of the department when he/she maps the program learning outcomes(PLOs) with the course outcomes(COs).
COs for the courses and mapping each of them with on PLOs	Transaction Processing System (TPS)	The data is being updated by the faculty of the course when he/she maps the program learning outcomes(PLOs) with the course outcomes(COs) after finalizing the COs for the courses.
Validate and Verify the Mapping	Decision Support System (DSS)	The head of the department would validate and verify the

		CO-PLO mapping such that they are distributed evenly across all the courses.
Assessments mapping with the COs	Transaction Processing System (TPS) Management Information System (MIS)	The faculty member would map the assessments with COs and can view them.
Evaluating Students Performance	Transaction Processing System (TPS) Management Information System (MIS)	The faculty member would update the marks and evaluate students based on the marks received on the assessment that was taken and calculate the percentage of the CO achieved.
Storing records of Students assessments evaluation	Transaction Processing System (TPS)	The faculty member would enter the records of the students' assessments which were evaluated.
Compute and Summarize achievement stats for the students enrolled in a course	Management Information System (MIS) & Decision Support System (DSS)	The faculty member and the head of the department would be able to generate a report based on students' performance in a course and if needed they can also take decisions on how to improve their course structure.
Prepare a set of reports to fulfill the requirements for	Management Information System (MIS)	Dean, Head of the department, Faculty &

different stakeholders		<p>Students can generate reports based on their requirements and take decisions based on the reports.</p> <p>Eg: Course Progress view, Course Verdict Table, Student Progress View, Semester Progress View, Target Vs achievement PLO department-wise &, etc.</p>
------------------------	--	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

CHAPTER 03

REQUIREMENT ANALYSIS

Details of Fact-Finding Techniques selected with justification

Detail plan of the requirement analysis

Business Requirement Document

3.1 Details of Fact-Finding Techniques selected with justification

The formal process of using research, meetings, interviews, questionnaires, sampling, and other techniques to collect information about the system problems, requirements, and preferences.

The techniques we'll be using are:

I. Sampling

The fact-finding method sampling is important as it allows us to gather documents and data information. Through this, we can collect information very efficiently. Existing course outlines of every course, the CO and PLO mapping. Course-wise student performance reports. Faculty information, student information, documents of performance records. Documents related to the problems observed by the users. Previous organization chart of IUB. Stored Data from Database. All the flowcharts, records of the stakeholders. Documents of performance records, Documents that describe the problem. Randomized selection to eliminate any sort of repeated data.

II. Questionnaires

This fact-finding method allows the analyst to collect information and opinions from a large number of respondents while maintaining uniform responses. Our project requires the participation and feedback of the customers, so knowing and understanding what they want to see being implemented in the software can be done by this method. We'll be using all of the types of questionnaire patterns to be able to analyze the responses well. Free-format questions would allow the respondents to feel more at ease in sharing their desires, while fixed-format and ranking questions would allow the analysts to find certain facts easily.

III. Interviews

The fact-finding technique interview is one of the important ways to gather information from the stakeholders. In the interview, the interviewer and stakeholders talk face to face and are able to question a person about the problems more descriptively. By interviewing the analyst can know about the whole of the system, who's job is what in the system, who are primary stakeholders, and what are the primary requirements of the system. By asking questions stakeholders can understand what to implement in the system or what to not. In an interview, it is easy to evaluate the stakeholders.

3.2 Detail plan of the requirement analysis

The first technique applied: Sampling

The analysts start off by planning how they will start collecting data. The first document we tend to seek out is the organisational chart and trace the history details of previous student transcripts, mark sheet, individual students assessment scripts, course outline, assessment plans, stored in IUB. For our system we have a desired outcome of 95% where 5% error would be acceptable, from this we can deduce the sample size using the Sample Size formula

(Sample size = $0.25 * (\text{Certainty factor} / \text{Acceptable error})^2$)

Sample Size = $0.25 * (1.96/0.05)^2 = 384.16 \sim 390$

we can sort out how many documents we'll be sampling. Next using the stratification sampling technique through which we can reduce the variance of the estimates by spreading out the sampling

The second technique applied: Questionnaires

The analyst designs a questionnaire by determining what facts and data will be essential to make the system. Next, we determine in which format the questions should be asked, based on our system a mixture of free and fixed formatted questions would allow the users of the system to understand what is being changed and to feel more in control of what they want to see being implemented into the system. While making the questionnaire we must remember to not ask personal biased questions and opinions to not lead them into answering in what we think is more suitable.

For example, asking the faculty member for a particular CO, how many assessments would they like to take?

Also ranking a set of questions would allow the user to show how they feel about the system. For example, asking the students to evaluate the current system on a scale of 1-5, 1 being extremely satisfied and 5 being extremely dissatisfied with the current manual system.

After a set is completed using a sample of respondents to test out the questions to check for problems that might arise from the questionnaire, after editing the errors again the a questionnaire is sent out to the stakeholders.

Questionnaire Form:

https://docs.google.com/forms/d/e/1FAIpQLScJX4Wtr3D8kbK9do0czG6oFudS7nvXV67IngIrc9i_oYewsw/viewform

The third technique applied: Interview for the key stakeholder, Head of the Department, Faculty Members.

Interviews are a formal setting where they are able to discuss their problems and desires of the system with the analyst. The appointment for the interview is taken beforehand.

Planning for the interview and preparing questions that won't make the interview too long (approx 1hr) is ideal and so it won't feel like the interviewee is being questioned about their lacking but the systems' lackings. Make sure the interviewees are granted permission for the interview by their supervisor. Knowing who the person you are interviewing is important in order to greet them well. Preparing beforehand a checklist of what questions to ask them like the interview guide given below which contains open-ended questions that allows room for discussion and follow-up questions as well. Avoiding any kind of threatening or criticizing questions and biased questions.

Also making sure that the internet connection is good as the meetings will be conducted on google meet. At the start of the interview make sure to let them know that you appreciate their time and that they allowed the analyst to conduct the interview. During the interview, make sure to keep notice of expressions and maintain good eye contact. Take notes of the verbal and nonverbal responses and add follow-up questions.

At the end of the interview make sure to thank the interviewee for their time again and let them know you'll be providing feedback and a summary of the interview to them.

Interview Guide:

Interviewee: Head of the department, Faculty Members Date: 15/11/2021 Time: 08.00am Place: Google Meet. Subject: Student Performance Monitoring System (SPM)		
Time Allocated	Interviewer Question or Objective	Interview Response
1 to 2 min	Objective Open the interview meet Link: <ul style="list-style-type: none">• Introduce ourselves• Thanking every interviewee• Present the purpose of the interview -- To have a better understanding of how the currently existing system is working.	
5min	Question 1: What are the difficulties that you face with the current system? Follow-up: <i>Justification:</i> <i>Asking this would help us in understanding the problems that the student is facing.</i>	
5min	Question 2 : What are the things that you would like to see being implemented if there is a new system? Follow-up: <i>Justification:</i> <i>Asking this would help us in understanding what to implement and what not to implement in the system.</i>	

3min	<p>Question 3 :</p> <p>How are the students able to see their performance in a course?</p> <p>Follow-up:</p> <p><i>Justification:</i></p> <p><i>This question allows us to know how effective the current situation is.</i></p>	
4min	<p>Question 4:</p> <p>How are the CLOs and POs being mapped with a course?</p> <p>Follow-up:</p> <p><i>Justification:</i></p> <p><i>Asking this will help us in mapping the COs and PLOs in the system</i></p>	
4min	<p>Question 5:</p> <p>What kind of charts do you want to see in the new system?</p> <p>Follow-up:</p> <p><i>Justification:</i></p> <p><i>It is easier to visualize and evaluate</i></p>	
4min	<p>Question 6:</p> <p>How do you feel about the students being allowed to view their CO and PLOs without the permission of their respective faculty?</p> <p>Follow-up:</p> <p><i>Justification:</i></p> <p><i>This question would allow us to know who will be granted access to that system</i></p>	

4min	<p>Question 7:</p> <p>How is the student being evaluated based on their performances in the course?</p> <p>Follow-up:</p> <p><i>Justification:</i></p>	
4min	<p>Question 8 :</p> <p>What are the reports that you want to see in the new system?</p> <p>Follow-up:</p> <p><i>Justification:</i></p> <p><i>Asking this would help us in understanding what the higher authorities want to see when they will make decisions.</i></p>	
4min	<p>Question 9:</p> <p>How are the students notified in which CO and PLO they are performing poorly?</p> <p>Follow-up:</p> <p><i>Justification:</i></p> <p><i>Asking this would help us in understanding how the students will know in which segments they need to focus more.</i></p>	
1 min.	<p>Objective</p> <p>Conclude the interview:</p> <ul style="list-style-type: none"> • Thanking all the interviewees for their cooperation and ensuring them that they will receive a copy of what transpired during the interview. 	
40 minutes	Time allotted for questions and objectives	

10 minutes	Time allotted for follow-up questions and redirection	
50 minutes	Time allotted for interview ()	
General Comments and Notes:		

3.3 Business Requirement Document

3.3.1 Purpose

The purpose of the Business Requirement Document(BRD) is to analyze the current method of how IUB monitors the student's performances and propose a new system (Students Performance Monitoring System) that can allow the students to monitor their own performances, make an analysis of data and generate reports easily so that IUB can make decisions more efficiently in order to improve as a whole.

3.3.1 Overview

Our goal is to deliver a project that will design and build to help universities to promote a productive way for student performance monitoring systems. The main idea of our project is to evaluate the COs achieved and map to a PLOs achieved by each student in each of the enrolled courses as that would be necessary for monitoring the student performance. We intend to provide a wholesome experience for students, faculty members, heads of departments, and all the higher authorities.

3.3.3 Customer and Primary Stakeholders Analysis:

The Primary Stakeholders for this system would be the Students, Faculty Members, Head of Departments, Additional Stakeholders are VC/Trustees, parents. And the external stakeholders include UGC/IEB/BEATE/IQAC.

1. Stakeholders with their responsibilities

Primary Stakeholders Analysis:

a. Students: Primary Stakeholders - Defenders

Students will use the system directly as they will see their performance on their respective courses. How many PLOs they have achieved so far

B. Faculty Members: Primary Stakeholders - Defenders

Faculty will use the system directly as they will map the CO and PLO and give marks etc

C. head of departments: Primary Stakeholders - Promoters

Deans will use the system directly as they can monitor and compare the performance of each department

Additional Stakeholders Analysis:

D. Trustees/VC: Key stakeholders-Promoters

They use the system to monitor performance and make decisions accordingly

E .Parents: Key Stakeholders - Apathetic

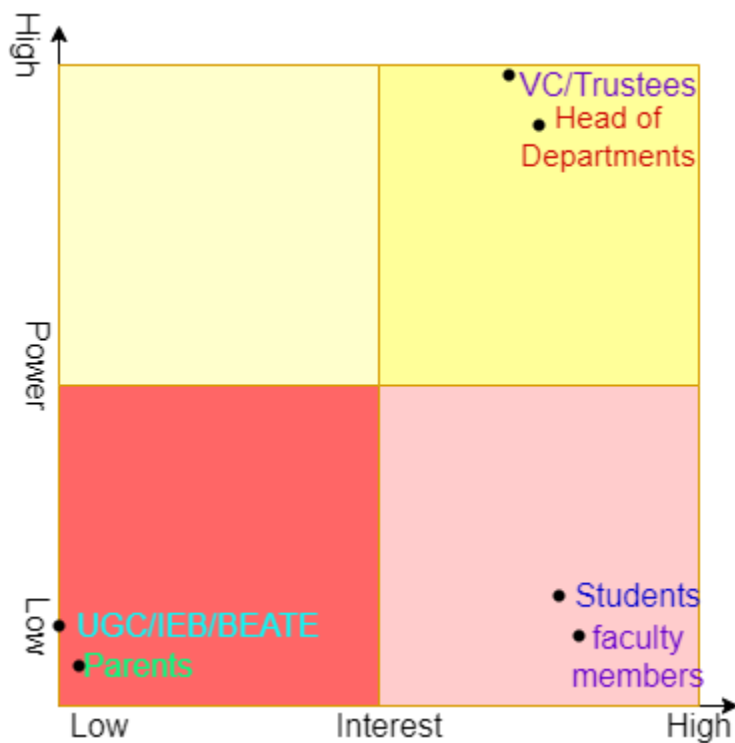
They are not directly involved in the system but they have an influence on it

F. UGC/IEB/BEATE personnel: Key Stakeholders - Apathetic

They are the policymakers and they can influence university programs.

2. Stakeholder analysis based on interest, knowledge, power.

High Influence, Low Interest (Latent)	High Influence, High Interest (Promoters) VC/Trustees, Head of Departments
Low Influence, Low Interest (Apathetic) Parents, UGC/IEB/BEATE	Low Influence, High Interest (Defenders) Students, Faculty Members



3.3.4 SCOPE

The SPM Software is being developed to automate the manual process of the current system. It will greatly reduce the time required to work on the processes. This system would help the students, faculty as well as the head of the departments greatly.

The SPM software stores the marks received of the students during their assessment of a particular course and those assessments are mapped with a particular Course Outcomes(CO) which are mapped with Program Learning Outcomes(PLO). Then it can evaluate the student's performance based on the percentage of marks they received and it will inform the students how they are performing in a course and also on which particular PLO/CO they need to focus on. Every stakeholder who will use this system will have access to the software. How much they can access the software would be based on the type of user who is logging in to the system. The software will have charts, graphs, and tables by which the users can have a much better analysis.

This project is been focused on running on all types of universities that follow the Outcome-Based Education (OBE) rules & regulations

3.3.5 Goals, Objectives, and Outcome Measures

Objective	Desired Outcome	Measurement	Impact
Goal1: Access to Students performance reports			
Student-wise PLO achievement	The student and Faculty can check the students performance on a chart and analyze it	The system stores the performances of the student from all the courses and averages the percentage of PLO achieved and generates a chart or a table	It Allows the Students or the faculty to check whether they are performing bad or good at a particular PLO and if they doing bad at a particular PLO they can focus on it
Department-wise PLO performance	The head of the department and the Dean can check the performances of a department	The system stores the performances of the students and then shows the average of every student in that department of how they are performing in every single PLO.	It will allow the dean and the head of the department to see how their department is performing in comparison to other departments.
Course-wise PLO analysis	The student and Faculty can check how much percentage of PLO was achieved from each course.	The system stores the percentage of PLO achieved from every course.	It will allow students to check on which course they need to improve on to have a higher percentage of PLO.

