

CSC303.2: Database Management Systems

Project Title: Student Performance Monitoring System

Prepared By: Naimul Aziz (1822240)

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Report 1: Introduction

Project Background:

The purpose of the Student Performance Monitoring system is to adjust to the new education system formed around outcome-based learning for the private universities of Bangladesh. OBE has been widely regarded as one of the most effective methods for educational management. Concentrating the primary goals of an academic process around manageable subdivided objectives for students are accomplished by setting program curriculum into various levels of outcomes. Program Educational Objectives (PEO) stand at the top of the hierarchy for the processing of individual outcome achievement and university accomplishments. Program Learning Outcomes (PLO) and Course Outcomes (CO) are of the most fundamental concern of studies for this project. The mapping of PLOs to COs allows for higher management to have a better tracking efficiency of the students in academia. Instructors are also able to effectively monitor the performance and progress of their students through the newly improved system. Therefore, there must be ample effort and time dedicated towards the improvement of the current SPM system. Performance Monitoring System.

Project Goals & Objectives:

The goal of the project is to carry out the tasks, allocate resources and propose improvements for the completion of the requirements to create a scalable student monitoring system. Important artifacts to include are a robust database design to provide security and performance benefits of software features, an interactive UI design for easy navigation, and a well optimized codebase for modularity of components and continuous improvement and maintenance. The project will uncover the difficulty of implementation on an automated software tool that will aid the process of course planning and individual student evaluation to ultimately guide the academic path throughout the respective universities.

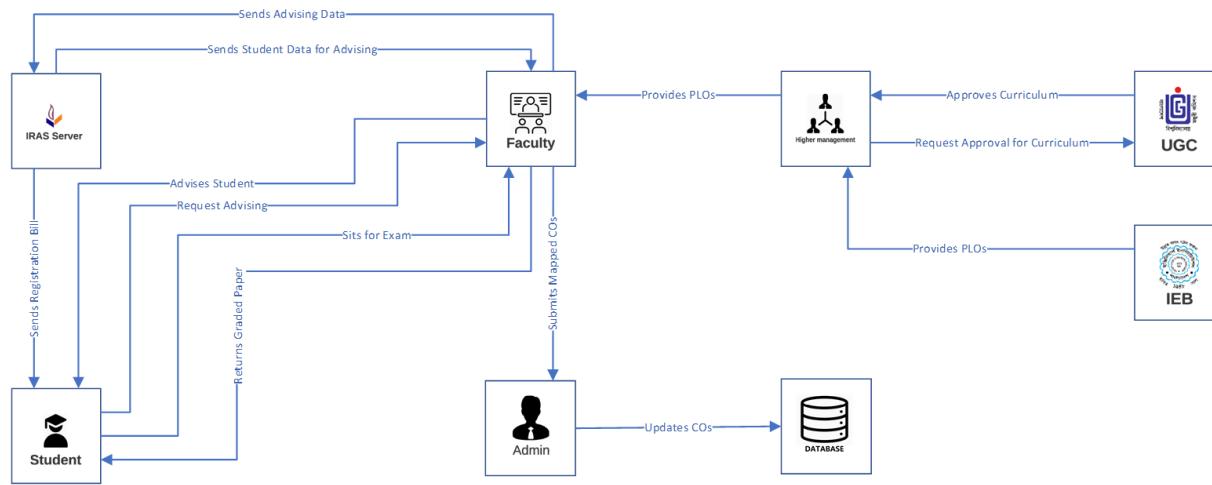
Project Scope

The criteria for the completion of the project will be based on the following list of requirements:

- Gather relevant information on outcome-based learning and the current academic system of Independent University, Bangladesh to enhance the understanding of the project context.
- Acquire a team for cooperative effort towards the requirements analysis and plan of an organized software project.
- Approach the logical design of the software from a database perspective and document relevant illustrations.
- Validate requirements and review work periodically for the assurance of quality and goals
- Perform SQL unit tests to speed up the development process.
- Develop a basic prototype on the functional requirements of the system that adheres to the design plan and procedures.
- Maintain documentation for maximum adherence of software for quality purposes.

Report 2: Requirements Analysis

Rich Picture (AS-IS):



Six Element Analysis (AS-IS):

Process	System Roles					
	Human	Non-Computing Hardware	Computing Hardware	Software	Database	Network & Communication
1. UGC Approves Curriculum based on the map of PLOs and COs	<p>Higher Mgt a) Sends curriculum booklet to UGC. b) If it gets approved, then the curriculum is published c) If it doesn't get approval, the curriculum is changed according to the demand of the UGC.</p> <p>Admin 1) Adds PLO to SPM 2) Maps PLO to CO.</p> <p>UGC a) Receive Curriculum booklet b) Reviews the curriculum and approves it or sends feedback on the required changes necessary for an adequate curriculum.</p>	<p>Paper It is used for printed versions of the curriculum booklet.</p>	<p>Computer a) Used to send and receive mail between Higher Mgt and UGC. b) Used for editing and updating the Curriculum.</p> <p>Printer Used to print the Curriculum booklet.</p> <p>Networking Devices (Router, Switch, Bridge, Hub): a) Used to access the Internet</p>	<p>Microsoft Office Used for editing and updating documents regarding curriculum information.</p> <p>Email Software Used for mailing service between UGC and HM.</p> <p>Operating System Any OS used by the users, Windows, Mac.</p> <p>Adobe Acrobat Used for viewing files in PDF format.</p> <p>Printing Software Used for running the printer for generating hard copies of Curriculum Booklet.</p>	<p>Microsoft Excel Files Used by HM to access the information that is required to make any changes to the curriculum.</p>	<p>Internet Used by UGC and HM to send messages through the network.</p>