Goal 2: Access of CLO & PLO target vs Achieved performances			
Program-wise PLO target vs Achievement	The head of the department and the Dean can check the performances of a department	The system stores the performances of the students and then it will count how many students achieved or failed/attempted that particular PLOs respective to a particular Program.	It will allow the dean and the head of the department to see how their students in a particular program are performing in comparison to other programs.
Student Progress View	The student can check from a graph as how many PLO they are expecting to achieve in that semester vs to how much they actually have achieved at the end of the semester	The system stores the performances of the students and then it will count how many PLOs achieved or failed/attempted on that particular semester	It will allow the students to check how much they have actually progressed through the semester vs the expected progress.
Semester-wise department-progress view	The head of the department can check from a bar-chart as how many students have actually achieved the specific PLO	The system stores the performances of the students and then it will count how many students achieved or failed/attempted that particular PLOs respective to a particular Department.	It will allow the head of department to have a better understanding on how the students in that department are performing and completing their targeted outcome in comparison with other departments.

Instructor-wise Student performance view	The head of the department and the faculty can check from a chart as how the students are performing in the course of that particular Instructor	The system stores the performances of the student from all the courses that particular Instructor took and shows the PLO percentage achieved which generates a chart or a table	It will allow the head and faculty member to see how the students are performing on his/her courses so he can understand on which PLO should he/she focus on also on how his/her teaching style had an impact
------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

3.3.6 Enterprise Need/Justification

At the current moment, the system is manual and it is very time-consuming for all the users who are currently performing the task required to run the system. The Student performance monitoring system is much needed for the institution which will greatly improve the efficiency of the processes which were done before. In the current system the head of the department has to manually map all the PLOs with the respective courses and then it goes to the faculty member. The faculty member then has to map the COs with the course outcomes and then map those COs with the PLOs manually. The faculty member also needs to store manually the marks the students received during their assessments which also are mapped manually to the COs. Students are unable to know in which PLOs they should focus on and even if they want to check their performance they have to manually check it from the faculties. All of these processes waste a lot of time and become complicated as it is done on a huge scale. The SPM system can make all of these processes automated and also could generate reports and charts.

The Student Performance Monitoring (SPM) is based on the marks which the students obtained on their assessments on a particular course throughout the semester. Each assessment that the students give needs to be stored and then CO percentages and PLO percentages obtained need to be calculated and stored as well. All of these things done manually could be done on SPM efficiently and it could also generate reports on the performance of the students. The SPM would be able to produce reports on student-wise performance, course-wise performance, department-wise performance & program-wise performance. The Students-wise performance would help students to focus on the particular PLOs they need to improve their performance on. Course-wise performance would help the faculty and the head of the department to see how the students are performing in a course in a particular PLO which will help them to understand on which topic/PLO they should focus on. Department-wise and program-wise performance reports would help the Dean and the Head of the department to check how the students are performing in comparison to other departments and programs. The system would also show the expected vs actual PLO achieved performance graphs and charts for the Students which will also give them a clear idea of their performances. The head of the department would also be able to check the attempted vs actual PLOs percentage achieved of his/her department which will help to understand the performance of the department. The SPM would also be able to show instructor-wise course performance charts and graphs which will help the instructor to understand which topic or the PLO should he/she should focus on and as well how he can improve the course.

3.3.7 List of Features:

- Initial mapping of possible COs of the courses with the PLOs are updated in SPM.
- Finalizing the COs for the courses and mapping each of them with one PLO.
- Verify and validate the mapping.
- Assessments mapped to the COs.
- Faculty Members evaluate students and update marks in SPM.
- Students' assessments evaluations are recorded and stored.

- SPM generates transcripts to be viewed by students, faculty members, and heads of the departments.
- SPM can load department-wise, school-wise enrollment rates which can be viewed by the VC, Head of the department, Dean of the department, Faculty Members.
- Students, Faculty Members, Head of the department, Dean of the department, VC can view department-wise, program-wise comparisons of students' performance.
- Students, Faculty Members, Head of the department can see the total PLO percentage for each PLO achieved that corresponds with each CO among all the courses the student has completed.
- Students, Faculty Members, Head of the department can view the PLO achieved of a student for each course a student has taken.
- Students, Faculty Members, Head of the department can view the comparison report of PLO achieved percentage vs PLO attempted percentage.
- Students, Faculty Members, Head of the department can view the summary of CO-PLO
- Achievement report for a chosen course, program, department & School.
- Students, Faculty Members, Head of the department can view the prediction of course-wise student performance based on the faculty.

3.3.8 Feature-wise Business Requirements

Business Needs/Owner Requirements

BR No.	Feature	Module	Details	Priority *
BR01	Initial mapping of possible COs of the courses with	PLO-CO mapping module	The head of the departments get the PLOs from UGC and	5

	the PLOs are updated in SPM		update them in SPM	
BR02	The COs for the courses and mapping each of them with one PLO	Mapping module	Faculty Members map COs for their course to the PLOs in SPM	5
BR03	Verify and validate the mapping	Verification Module	SPM can verify whether the mapping of CO PLO is distributed evenly	5
BR04	Assessments mapped to the COs	Assessment Module	Faculty Members set question papers based on the COS in SPM	5
BR05	Faculty Members evaluate students and update marks in SPM	Evaluation Module	After the examination, the students submit their papers and the faculty members grade their papers accordingly	3
BR06	Students assessments evaluations are recorded and stored	Data Storage module	SPM will store the grades of the Students	5
BR07	SPM generates transcripts to be viewed by	Evaluation Report module	SPM will generate a transcript for the students that will be	4

	students, faculty members, heads of the departments		based on their academic performances	
BR08	SPM can load department-wise, school-wise enrollment rate which can be viewed by the VC, Head of the department, Dean of the department, Faculty Members	Enrollment module	SPM keeps count of the number of students enrolled in each school and department per semester with a visual comparison of school-wise and department-wise	5
BR09	Students, Faculty Members, Head of the department, Dean of the department, VC can view department-wise, program-wise comparisons of students' performance.	Students performance module	The system will allow the stakeholders to graphically view a trend of students performance not only individually but also can be viewed with a comparison to schools, programs, departments within a given period of time.	5
BR10	Students, Faculty Members, Head of the department can see the total	CO-PLO module	SPM allows the users to view the total PLO percentage of which is calculated after PLO is	4

	PLO percentage for each PLO achieved that corresponds with each CO among all the courses the student has completed.		achieved that corresponds with the COs of the course.	
BR11	Students, Faculty Members, Head of the department can view the PLO achieved of a student for each course a student has taken	PLO achieved module	SPM stores the data and updates PLO achieved by the student and allows the stakeholders to view PLOs they have achieved	4
BR12	Students, Faculty Members, Head of the department can view the comparison report of PLO achieved percentage vs PLO attempted percentage	PLO achieved versus PLO attempted module	SPM stores the PLOs and allows the stakeholders to analyze using relational database model using proper SQL operations their PLO achieved vs attempted comparisons individually.	5

BR13	Students, Faculty Members, Head of the department can view the summary of CO-PLO Achievement report for a chosen course, program, department & school.	CO-PLO achievement summary module	SPM will allow its stakeholders to view and analyze the CO-PLO summary in a tabular format	4
BR14	Students, Faculty Members, Head of the department can view the prediction of course wise student performance based on the faculty	Student Performance Prediction module	SPM can predict the performance of students based on the faculty of the course by learning from the past outcomes of those courses, which then the stakeholders can view in a chart format	4

Additional Reporting Requirements

The additional reporting requirements we needed for our system

- Report_outlineAut2021

- CSE_307_BRS-Sample_V1.2
- Database_report_final
- OBE_mark_sheet
- Curriculum PLO-CO mapping

3.3.9 Related Project and Work Effort

The project named Student Performance System Developed (SPS) by Ideal Consulting which is almost similar to our system (SPMS). SPS facilitates the process of allocating services within a Multi-Tiered System of Supports (MTSS), determining responsiveness to universal, strategic, and/or intensive instruction, developing and monitoring specific, measurable, relevant student goals, and determining entitlement for special education services. In addition, SPS allows teachers and specialists a user-friendly platform for using research-based normative growth rates to examine student learning as a component of an educator evaluation platform.

3.3.10 Other Considerations

3.3.10.1 Alternatives:

We are assuming that there is no system. All the work was done manually. Now we are building a new system. So, there are no alternatives.

3.3.10.2 Assumptions:

- IUB Board of trustee's findings and resources to develop the requested improvements will be provided for upgradation, maintenance, and operations.
- The requested improvements will provide more efficiency in monitoring student performance.

- If a phased approach to development is utilized, any needed functionality that will not be improved immediately will still be available and interfaced appropriately.

3.3.10.3 Dependencies:

- UGC is responsible for approving/disproving a proposed curriculum by universities.
- IEB is responsible for providing PLOs for a program to the Higher Authority of the university
- BAETE provides accreditation to a program that is offered by an institution of higher learning approved by an appropriate authority, viz., the UGC, or any other appropriate government body.

3.3.10.4 Constraints

- Due to the lack of proper guidelines, it is quite difficult to manipulate data while developing a proper system that can evaluate and monitor student performance.
- It is difficult to find an ideal method of assessment and mark distribution policy.

3.3.10.5 Business Risks and Mitigation

Business Risks: For users, it may be difficult to understand their task in the system as it is a new system.

Mitigation: Training the involved users beforehand regarding their dedicated tasks and responsibilities

Business Risk: Data loss due to backend services such as database malfunction or unwanted deletion.

Mitigation: Setting up a daily updated backup database with limited access only given to top-level management and dedicated stakeholders.

Business Risks: insecurity of data and unauthorized access

Mitigation: Implementation of security measures and protocols while the system is being developed and careful account creation with a strong password for individual users.

Chapter 04:

Feasibility Analysis

Purpose

Candidate Matrix (Technical Feasibility & Operation Feasibility)

Economical feasibility

Feasibility Analysis Matrix

\

4.1 Purpose

The purpose of feasibility analysis is to provide information to IUB on whether or not they should pursue the course of action. It is the study to understand the desirability and practicality of this project. It also determines how much resources IUB would need to complete the project or could be done with the resources that are available. The institution needs to know whether their project would be successful or not before investing which is why feasibility analysis becomes important.

4.2 Candidate Matrix (Technical Feasibility & Operation Feasibility)

Characteristics	Candidate 1	Candidate 2	Candidate 3
Portion of System Computerized	CO-PLO Mapping, Student Performance	Same as candidate 1	Same as candidate 1

Brief description of that portion of the system that would be computerized in this candidate.	Evaluation, Various Performance Report generation would be computerized		
Benefits Brief description of the business benefits that would be realized for this candidate.	This Solution would make the process of the current system more efficient.	Same as candidate 1.	Same as candidate 1.
Servers and Workstations A description of the servers and workstations needed to support this candidate.	Core i7, Microsoft windows 10 class servers, and workstations.	Same as candidate 1.	Same as candidate 1.
Software Tools Needed Software tools needed to design and build the candidate (e.g., database management system, emulators, operating systems, languages). Not generally applicable if applications software packages are to be purchased.	Python Django and MS Access for customization of package to provide report writing and integration	Java and MS Access for customization of package to provide report writing and integration	VS code, windows 10, PHP Laravel
Application Software A description of the software to be purchased, built, accessed, or some combination of these techniques.	Custom solution	Same as candidate 1	Same as candidate 1
Method of Data Processing	client/server	Oracle	Same as Candidate 1.

Generally some combination of online, batch, deferred batch, remote batch, and real time.			
Output Devices and Implications A description of output devices that would be used, special output requirements (e.g., network, preprinted forms, etc.), and output considerations (e.g., timing constraints).	HP 24mh monitor, HP Laser Printer, Router, Touch screen.	Same as candidate 1.	Same as candidate 1.
Input Devices and Implications A description of input methods to be used, input devices (e.g., keyboard, mouse, etc.), special input requirements (e.g., new or revised forms from which data would be input), and input considerations (e.g., timing of actual inputs).	Keyboard,touch screen panel, Router and mouse	Keyboard and mouse.	Same as candidate 1.
Storage Devices and Implications Brief descriptions of what data would be stored, what data would be accessed from existing stores, what storage media would be used,	MySQL Server	Oracle server	MS SQL Server

how much storage capacity would be needed, and how data would be organized.			
-----------------------------------------------------------------------------	--	--	--

Economical Feasibility

Cost Analysis For Candidate 1 (Solution 1):

Development Costs

Personnel:

Designation	Number	Amount(BDT)
Project Manager (1875 BDT/hr)* 640 hrs	1	12 lac
Systems Analysts (1250 BDT/hr)* 320 hrs	2	4 lac *2=8 lac
Programmer/Analysts (625 BDT/hr)*1600 hrs	3	10 lac*3= 30 lac
Bug Tester (625 BDT/hr)*800hrs	1	5 lac

GUI Designer (625 BDT/hr)*480 hrs	1	3 lac
Telecommunications Specialist (625 BDT/hr)*160 hrs	1	1 lac
System Architect (625 BDT/hr)*320 hrs	1	2 lac
Database Specialist (750 BDT/hr)* 160 hrs	1	1.2 lac
System Librarian(625 BDT/hr)* 320 hrs	1	2 lac

Expenses:

Smalltalk training registration(All Stakeholders) (50000 BDT)	2	1 lac
------------------------------------------------------------------	---	-------

New Hardware & Software:

DBMS server software	1	3 lac
DBMS client software	4	50000*4=2 lac

Total Development Costs:(7,020,000 BDT + 40% 2,808,000) = 9,828 ,000 BDT

Projected Annual Operating Costs:

The maintenance cost will be 10% of the development cost.