2. Map COs to PLOs	<p>Faculty</p> <p>a) Maps the COs to PLOs based on the content covered throughout the course syllabus.</p> <p>b) Mails the mapped COs to admin.</p> <p>Admin</p> <p>a) Receives mapped COs from faculty over the network.</p> <p>b) Update COs status in excel files.</p>	<p>Paper</p> <p>Used by both faculty and admin to print out hardcopy of COs as required</p>	<p>Computer</p> <p>Used to store, edit or run a printer on the mapped COs.</p> <p>Printer</p> <p>Used to print hardcopy of mapped COs for back up.</p>	<p>Microsoft Excel</p> <p>Used for storing the mapped COs and updating them as required.</p> <p>Mail / Outlook</p> <p>Send and receive COs through email.</p>	<p>Excel File System</p> <p>Used for managing the large set of data regarding the mapped COs.</p> <p>Filing Cabinet</p> <p>Used for maintaining hardcopy version of mapped COs.</p>	<p>Internet</p> <p>Used for sending and receiving mail about COs.</p>
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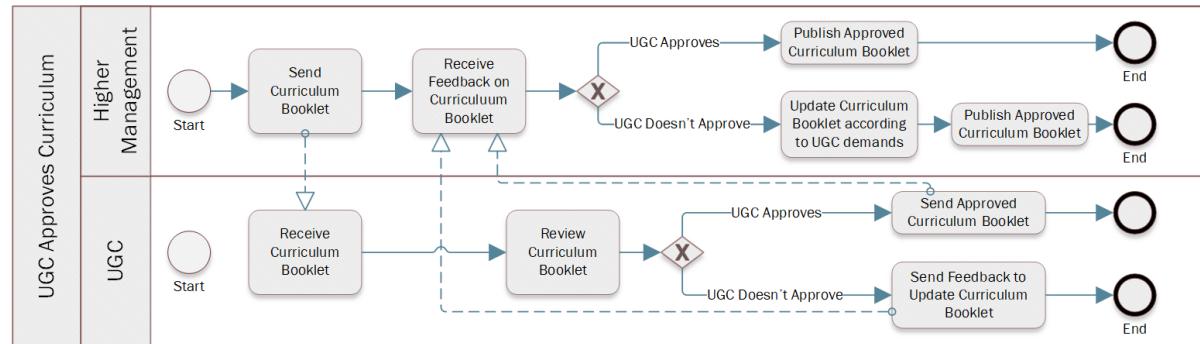
3. Set Question Papers according to COs and conduct exams	<p>Faculty 1) Retrieve COs from software. 2) Format and set question papers for exams according to CO mapping. 3) Set classroom schedule for exams. 4) Conduct exams and collect test papers.</p> <p>Student Sit for exams and submit their responses for the test questions to faculty.</p>	<p>Table & Chair a) To use during exams.</p> <p>Pen and Paper 1) For attempting the exams. 2) Printed question may be used for certain exams.</p> <p>Clock Setting time for the exam.</p> <p>Room Specific room for exams.</p>	<p>Computer 1) Used by faculties to access the COs from the software. 2) Faculties also use it to take online exams and interact with students 3) Students may use it to attend online exams.</p> <p>Mobile Phones Some exams may allow mobile phones for scanning and uploading pdfs to virtual examinations.</p> <p>Printer Used by faculties to print out question papers for students.</p> <p>Database Server Used by faculties to access and collect the COs to set questions.</p> <p>Networking Devices Used by everyone to access the Internet.</p>	<p>SPM The software from which the faculty will collect COs.</p> <p>Google Classroom Used by faculties and students during exams.</p> <p>Operating system Any OS used by the users such as Windows or Macintosh.</p> <p>Printing Software Used to run the printer for printing the question paper.</p> <p>PDF Viewer a) To view the questions or send the answers in PDF format.</p>	<p>SPM Database Faculty members access COs from this.</p> <p>.</p>	<p>Internet 1) Used by faculties to access SPM software and its database. 2) Used by faculties and students during exams.</p>
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5. Student evaluation and transfer of COs to Admin for updating the data into Excel	Faculty 1) Grade exam papers and indicate outcomes achieved for each student. 2) Forward the COs to system admin. Admin Update COs manually into Excel files. Student Request faculty to return graded exam papers.	Pen and Paper a) The exam paper is marked with a red pen. b) The COs may be listed in a paper sometimes.	Computer a) Used by faculty members to store the exam results. b) Used for forwarding the COs to Admin. c) Used by the Admin to update the database with achieved COs.	Microsoft Office Used by Admin and faculty members to store the CO achievements. Operating System Used for running all computers and related devices under Windows, Mac, etc.	Excel Database Used to update the COs by Admin or Faculty. PDF Viewer Used for viewing the questions in PDF format for convenience.	Internet a) Used by Admin to update COs in the Excel database. b) Faculty used the network to submit the COs to Admin through email.
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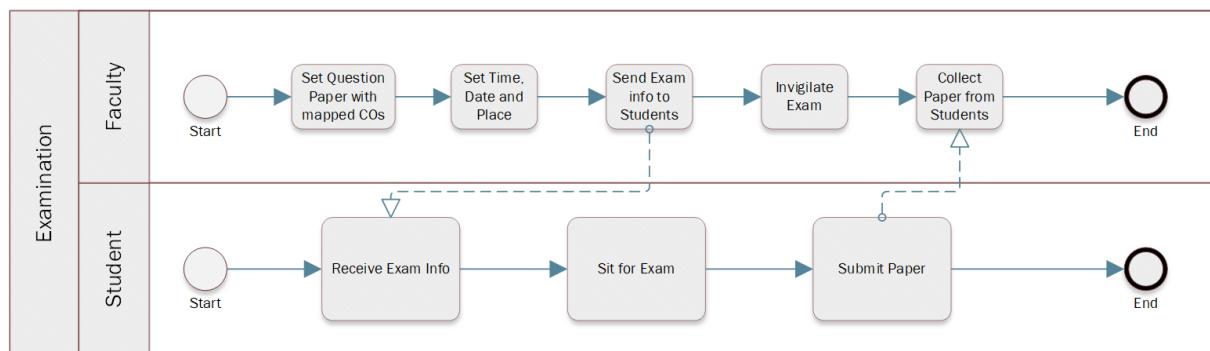
6. Student Transcript Request	<p>Student 1) Request the system to generate a transcript from the database. 2) Receive the transcript and view or print it.</p> <p>Admin a) Receive transcript requests from students. b) Sends request to the server for list of courses and associate grades. c) Goes through the Excel files to collect the relevant information and compile them into a transcript.</p>	<p>Paper a) Used for filling out necessary forms for requesting transcript b) Used in case the student wants to print the transcript.</p> <p>Pen The transcript request form may be filled out by hand.</p>	<p>Computer 1) Used to request the transcript online. 2) View electronic transcript for confirmation of the hardcopy before printing.</p> <p>Operating System Any OS such as Windows, Mac, etc.</p> <p>Printer Used to print the transcript on paper.</p> <p>Networking devices (Router, Switch, Bridge, Hub): a) Used to access the Internet</p>	<p>Microsoft Excel All relevant data is stored in MS Excel files.</p> <p>Operating System Any OS used by the users, Windows, Mac.</p> <p>Printing Software Printing software used for printing progress reports transcript.</p> <p>PDF Viewer To view transcript in PDF format.</p>	<p>Microsoft Excel File Each course distributes its marks along with CO and PLO success in Excel files.</p>	<p>Internet a) Used to connect to the network for accessing MS Excel files b) Used for requesting important information from Admin c) Used to send reports to students.</p>
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7. Higher Mgt collects PLOs	<p>IEB Provides standards and PLOs.</p> <p>Higher Mgt Collect PLOs from IEB.</p> <p>Faculty Retrieve PLOs from HM.</p>	<p>Book Contains curriculum details based on outcomes needed to be achieved for program learning.</p> <p>Pen and Paper Used for manually collecting and managing PLOs</p>	<p>Computer</p> <ul style="list-style-type: none"> a) HM accesses PLOs online. b) IEB uses computing devices to write scripts about PLOs for the universities. c) Used by faculty to retrieve PLOs. <p>Printer</p> <ul style="list-style-type: none"> a) Used by IEB to print required documents. b) Used by faculty to request PLOs from HM through physical forms. c) Used by HM to print PLOs. 	<p>Microsoft Excel</p> <ul style="list-style-type: none"> a) Used to create PLO. b) Used to save the retrieved PLO. <p>Email Software Used for communication between HM, Faculty and IEB.</p>	<p>Marks Database</p> <ul style="list-style-type: none"> a) Used for storing the mapped COs and PLOs. <p>IEB Database Used for retrieving PLO details from IEB.</p>	<p>Internet</p> <ul style="list-style-type: none"> a) Used by HM and faculty to access IEB website. b) HM further uses the network connection to store and update the PLO. c) IEB uses the Internet to update and store the PLOs in their database.
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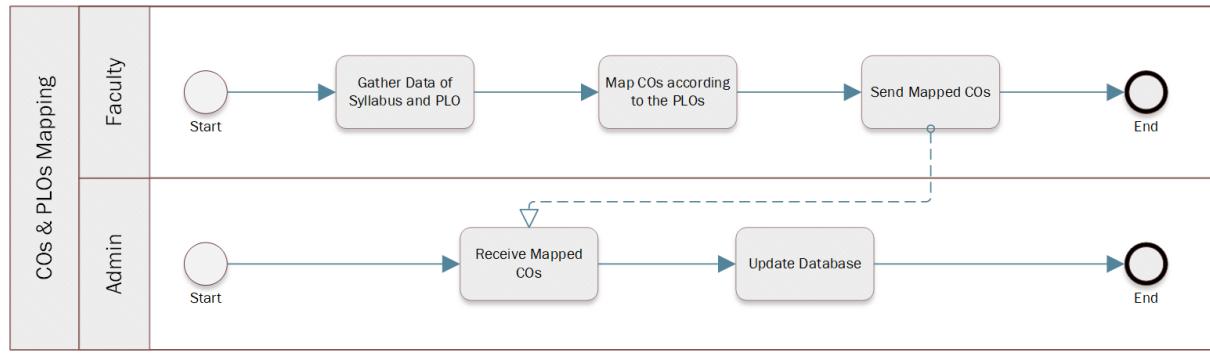
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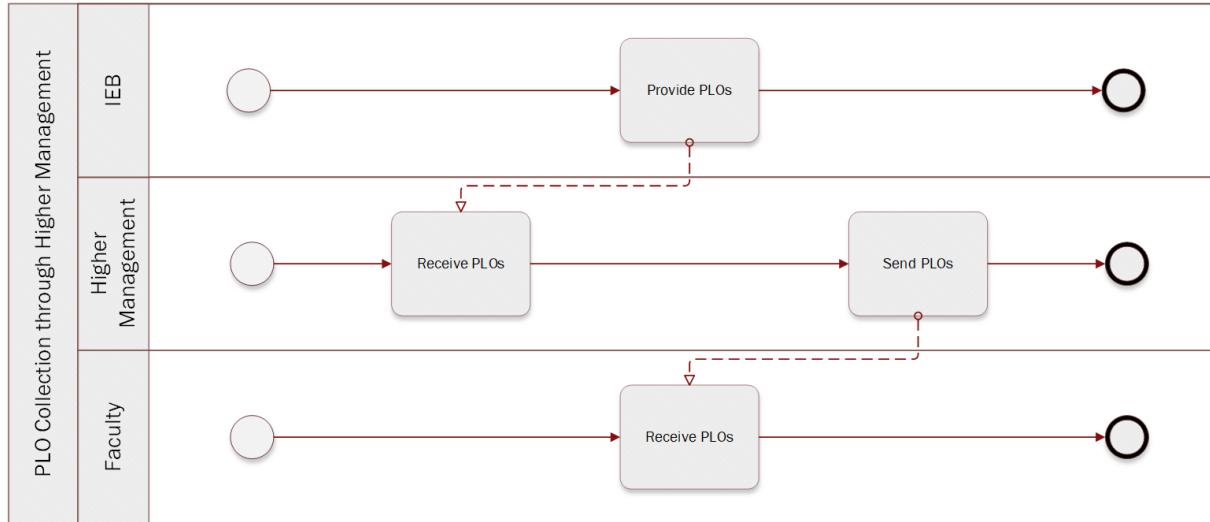
Process Diagram for UGC Approval of Curriculum