Summary:

Candidate 1:

- Solution: Web portal with Mobile App
- Technology: python Django with MySQL Server Database

- Development cost: 9828000 BDT
- Projected maintenance cost: 10% of development cost, the percentage increase in maintenance cost at the end of each year: 2.25%
- Quantified projected benefits at the end of each year: 45.79% of development cost and percentage increase at the end of each year: 5%.

Justification: Every semester a faculty member spends around 4 hours analyzing the assessment he/she takes per course. There are 2 assessments per semester and per year there are 3 semesters. So overall per semester, a faculty member would save 8 working hours that he/she would have spent to analyze and generate the reports for students' performances.

Per assessment = 3hours

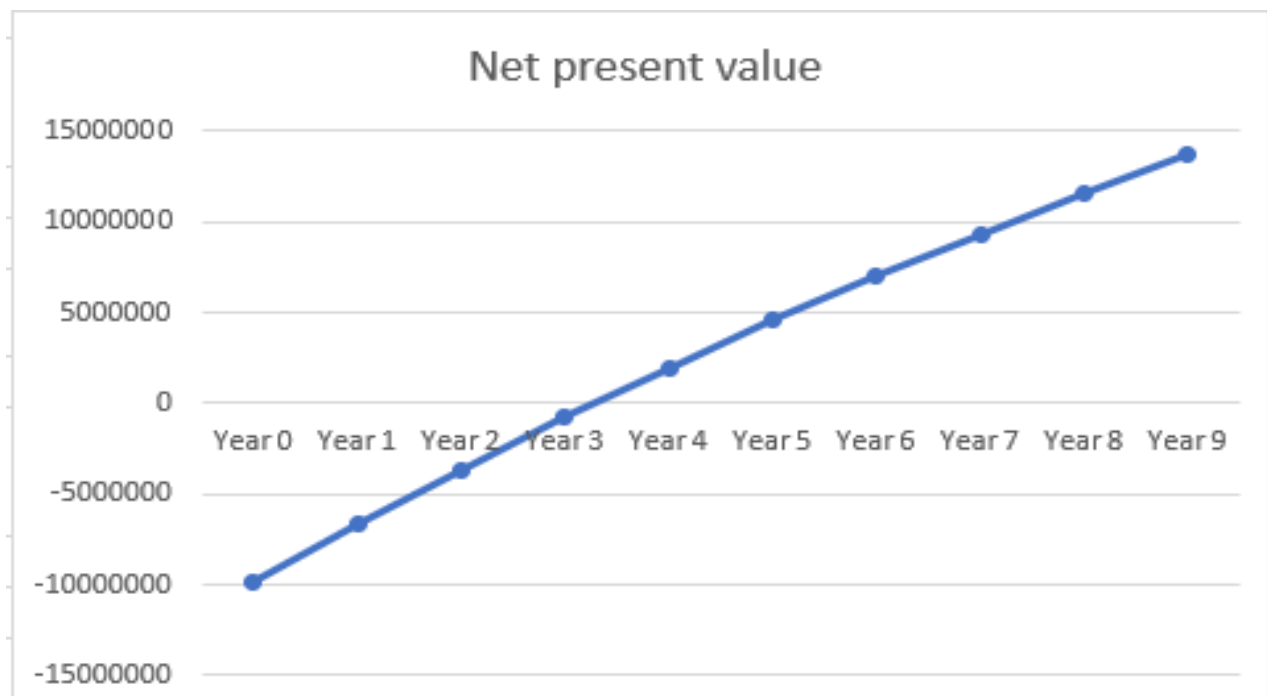
2-4hours for analysis

200 faculty *4 hours *2 assessments per semester *3 *937.5tk/hr = 4500000tk per year.

Percentage Calculation = $100\% - (9828000 - 4500000 / 9828000 * 100)\% = 45.79\%$

- Duration: 12 months

Candidate-1										
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Development cost	9828000									
Operation & Maintenance cost: (10%) (2.25% yearly increment)		982800	1004913	1027524	1050643	1074282	1098454	1123169	1148440	1174280
Discount factors for 10%	1	0.9	0.81	0.729	0.6561	0.59049	0.531441	0.478297	0.430467	0.38742
Time-adjusted costs	9828000	884520	813979.5	749064.7	689326.8	634352.9	583763.3	537208.2	494365.8	454940.1
Cumulative time-adjusted costs	9828000	10712520	11526500	12275564	12964891	13599244	14183007	14720215	15214581	15669521
Benefits deived from operation of new system		4500241	4725253	4961516	5209592	5470071	5743575	6030754	6332291	6648906
Discount factors for 10%	1	0.9	0.81	0.729	0.6561	0.59049	0.531441	0.478297	0.430467	0.38742
Time-adjusted benefit		4050217	3827455	3616945	3418013	3230022	3052371	2884491	2725844	2575922
Cumulative time-adjusted cost+ benefits	0	4050217	7877672	11494617	14912630	18142653	21195024	24079515	26805359	29381281
Net present value	-9828000	-6662303	-3648827	-780947	1947740	4543409	7012017	9359299	11590777	13711760



Cost Analysis For Candidate 2 (Solution 2):

Development Costs

Personnel:

Designation		Amount(BDT)
Project Manager (1875 BDT/hr)* 320 hrs	1	6 lac
Systems Analysts (1250 BDT/hr)* 320 hrs	2	4 lac *2=8 lac
Programmer/Analysts (625 BDT/hr)*800 hrs	3	5 lac*3= 15 lac
Bug Tester (625 BDT/hr)*240hrs	1	1.5 lac
GUI Designer (625 BDT/hr)*240 hrs	1	1.5 lac
System Architect (312.5 BDT/hr)*320 hrs	1	1 lac
Database Specialist (750 BDT/hr)* 160 hrs	1	1.2 lac
System Librarian(187.5 BDT/hr)* 800 hrs	1	1.5 lac

Expenses:

Smalltalk training registration(All Stakeholders) (50000 BDT)	1	50,000
------------------------------------------------------------------	---	--------

New Hardware & Software:

Development Server	1	7 lac
DBMS server software	1	5 lac
DBMS client software	1	50000*2=1 lac

Total Development Costs:(4,920,000 BDT + 30% 1,476,000) = 6,396,000 BDT

Projected Annual Operating Costs:

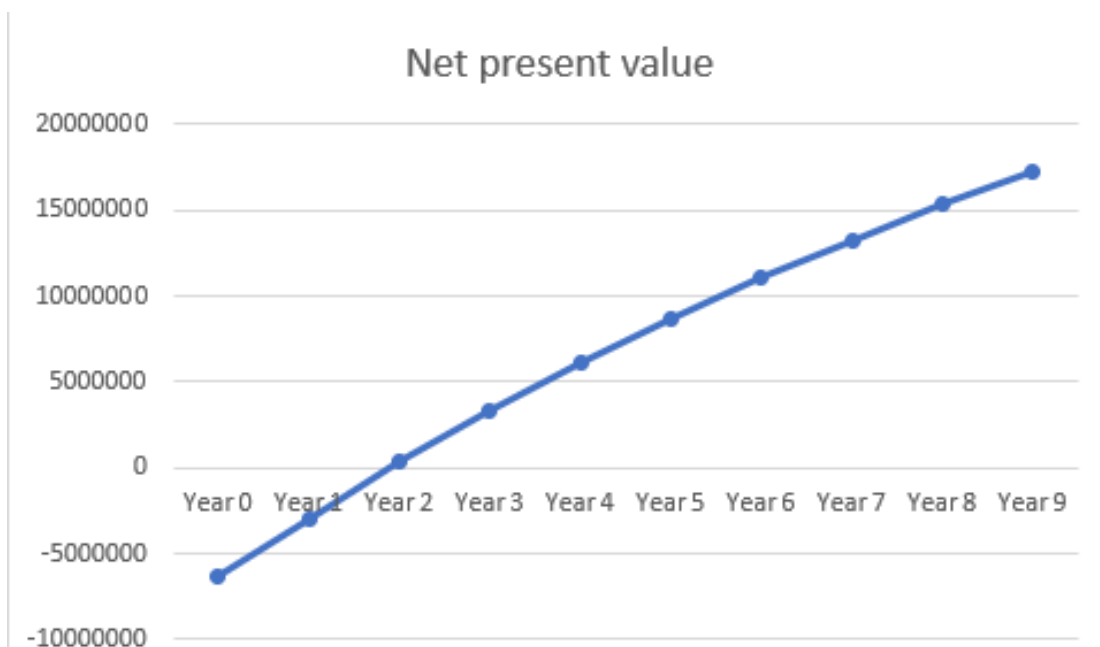
The maintenance cost will be 10% of the development cost.

Summary:

Candidate 2:

- Solution: Desktop-based tool
 - Technology: JAVA with Oracle Server
 - Development cost: 6,396,000 BDT
 - Projected maintenance cost: 10% of development cost, a percentage increase in maintenance cost at the end of each year: 2%
 - Quantified projected benefits at the end of each year: 70.37% of development cost
percentage increase at the end of each year: 3%
- Percentage Calculation = $100\% - (6,396,000 - 4,500,000 / 6,396,000 * 100)\% = 70.37\%$
- Justification: Same as candidate 1
- Duration: 6 months

Candidate-2										
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Development cost	6396000									
Operation & Maintenance cost: (10%) (2% yearly increment)		639600	652392	665439.8	678748.6	692323.6	706170.1	720293.5	734699.4	749393.3
Discount factors for 10%	1	0.9	0.81	0.729	0.6561	0.59049	0.531441	0.478297	0.430467	0.38742
Time-adjusted costs	6396000	575640	528437.5	485105.6	445327	408810.2	375287.7	344514.1	316264	290330.3
Cumulative time-adjusted costs	6396000	6971640	7500078	7985183	8430510	8839320	9214608	9559122	9875386	10165717
Benefits deived from operation of new system		4500865	4635891	4774968	4918217	5065763	5217736	5374268	5535496	5701561
Discount factors for 10%	1	0.9	0.81	0.729	0.6561	0.59049	0.531441	0.478297	0.430467	0.38742
Time-adjusted benefit		4050779	3755072	3480952	3226842	2991283	2772919	2570496	2382850	2208902
Cumulative time-adjusted cost+ benefits	0	4050779	7805851	11286802	14513644	17504927	20277846	22848342	25231192	27440093
Net present value	-6396000	-2920861	305773	3301619	6083134	8665607	11063238	13289220	15355805	17274377



Cost Analysis For Candidat 3 (Solution 3):

Development Costs

Personnel:

Designation		Amount(BDT)
Project Manager (1875 BDT/hr)* 746 hrs	1	14 lac
Systems Analysts (1250 BDT/hr)* 320 hrs	2	4 lac *2=8 lac
Programmer/Analysts (625 BDT/hr)*1700 hrs	3	1062500*3= 3,187,500
Bug Tester (625 BDT/hr)*850hrs	1	531,250
GUI Designer (625 BDT/hr)*480 hrs	1	300,000
Telecommunications Specialist (700 BDT/hr)*160 hrs	1	112,000
System Architect (625 BDT/hr)*320 hrs	1	200,000
Database Specialist (750 BDT/hr)* 160 hrs	1	120,000
System Librarian(625 BDT/hr)* 400 hrs	1	250,000

Expenses:

Smalltalk training registration(All Stakeholders) (50000 BDT)	2	1 lac
------------------------------------------------------------------	---	-------

New Hardware & Software:

Development Server	1	5 lac
DBMS server software	1	3 lac
DBMS client software	4	50000*4=2 lac

Total Development Costs:(8,000,750 BDT + 45% 3,600,337.50) = 11,601,087.50 BDT ~ 11,601,087

Summary:

Candidate 3:

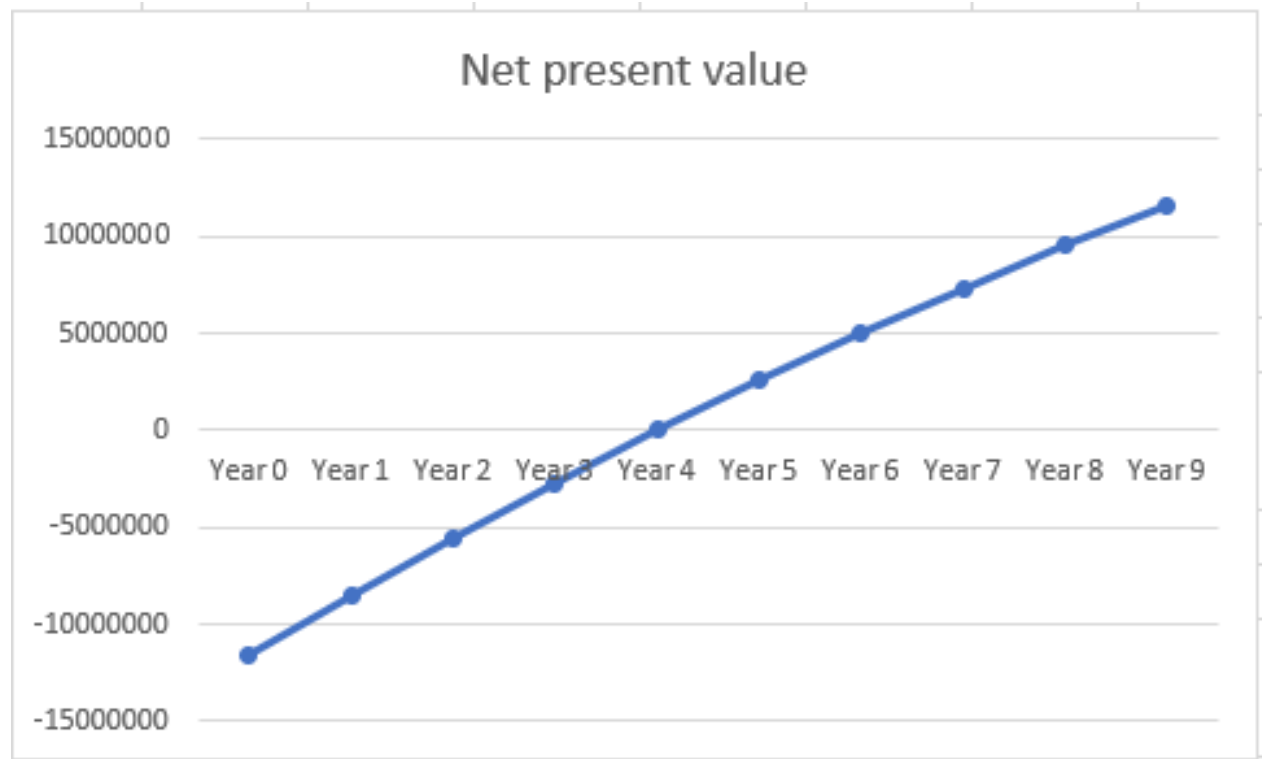
- Solution: Web-based portal
- Technology: PHP Laravel with MySQL Server Database
- Development cost: 11,601,087.50 BDT
- Projected maintenance cost: 9% of development cost, the percentage increase in maintenance cost at the end of each year: 1.5%
- Quantified projected benefits at the end of each year: 38.79% of development cost
percentage increase at the end of each year: 5%