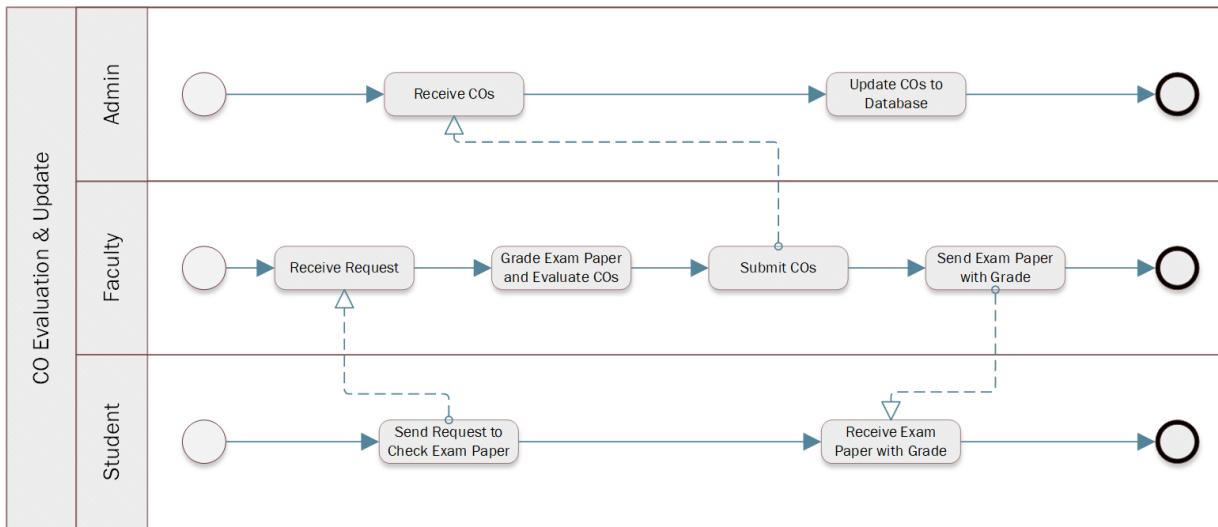
Process Diagram for Conducting Examination



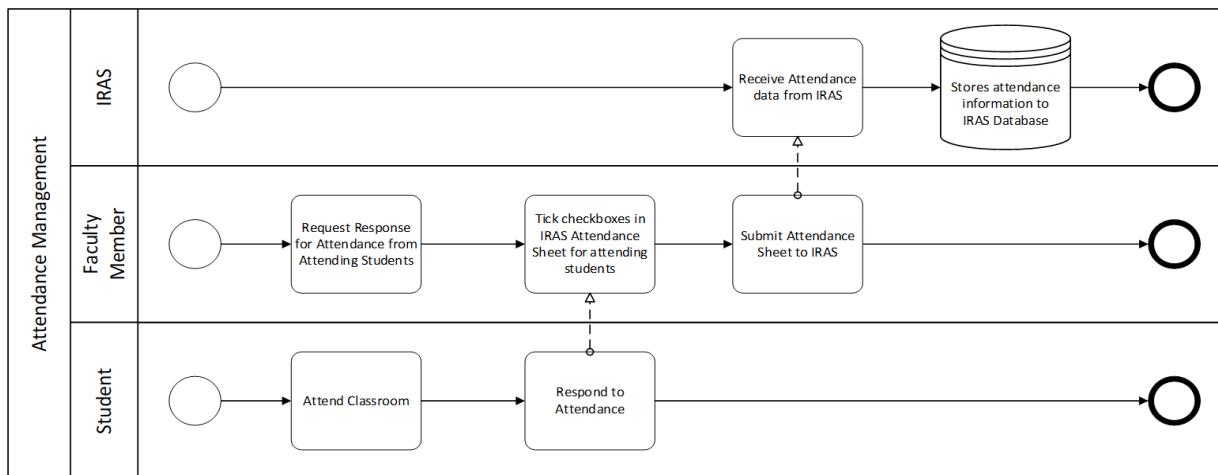
Process Diagram for Mapping of PLOs to COs