Percentage Calculation = $100\% - (11,601,087 - 4500000 * 100)\% = 38.79\%$

Justification: Same as candidate 1

- Duration: 14 months

Candidate-3										
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Development cost	11601087									
Operation & Maintenance cost: (9%) (1.5% yearly increment)		1044098	1059759	1083604	1107985	1132915	1158405	1184469	1211120	1238370
Discount factors for 10%	1	0.9	0.81	0.729	0.6561	0.59049	0.531441	0.478297	0.430467	0.38742
Time-adjusted costs	11601087	939688	858405	789947.2	726948.9	668974.8	615624	566528	521347.4	479769.9
Cumulative time-adjusted costs	11601087	12540775	13399180	14189127	14916076	15585051	16200675	16767203	17288550	17768320
Benefits deived from operation of new system		4500062	4725065	4961318	5209384	5469853	5743346	6030513	6332039	6648641
Discount factors for 10%	1	0.9	0.81	0.729	0.6561	0.59049	0.531441	0.478297	0.430467	0.38742
Time-adjusted benefit		4050055	3827302	3616801	3417877	3229894	3052249	2884376	2725735	2575820
Cumulative time-adjusted cost+ benefits	0	4050055	7877358	11494159	14912035	18141929	21194178	24078554	26804289	29380109
Net present value	-11601087	-8490720	-5521822	-2694969	-4040.78	2556878	4993503	7311351	9515739	11611788



4.3 Feasibility Analysis Matrix:

Feasibility Criteria	Weight	Candidate:1	Candidate: 2	Candidate: 3
Operational Feasibility	20	<p>Web portal based with a mobile app which will be available for all stakeholders</p> <p>Score: 90/100</p>	<p>Desktop-based tool which will be available for all stakeholders</p> <p>Score: 30 /100</p>	<p>Web-based portal for all stakeholder</p> <p>Score: 75 /100</p>

Technical Feasibility	20	<p>We are using python and Django framework with MySQL Server Database for development. Python and Django are the latest and most modern programming languages for frontend and backend development. The Features of python and Django applications are Secure, Scalable, and Fully loaded compared to other languages.</p> <p>Score:90/100</p>	<p>JAVA with Oracle Server.</p> <p>There are much better options than java with an oracle server. This technology is old and costly.</p> <p>Score: 60 /100</p>	<p>We are using PHP Laravel with MySQL Server Database.</p> <p>Laravel scores better than other web frameworks because of its advanced features and development tools that facilitate rapid web applications.</p> <p>Score: 90/100</p>
Economical Feasibility Cost to develop: Payback period (discounted): Net present value: Detailed calculations	50	<p>Approximately:9,828,000 BDT</p> <p>Approximately:3.5 years</p> <p>Approximately:1947739.507 BDT</p> <p>See Attachment</p> <p>Score: 80/100</p>	<p>Approximately:6,396,000 BDT</p> <p>Approximately: 1.5 years</p> <p>Approximately:305772.9964 BDT</p> <p>See Attachment</p> <p>Score: 90/100</p>	<p>Approximately:11,601,087.50 BDT</p> <p>Approximately:4 years</p> <p>Approximately:2556877.99 BDT</p> <p>See Attachment</p> <p>Score: 70/100</p>

Schedule Feasibility	10	12 months Score: 70/100	6 months (Take less time than other candidates) Score:80/100	14 months (Takes More time than others) Score:50/100
Rating	100%	Total Score: 83% $20*0.9 + 20*0.9 + 50*0.8 + 10*0.7 = 83$	Total Score: 71% $20*0.3 + 20*0.6 + 50*0.9 + 10*0.8 = 71$	Total Score:73% $20*0.75 + 20*0.9 + 50*0.7 + 10*0.5 = 73$

CHAPTER 5

SYSTEM REQUIREMENT SPECIFICATION

FUNCTIONAL REQUIREMENTS
NON - FUNCTIONAL REQUIREMENTS

5.1 FUNCTIONAL REQUIREMENTS

Name of the Function: CO and PLO mapping		
PRECONDITION:	<ol style="list-style-type: none">1. Users should have proper access to the system2. Program Learning Outcome should be available3. Course Outcome for the course we are mapping should be available as well4. Users should have the proper knowledge about the IEB website	
INPUT	PROCESS/ACTIVITIES	OUTPUT
<ol style="list-style-type: none">1. PLOs2. COs	<ol style="list-style-type: none">1. Select a CO and check the outcome of the CO as per the course.2. Assign the CO with the logically related PLO/s.3. Recheck/validate the mapping by the faculty.4. Finalize the CO-PLO mapping.5. Continue the process for all the	<ol style="list-style-type: none">1. The system shows a list of the mapping with the course wise PLO2. The system shows a list of the mapping with the PLO-wise CO.

	COs. 6. Check the PLO wise CO mapping and CO wise PLO mapping. 7. Confirm the PLO-CO mapping for the program.	
POST CONDITION:		
ALT OPT:	1. If the outcome is not clear then we must notify the appropriate authority 2. One CO should be mapped with one PLO most of the time. 3. In case PLO-CO mapping is not correct then change that accordingly 6. PLO-wise CO mapping number should be more than the threshold value. Each CO should map at least one PLO.	

Name of the Function: Assessments mapped with COs		
PRECONDITION:	1. Users should have proper access to the system. 2. Faculty Members should have access to assessment results of the course they are taking in a particular semester	
INPUT	PROCESS/ACTIVITIES	OUTPUT
1. Assessment Marks 2. COs	1. Select the course in which the user wants to map the CO to the assessment questions. 2. Assign assessment results with the logically related COs. 3. Recheck/validate the mapping by the faculty. 4. Finalize the CO-Assessment mapping 5. Continue the process for	The system shows a list of the Assessment Questions that are mapped with the COs.

	all the assessments for that course 6. Confirm the Assessment-CO mapping. 7. Repeat process for all the courses taken by the user.	
POSTCONDITION:		
ALT OPT:	1 One Assessment question should be mapped with at least one CO most of the time. 2. In case Assessment-CO mapping is not correct then change that accordingly	

Name of the Function: Evaluating and Update Students Performance		
PRECONDITION	1. Users should have proper access to the system. 2. Faculty Members should have access to evaluate the course they are taking in a particular semester 3. Assessment questions should be mapped to COs	
INPUT	ACTIVITIES	OUTPUT
1. Course ID 2. Student ID	1. Select the course the faculty members want to evaluate. 2. Select the assessment the faculty members want to evaluate. 3. Select the student the faculty members want to assign assessment marks to. 4. Assign Marks 5. Repeat process for all students	1. The system will show a mark sheet of the students in a tabular format.

	6. Confirm the mark sheet of that assessment.	
POSTCONDITION		
ALT OPT	1. If the student has already withdrawn from the course then upon clicking that student an error message will be shown. 2. If the faculty assign marks wrongly the system gives an error message	

Name of the Function: View Reports for different stakeholders.		
PRECONDITION:	1. The user details must be in the system 2. Students assessment marks must be updated	
INPUT	ACTIVITIES	OUTPUT
1. User credentials 2. Student ID 3. Department ID 4. Course ID 5. Program Name 6. School Name 7. University Name	1. Verify the user credentials 2. The system collects the assessment results for all students 3. If the authorized user selects to monitor individual performance, they can select from PLO progress, Course-wise PLO Report. 4. If PLO progress is chosen, the system will map the	1. The system will show individual student reports for the following: <ul style="list-style-type: none"> I. PLO-progress II. Course-Wise PLO Report 2. The system will show Group student report for the following: <ul style="list-style-type: none"> I. Course-wise PLO performance report. II. Department-wise

	<p>assessment results in line with COs.</p> <p>5. Find the PLOs which are mapped to those COs.</p> <p>6. Calculate the PLO progress.</p> <p>7. If Course-Wise is chosen, the system will map the assessment results in line with COs of a specific chosen course.</p> <p>8. Find the PLOs which are mapped to those COs.</p> <p>9. Calculate the PLO for that chosen course</p> <p>10. Repeat process for any chosen courses.</p> <p>11. If the authorized user selects to monitor group performance, they can select from course-wise, department-wise, school-wise, university-wise</p> <p>12. If course-wise PLO performance is chosen, the system will map the assessment results in line with COs for each student of a specific chosen course.</p> <p>13. Find the PLOs which are mapped to those COs.</p> <p>14. Calculate the PLO for each student in the chosen course.</p> <p>15. Find the average PLO for all the students in that course.</p> <p>16. If department-wise PLO performance is chosen, the system will map the</p>	<p>PLO performance report</p> <p>III. School-Wise PLO performance Report</p> <p>IV. University-wise PLO performance Report</p>
--	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------

	<p>assessment results in line with COs for each student of a specifically chosen department.</p> <p>17. Find the PLOs which are mapped to those COs.</p> <p>18. Calculate the PLO for each student in the chosen department.</p> <p>19. Find the average PLO for all the students in that department.</p> <p>20. If school-wise PLO performance is chosen, the system will map the assessment results in line with COs for each student of a specifically chosen school.</p> <p>21. Find the PLOs which are mapped to those COs.</p> <p>22. Calculate the PLO for each student in the chosen school.</p> <p>23. Find the average PLO for all the students in that school</p> <p>24. If university-wise PLO performance is chosen, the system will map the assessment results in line with COs for each student of a specifically chosen university</p> <p>25. Find the PLOs which are mapped to those COs.</p> <p>26. Calculate the PLO for each student in the chosen university.</p> <p>27. Find the average PLO for all the students in that University</p>	
--	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--

POSTCONDITION:	
ALT OPT:	<ol style="list-style-type: none"> 1. If the user can not be verified an error message will be shown. 2. If the system cannot connect to the database and collect the results then an error message will be shown.

5.2 NON- FUNCTIONAL REQUIREMENT

Sr. No	Non-Functional Requirements	Category	Justification
1.	Login into the system	Safety and Security Requirements	The system is protecting the functionalities from outsiders who are not supposed to use this system.
2.	Authorized access to different modules of the system	Verification Requirement	Each group of the users has some specific rules/functions they should not be able to use other functions or modules that are not assigned to them
3.	Academic/Event Calendar	Operational, Maintainability, and Documentation Requirement	The calendar would help the students to organize and keep check of their class routines and

			examination dates.
4.	Push Notifications	Resource and Reliability Requirements	The notifications will alert the students of their updated assessment marks.
5.	About the system	Resource Requirements	This will provide information on what are the scope and capabilities of the system.
6.	View CGPA	Performance and Documentation Requirements	This will allow user to know their overall performance in a semester
7.	View Credits Completed	Performance Requirements	This will allow users to know how many of their credits are completed and find out how many semesters they will need to graduate.
8.	View Semester	Documentation Requirements	This will allow users to know which semester they are in currently