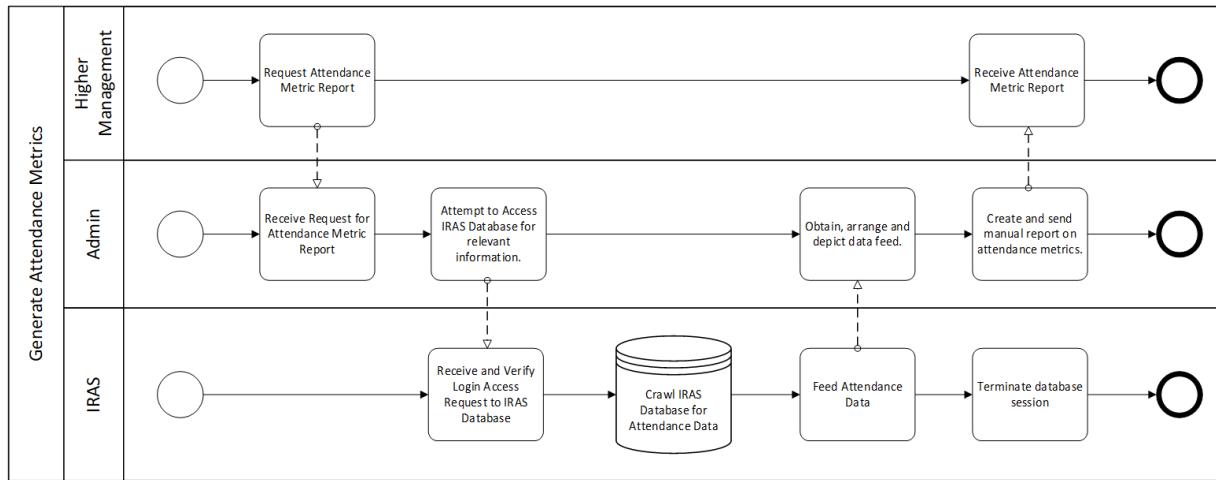
Process Diagram for Retrieval and Distribution of PLOs



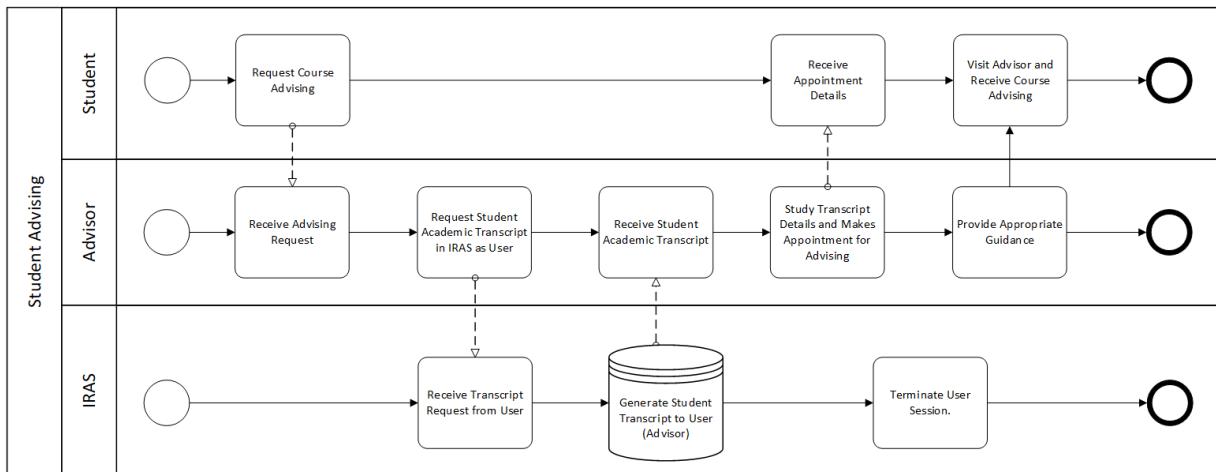
Process Diagram for Student Evaluation Based on COs and Achievement Update