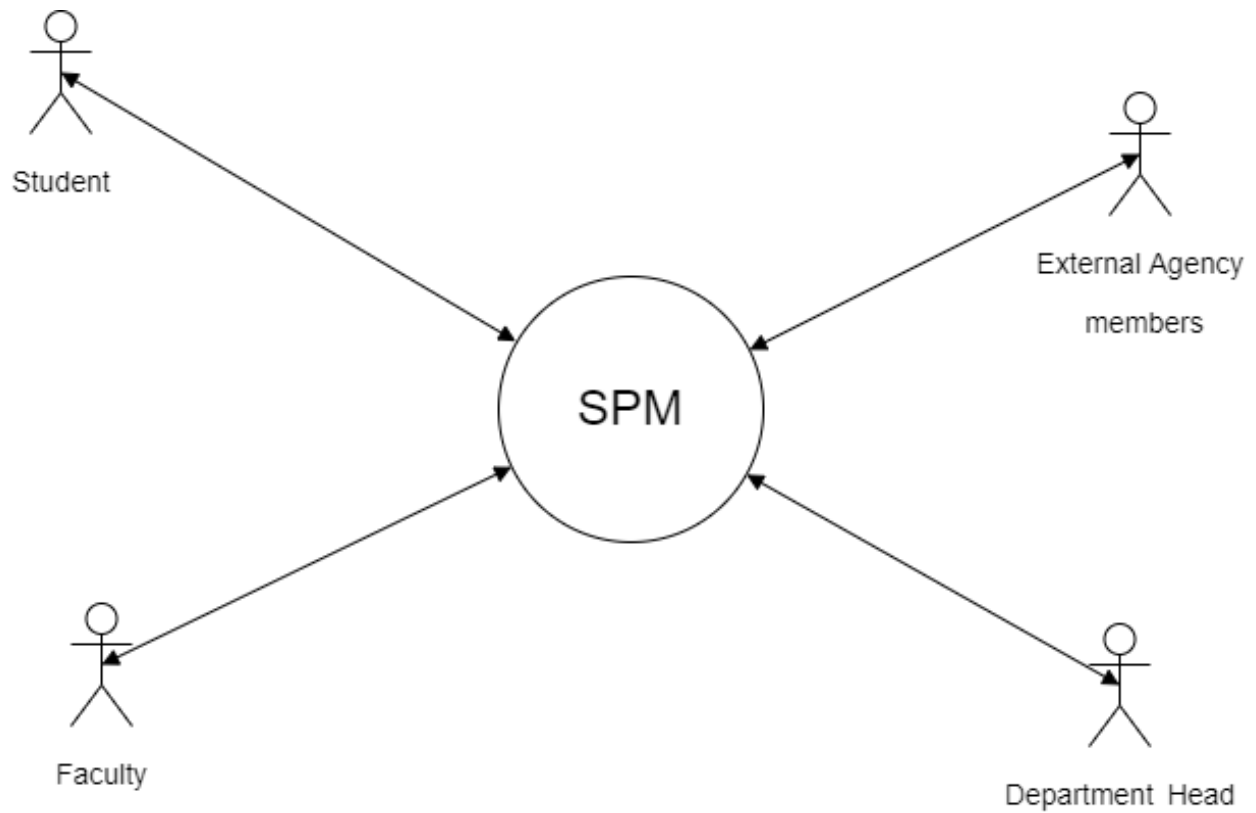
CHAPTER 6

LOGICAL DESIGN

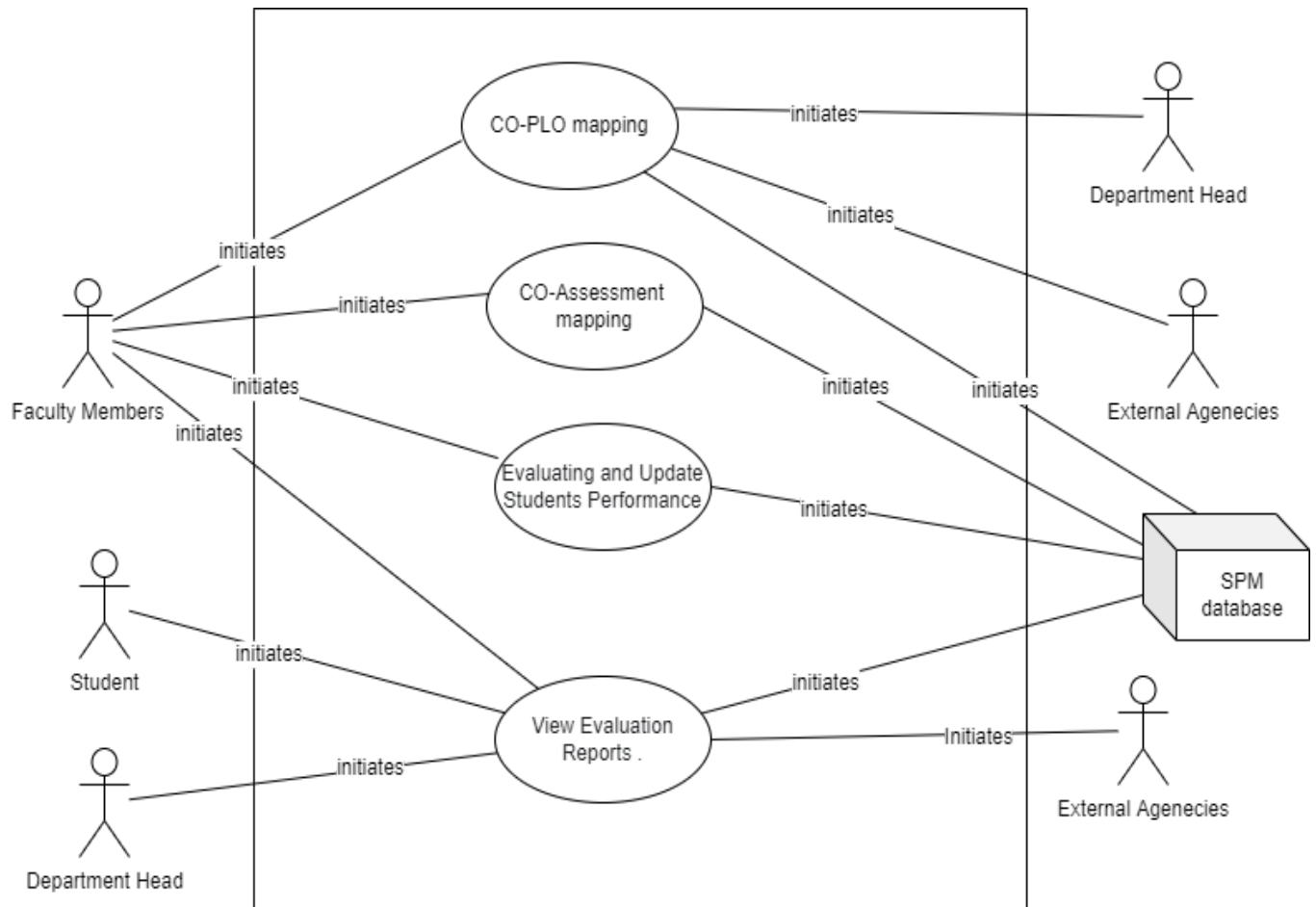
USE CASES
CLASS DIAGRAM
SEQUENCE DIAGRAM
ACTIVITY DIAGRAM

6.1 USE CASES

6.1.1 CONTEXT LEVEL



6.1.2 USE CASES DIAGRAM



6.1.3 NARRATIONS

Students Performance Monitoring System

6.1.3.1: CO AND PLO MAPPING

USE CASE NAME:	CO AND PLO MAPPING	
Actors	Faculty Members, Department Head, External Agency Members	
Description	The head of the departments gets the PLOs from UGC and updates them in SPM. Faculty Members map COs for their course to the PLOs in SPM.	
Precondition	1. Program Learning Outcome should be available 2. Course Outcome for the course we are mapping should be available as well	
Trigger	When the user wants to map a course with the program	
Typical course of Event	Actor Action	System Response
	1. Collect the set PLO assigned by the authority 3. Gather possible COs for the course 5. Request for a CO 7. Select CO and check the outcome of the CO as per the course. 8. Assign the CO with the logically related PLOs	2. Store the PLO in the system 4. Store the COs 6. Provide a list of the COs.
Alternate Courses	1. If the outcome is not clear then we must notify the appropriate authority 2. One CO should be mapped with one PLO most of the time. 3. In case PLO-CO mapping is not correct then change that accordingly 4. PLO-wise CO mapping number should be more than the threshold value. Each CO should map at least one PLO.	
Post Condition		

6.1.3.2: Assessments should be mapped with COs

USE CASE NAME:	Assessments should be mapped with COs	
Actors	Faculty Members	
Description	Faculty Members will set assessment questions for each course they are taking and map the COs to them,	
Precondition	<ol style="list-style-type: none">1. Users should have proper access to the system.2. Faculty Members should have access to assessment results of the course they are taking in a particular semester	
Trigger	When the user wants to map assessment questions to COs.	
Typical course of Event	Actor Action	System Response
	<ol style="list-style-type: none">1. Select the course taken by the Faculty in which he wants to do the mapping.2. Input assessment questions in the system.4. Choose logically related CO from the system.5. Map CO to assessment questions.	<ol style="list-style-type: none">3. Update the assessment questions in the system6. Store the mapping of Assessment questions to CO
Alternate Courses	<ol style="list-style-type: none">1 One Assessment question should be mapped with at least one CO most of the time.2. In case Assessment-CO mapping is not correct then change that accordingly	
Post Condition		

6.1.3.3: Evaluating and Update Students Performance

USE CASE NAME:	Evaluating and Update Students Performance	
Actors	Faculty Members	
Description	The Faculty Members are able to assign marks to the assessments and update them	
Precondition	<ol style="list-style-type: none">1. The user details must be in the system2. The assessments should be mapped to COs	
Trigger	When the user wants to assign/update assessment marks	
Typical course of Event	Actor Action	System Response
	<ol style="list-style-type: none">1. Select the course taken by the Faculty Members2. Select the assessment the faculty members want to evaluatee3. Select assessment to evaluate4. Select the student the faculty members want to assign assessment marks to.4. Assign marks to students5. Update Marks7. Confirm Marks	<ol style="list-style-type: none">2. List of courses3. List of assessments6. Update Marks.
Alternate Courses	<ol style="list-style-type: none">1. If the student has already withdrawn from the course then upon clicking that student an error message will be shown.2. If the faculty assign marks wrongly the system gives an error message	
Post Condition		

6.1.3.4: View Reports for different stakeholders.

USE CASE NAME	View Reports for different stakeholders.	
ACTOR	Students, Faculty Members, Department Head, External Agency Members	
Description	This will generate students performance reports depending on the user type	
Precondition	<ol style="list-style-type: none"> 1. The user details must be in the system 2. Students assessment marks must be updated 	
Trigger	When the user wants to see the performance reports for students, courses, departments, schools, and universities	
Typical course of Event	Actor Action	System Response
	<ol style="list-style-type: none"> 1. Request for individual student performance report 3. Select PLO-progress report 7. Select Course-wise PLO Report 11. Request for group performance report 13. Select Course-Wise PLO Report 18. Select Department-wise PLO Report 22. Select School-wise PLO Report 27. Select University-wise PLO Report 	<ol style="list-style-type: none"> 2. List of Performance reports 4 Find PLOs which are mapped to those COs 5. Calculate PLO progress 6. Provide PLO-progress report 8. Find PLOs which are mapped to those COs 9. Calculate the PLO for that chosen course 10. Provide Course-Wise PLO report 12. List of group performance reports 14. Find PLOs which are mapped to those COs 15. Calculate the PLO for each student in the chosen course. 16. Find the average PLO for all the students in that course. 17. Provide Course-wise PLO report. 19. Find PLOs which are mapped to those COs. 20. Calculate the PLO for each

		<p>student in the chosen department.</p> <p>21. Provide Department-wise PLO Report.</p> <p>23. Find PLOs which are mapped to those COs.</p> <p>24. Calculate the PLO for each student in the chosen school.</p> <p>25. Find the average PLO for all the students in that school.</p> <p>26. Provide School-wise PLO Report.</p> <p>28. Find PLOs which are mapped to those COs.</p> <p>29. Calculate the PLO for each student in the chosen university.</p> <p>30. Find the average PLO for all the students in that university.</p> <p>31. Provide University-wise PLO Report.</p>
Alternate Course	<ol style="list-style-type: none"> 1. If the user can not be verified an error message will be shown. 2. If the system cannot connect to the database and collect the results then an error message will be shown. 	
Post Condition		

6.2 CLASS DIAGRAM

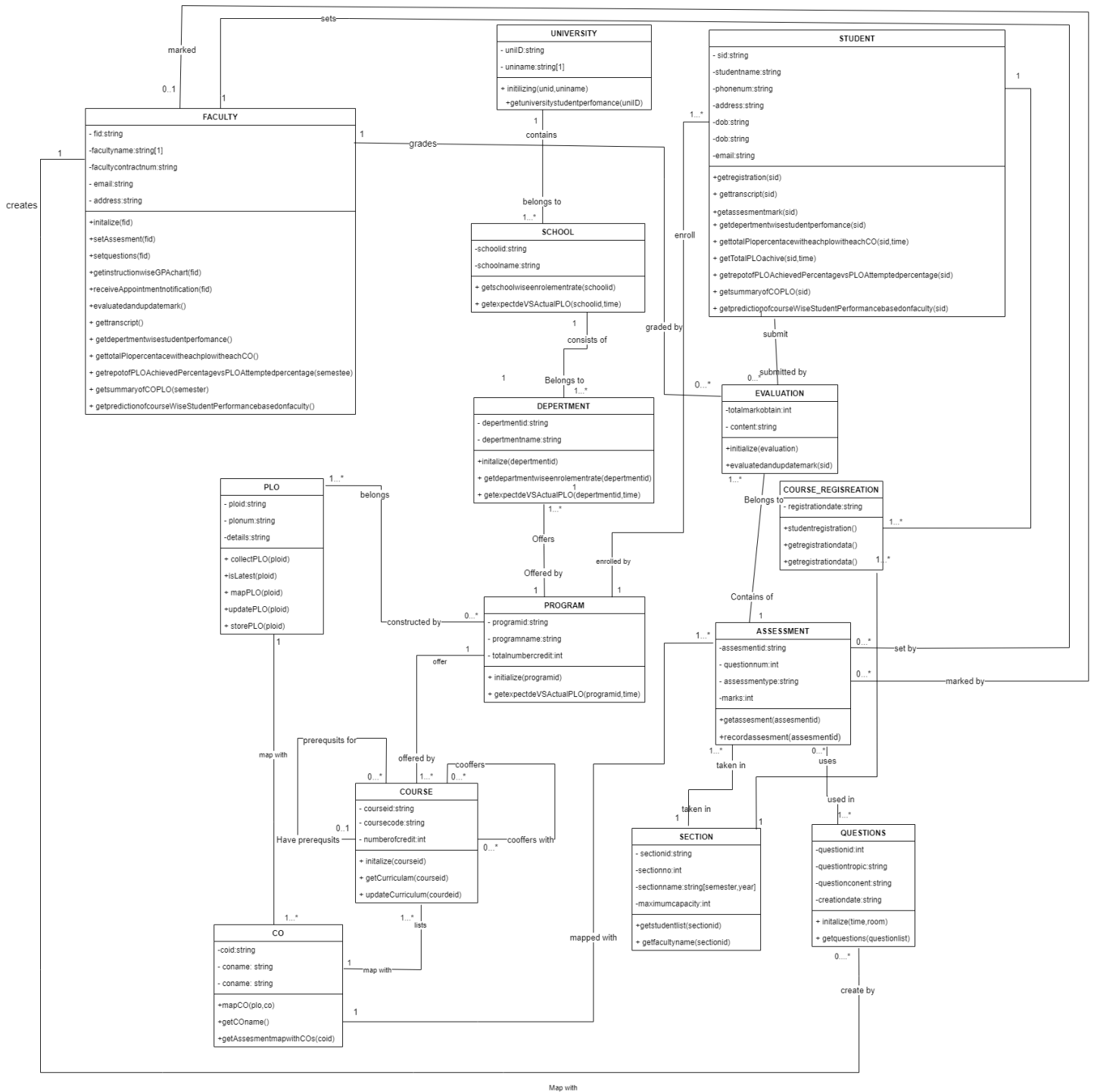


Fig: Class diagram

6.3 SEQUENCE DIAGRAM

6.3.1: CO AND PLO MAPPING

Faculty Members,
Department, External
Agencies

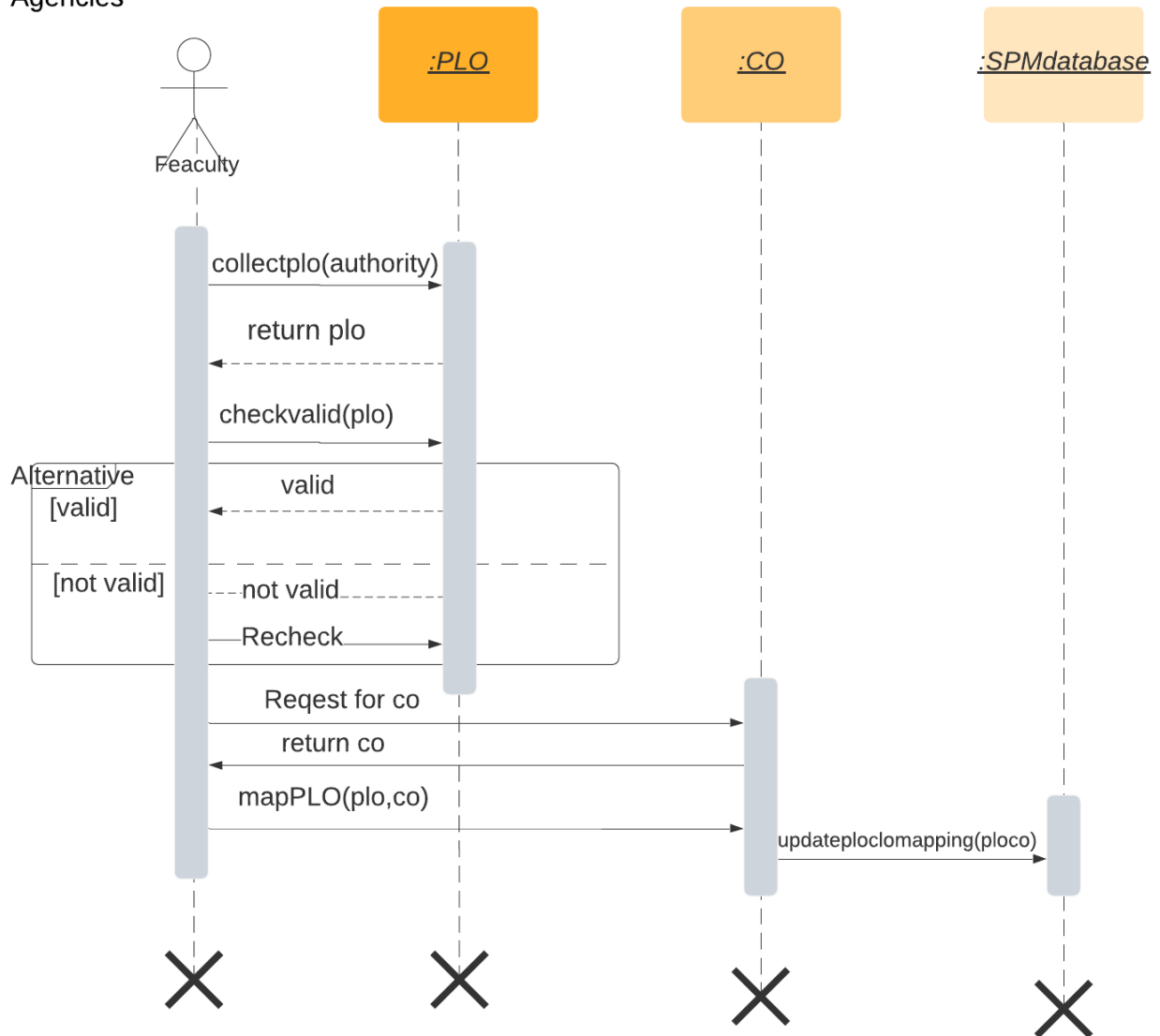


Fig : CO-PLO mapping

6.3.2: Assessments mapped with COs

Faculty Members,
Department, External
Agencies

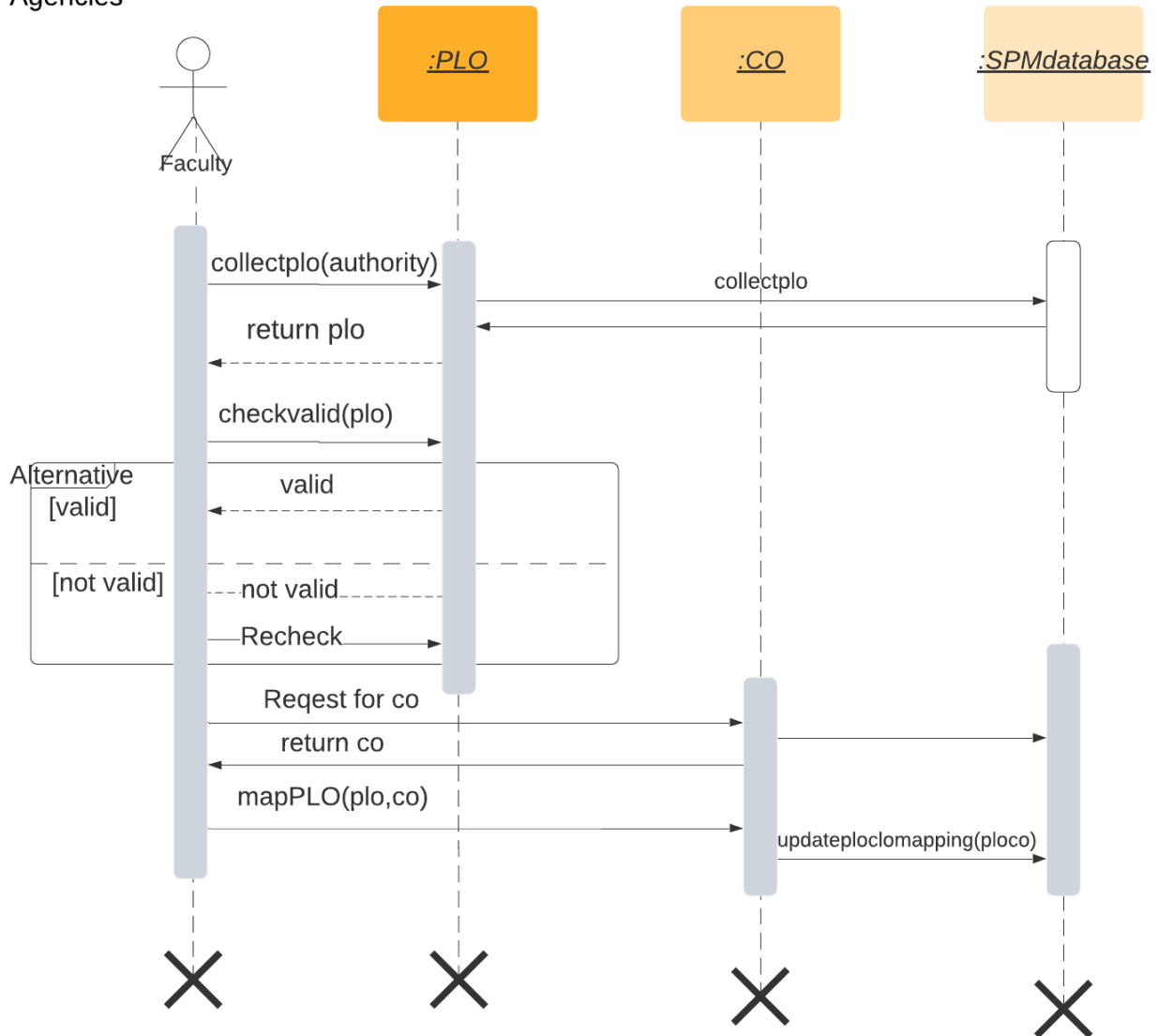


Fig: Assessments mapped with COs

6.3.3: Evaluating and Update Students Performance

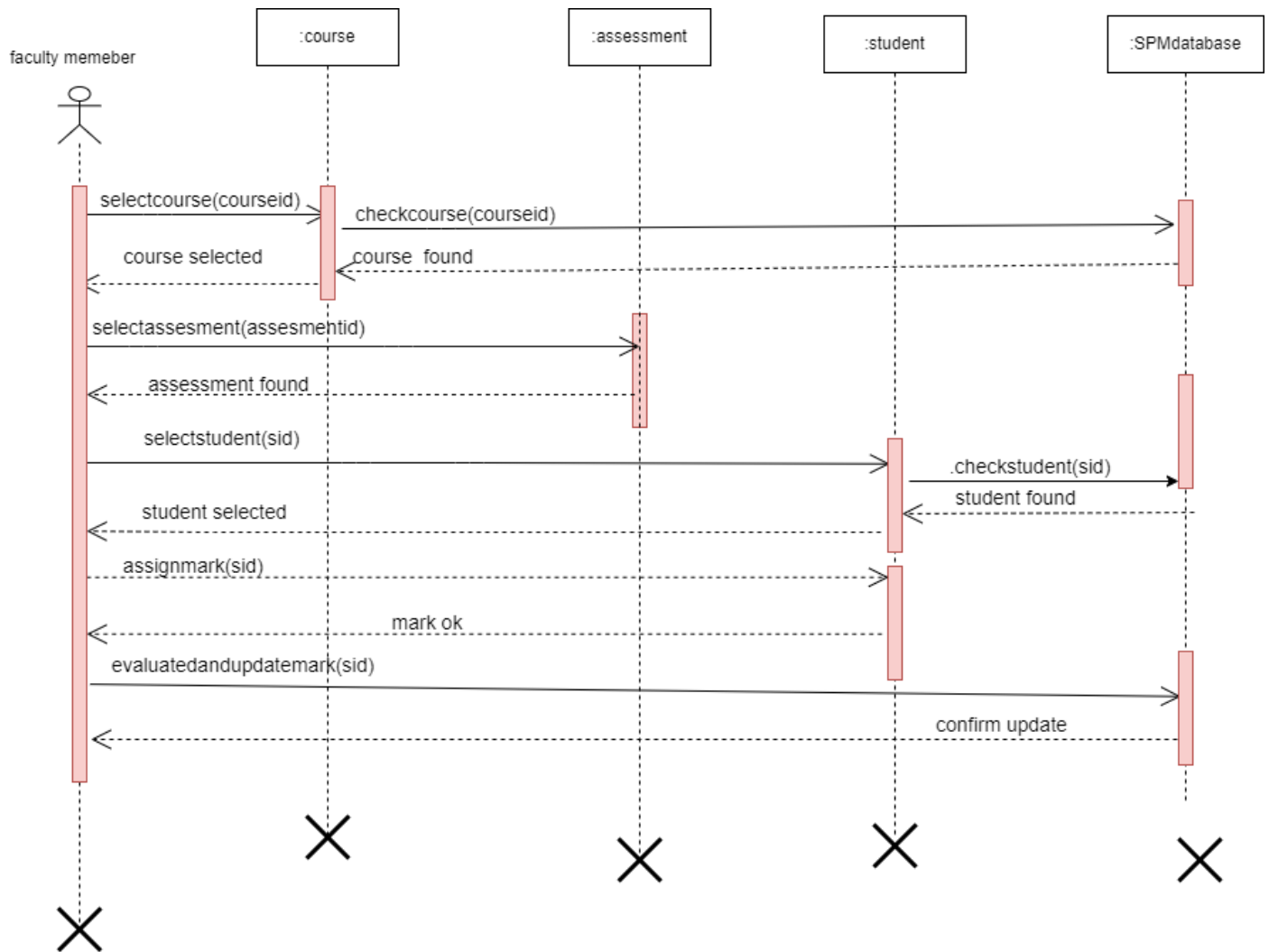


Fig: Evaluating and Update Students Performance

6.3.4: View Reports for different stakeholders.

- 6.3.4.1 Course-wise PLO Report

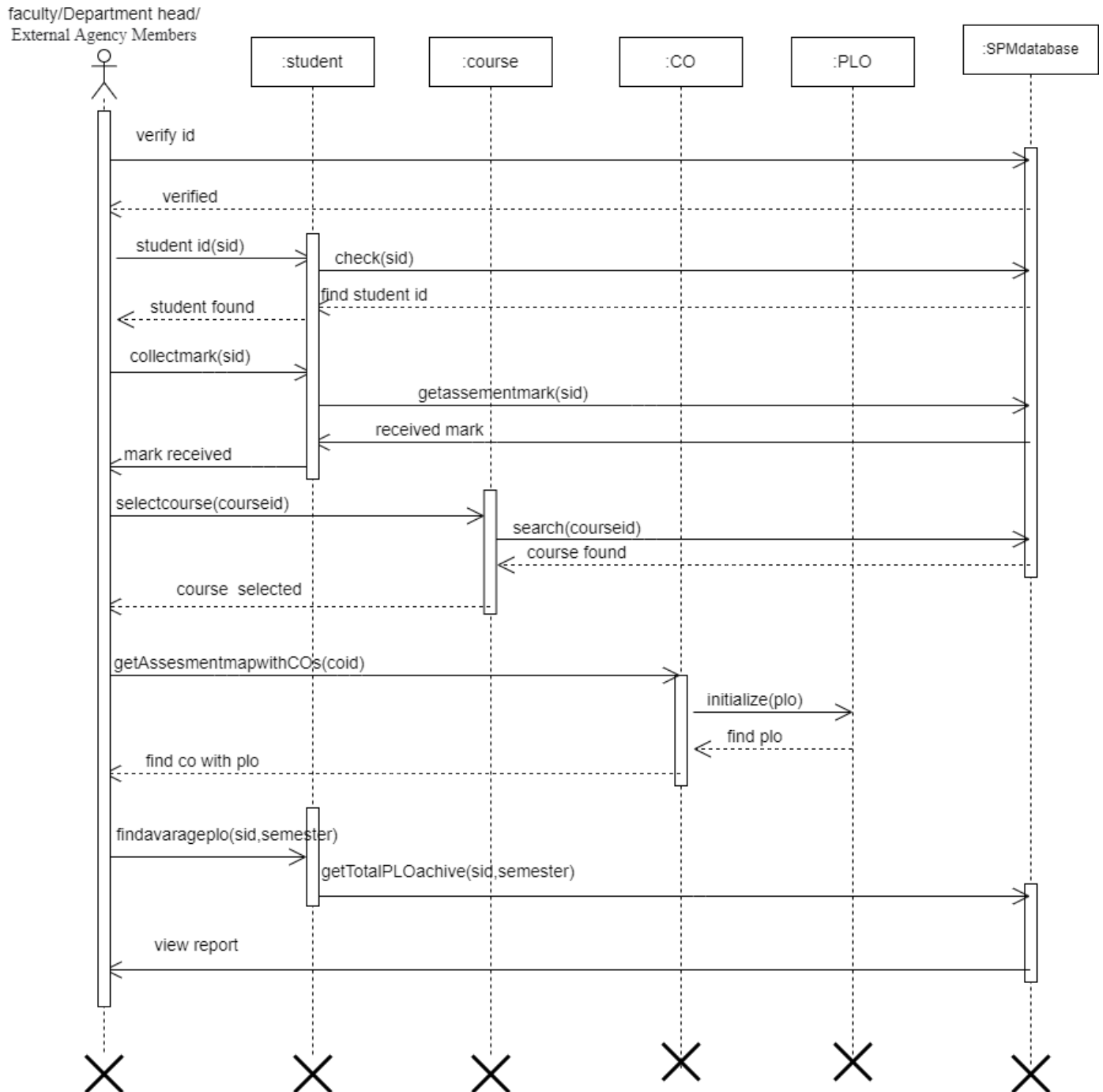


Fig: Course-wise PLO report

6.3.4.2 Department-wise PLO report

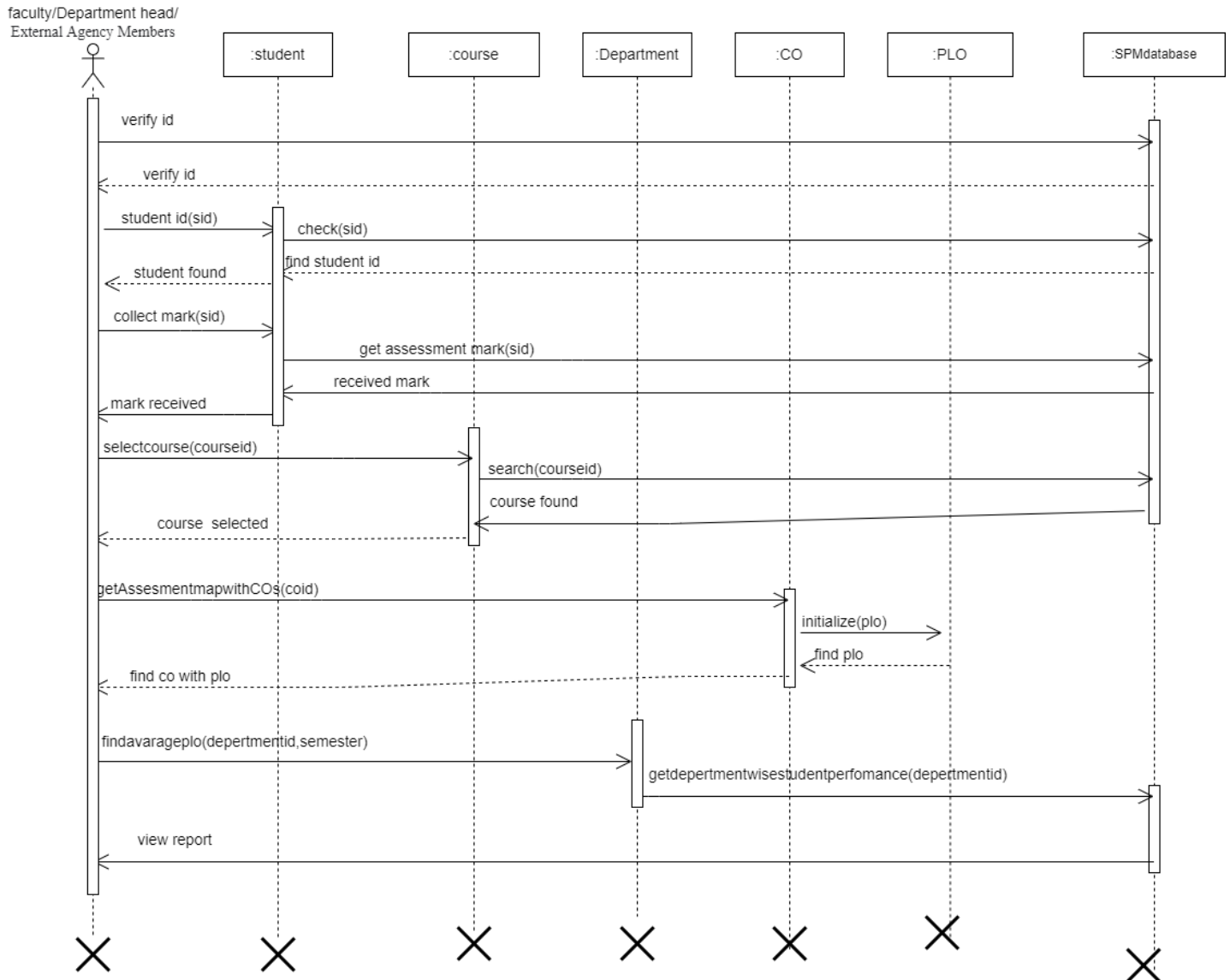


Fig: Department-wise PLO report

6.3.4.3 School wise PLO report

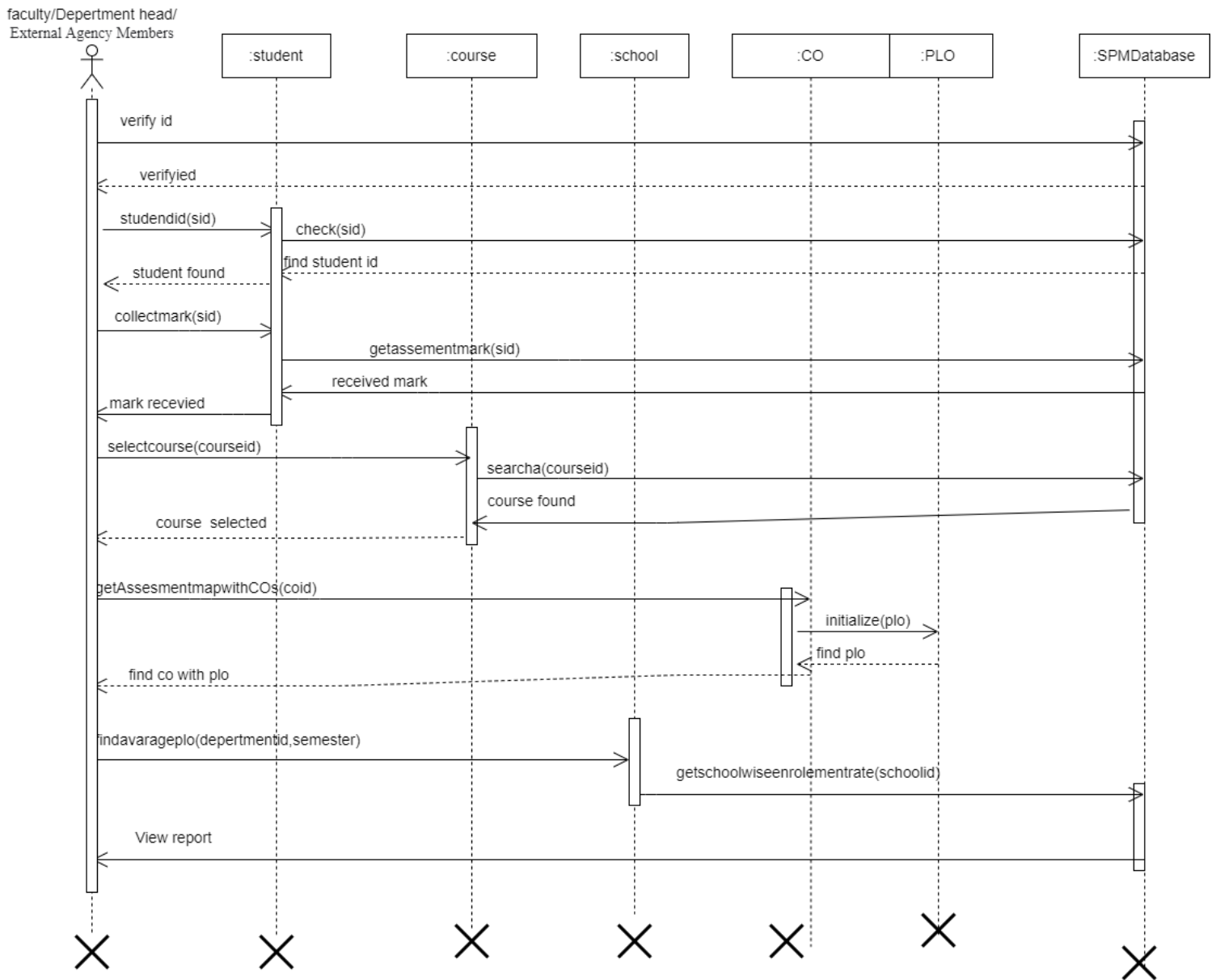


Fig: School wise PLO report

6.3.4.4 University-wise PLO Report

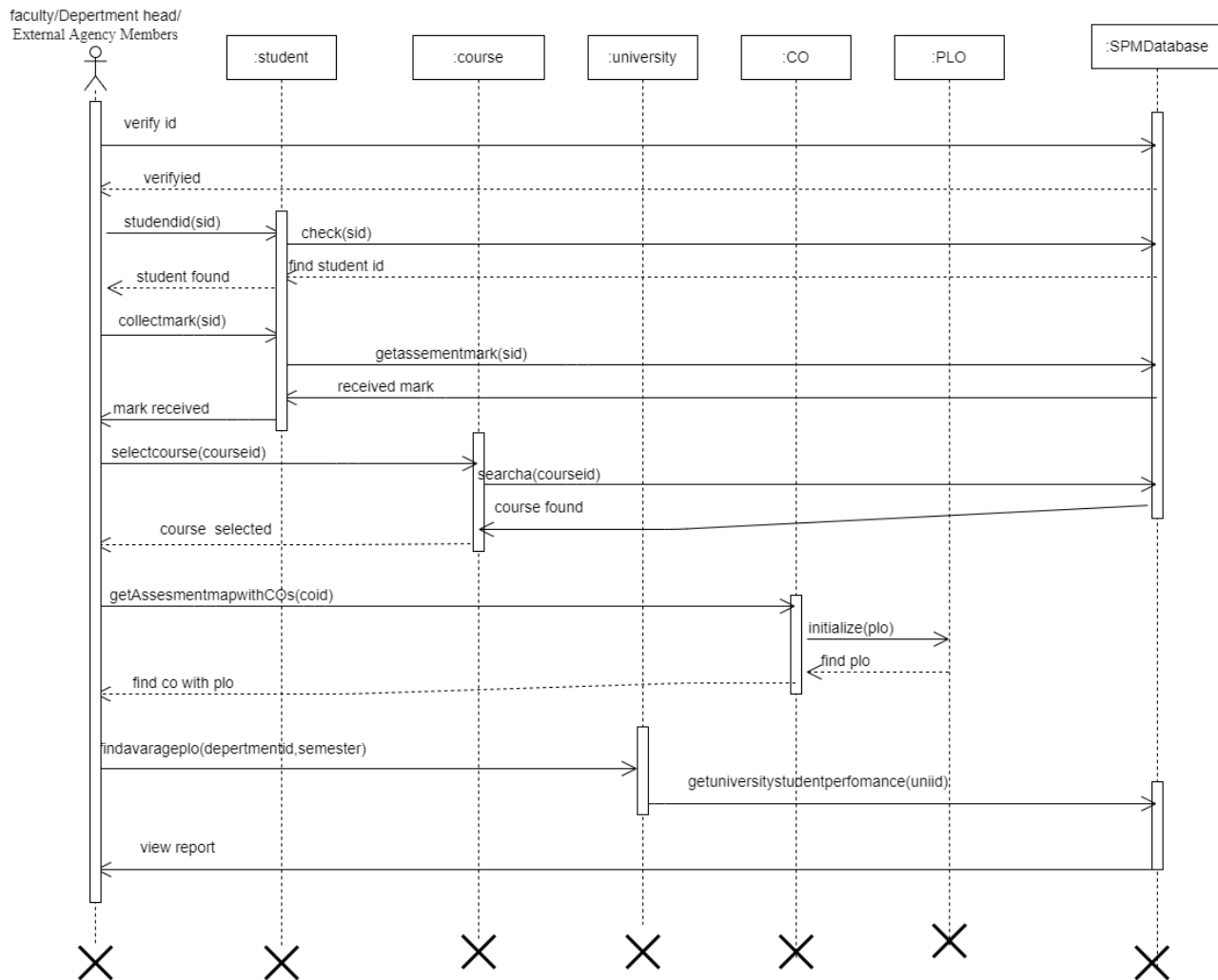
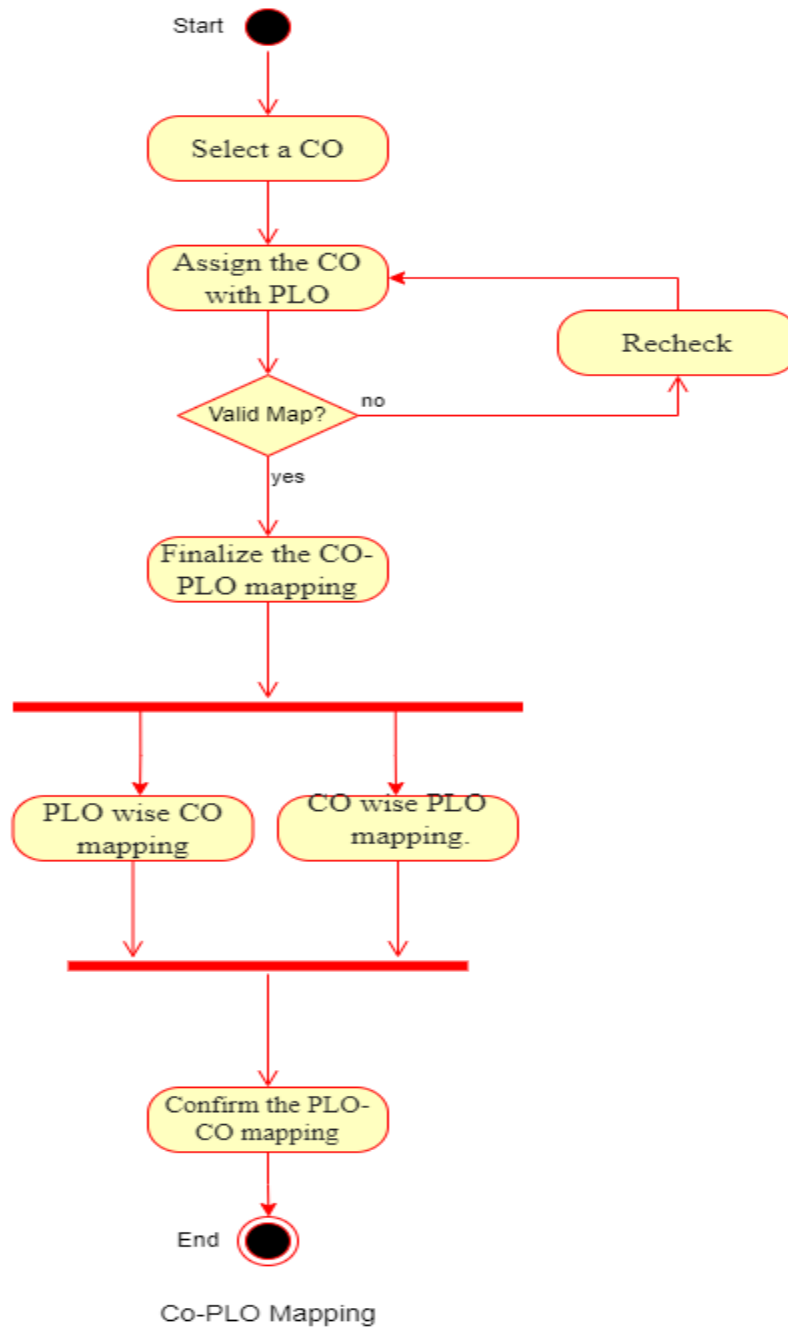


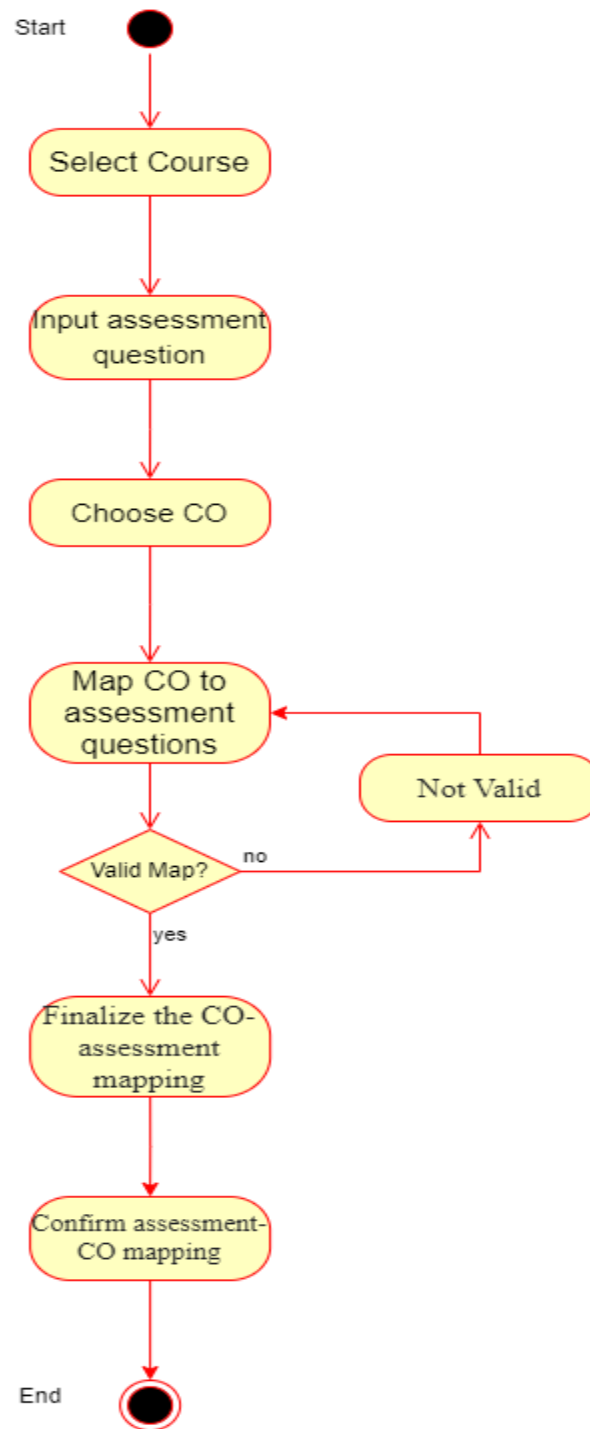
Fig: University-wise PLO Report

6.4 ACTIVITY DIAGRAM

6.4.1 1. CO and PLO mapping

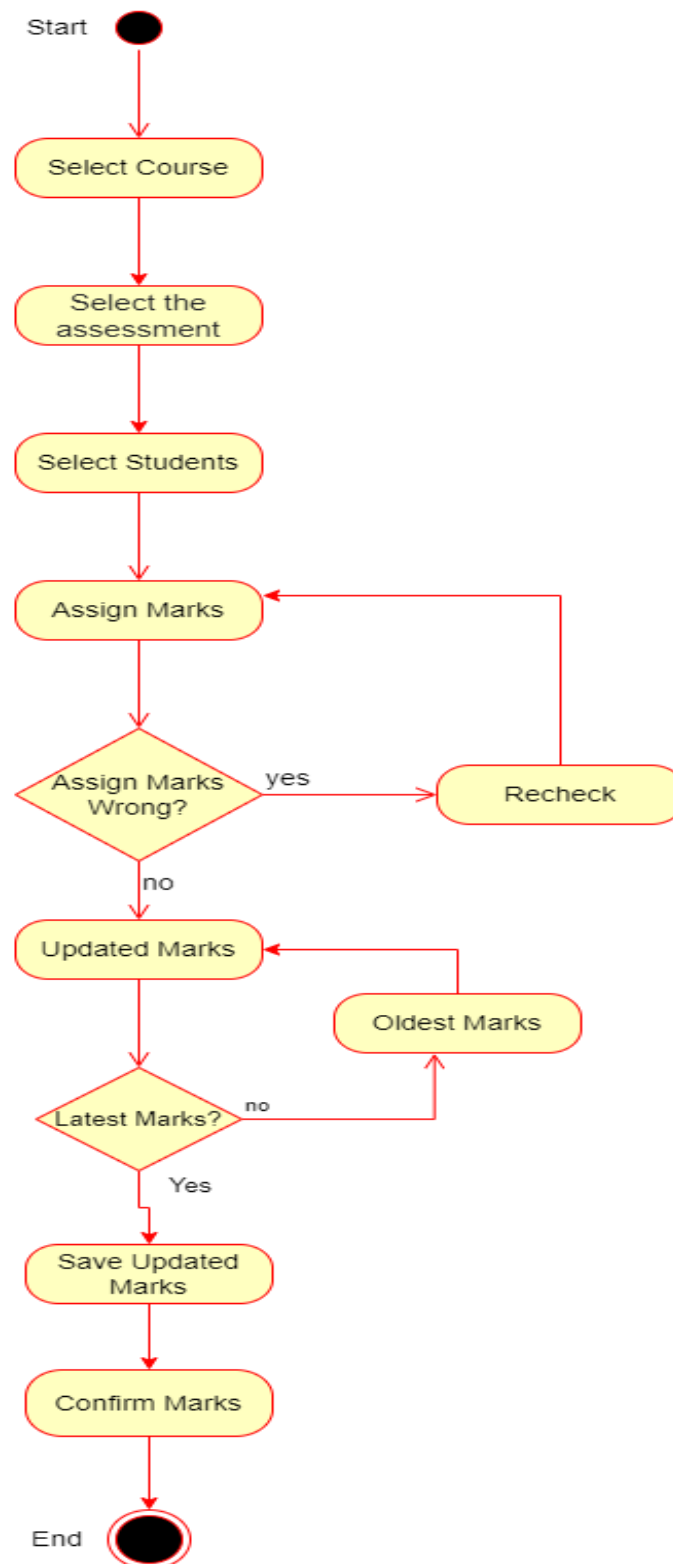


6.4.2 2. Assessments should be mapped with COs



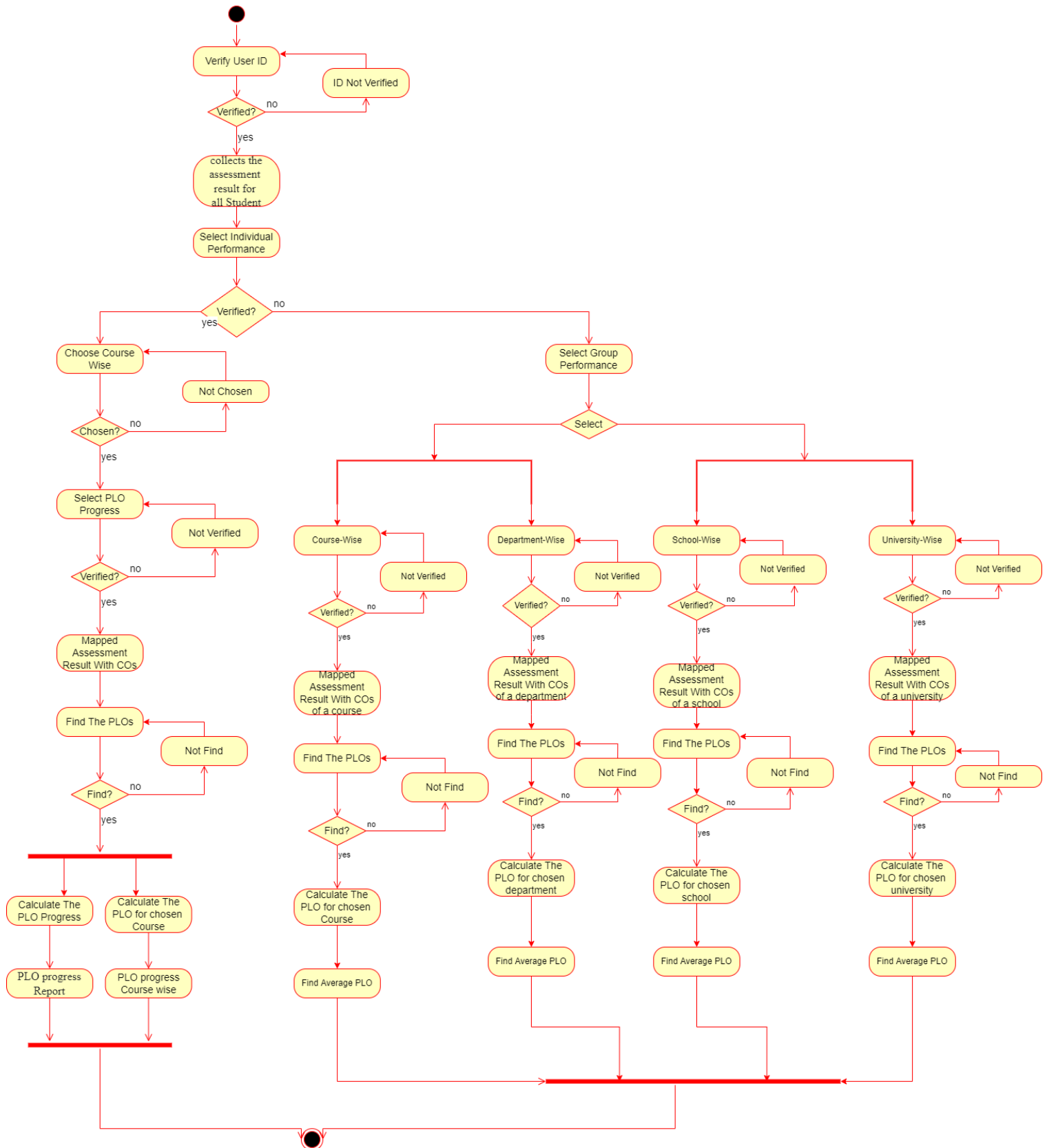
Assessments should be mapped with COs

6.4.3 3. Evaluating and Update Students Performance



Evaluating and Update Students Performance

6.4.4 View Reports for different stakeholders.



CHAPTER 7

CONCLUSION

ADVANTAGES
RECOMMENDATIONS
CONCLUSIONS

7.1 ADVANTAGES

The Student Performance Monitoring System would be beneficial for students as it allows the students to identify where they excel and lack in skills and where they can improve on, for faculties as they would be able to keep track of their students and can understand which topics the students are performing poorly so that the teacher can focus more on those topics, and for the external agencies who can monitor the universities overall performance and how much skills the student are able to achieve from those universities.

7.2 RECOMMENDATIONS

As many faculties and departments are still not aware of such a system to exist, a training session could be scheduled to introduce the system on how it works. For the students a basic guideline provided by the alumni of the universities, as their input could help the students and university understand from their experience which PLOs helped them reach to where they are today.

7.3 CONCLUSIONS

In this system, we have used the idea of mapping each Course Outcomes(COs) is mapped to a Program Learning Outcome(PLOs) which is used to identify the skill the students should achieve through the courses. Through this analysis report, we hope to have provided a solution that would save time on evaluating a student but also improve the quality of education for the students the universities offer.

REFERENCE

- <https://www.dropbox.com/s/0xice3rfckjyldg/20200620Group27.pdf?dl=0>
- Database_report_final_armun.pdf
- 1521535297-PLO-CO_CSE_allCourses.pdf
- CSE101-OBE-Mark-Sheet.xlsx