Process Diagram for Attendance Management



Process Diagram for Generating Attendance Metrics



Process Diagram for Student Advising

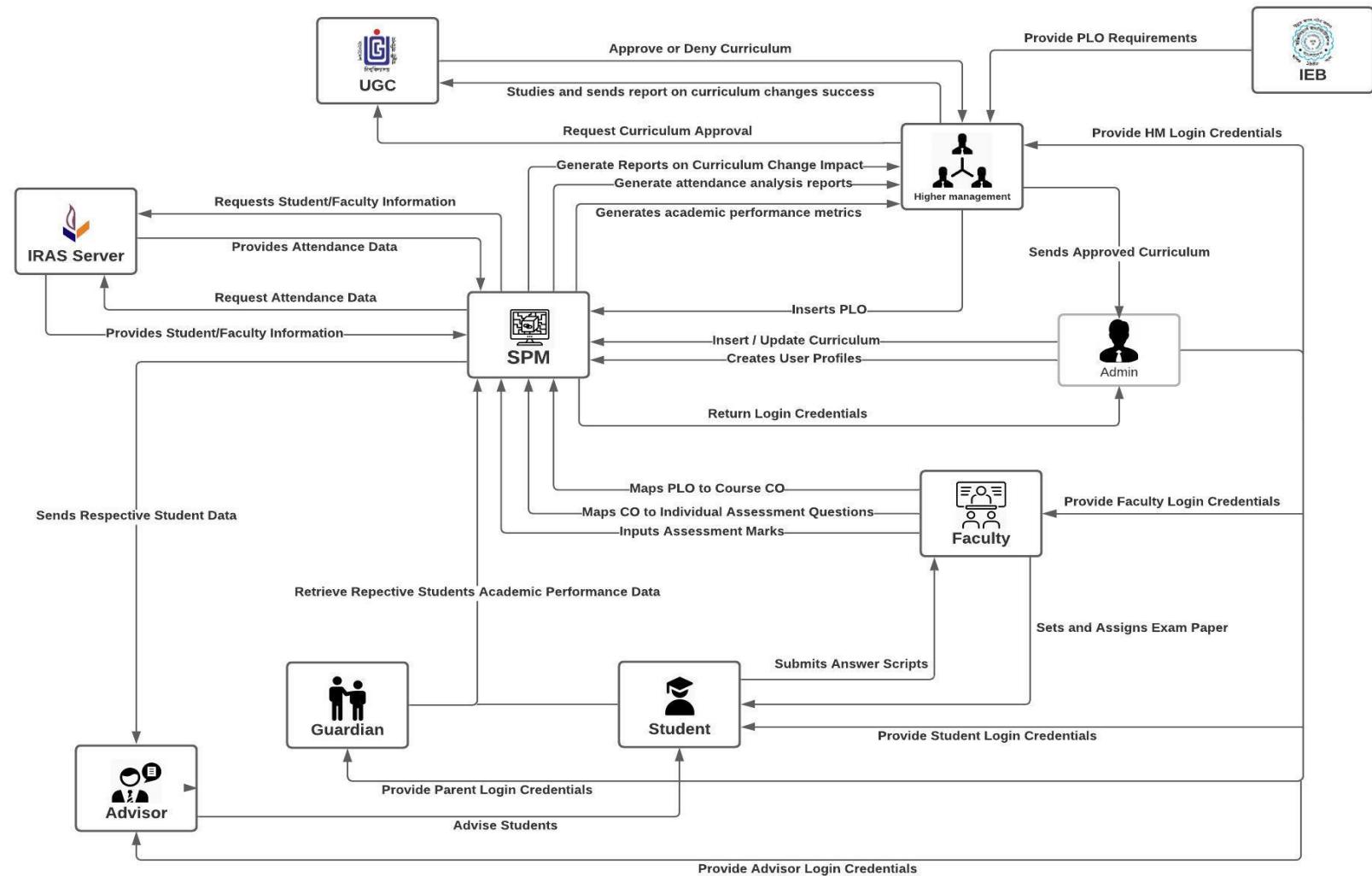
Problem Analysis

Process Name	Stakeholders	Concern (Problems)	Analysis (Reason of the Problem)	Proposed Solution
Admin creates user accounts.	1. Administrator 2. Guardians 3. Students 4. Faculty 5. Advisors 6. IRAS 7. Higher Mgt	<p>Currently, administrators can only create accounts for faculty, students, and Higher Management in IRAS.</p> <p>Unfortunately, the current system provides no user profiles for Advisors either.</p> <p>Furthermore, parents might be interested in opening accounts into the university system for tracking their children's study effort and academic performance.</p>	<p>University data is not highly accessible to diverse users leading to less interest by stakeholders into the system.</p> <p>The problem is that the parents are dependent upon the students to provide them with the proper results, grades, and progress of their coursework. Some students hesitate to share their achievements due to personal reasons.</p> <p>Since the advisors are typically instructors who have knowledge into the system, an extra portal for their ease of maintaining advising records has not been properly implemented into the system.</p>	<p>Allow an option for parents to apply for a use account by filling out a form to the institution. The information is reviewed before opening an account and allowing access to the parent. Both the student and guardian must sign the account request form.</p> <p>A portal in the SPM should be specifically developed for advisors so that they can pull transcripts and PLO progress of their designated students.</p> <p>Advisors can easily and quickly provide more holistic prognosis to their respective students through a friendly user interface accessing adequate data.</p>
Curriculum versions cannot be tracked although changes are made to the syllabus and the curriculum itself.	1. Admin 2. Higher Management 3. SPM 4. UGC	<p>Changes in curriculum do not occur frequently but a curriculum change request usually arises from a combination of reasons such as syllabus update, new PLOs, course addition, or new COs. These changes are vital to be tracked for evaluating the effectiveness of current curriculum and impact of changes in academic performance.</p> <p>The current system only stores data from the latest Curriculum change and PLO update.</p>	<p>The changes are easy to implement into the current system but tracking the changes will pose some complications in the system design and development. Therefore, impact analysis may be conducted manually by higher management in accordance with efforts from administrators who may be able to compile appropriate reports.</p>	<p>A Curriculum Management Subsystem (CMS) will be integrated into SPM attaining the sole responsibility for managing the changes in curriculum. The different versions can also be traced according to different PLO and CO achievements.</p> <p>Such historical data can be portrayed and studied to aid in the decision-making process for higher management in improving their curriculum.</p>

Request Transcript from IUB does not provide progress reports for the currently enrolled courses.	1. Student 2. Parents	<p>Students and parents are only allowed to view their students' academic progress through transcripts. The only problem is that the course grade is not published until semester ends. Moreover, only the course grade itself is published but not the assessment scores and question marks distribution.</p>	<p>The problem arises because there is a lack of managing student performance records such as scores of specific assessments and attendance records. This is a result from adherence to previous educational standards. With the latest establishment of outcome-based learning, there is an importance in managing individual records of assessments and question papers with respect to the responses, marks, and outcomes.</p>	<p>A system feature that will be implemented to allow user accounts, specifically students and parents, to view the respective progress of their courses throughout the semester. System will receive automatic updates frequently as teachers tally attendance, grade exam papers, and evaluate submitted projects. Students, administrators, teachers and occasionally the parents with user access may view and print progress reports as needed.</p>
Achievement tracking is problematic because the mapping of questions to COs is manually committed.	1. Faculty 2. Admin 3. SPM	<p>Faculty must maintain a separate Excel file for managing the achievement status for each student. This causes delay and inefficiency in the evaluation process for outcome achievement.</p> <p>Furthermore, the administrators are burdened with the data entry procedure of the outcome achievement status for all the students. This is done after the transfer of achievement tally fie by the faculty to the admin.</p> <p>The lack of logical connection between COs and questions can lead to insertion and update anomalies. A single CO can be mapped to two questions, one for the mid and the other for the final exam. It is important to note that the latest achievement status for an outcome is prioritized over the previous ones. Errors can be expected from this behavior if the data entry is not done chronologically.</p>	<p>The current outcome management system is manually done through Excel files. Although the approach is accurate, there is a lack of database integration into the system for managing the achievement data which must be accessible by various stakeholders such as higher management, UGC, etc.</p> <p>Moreover system. This is difficult to manage through a manual procedure involving an administrator and a bunch of information update requests from Excel files into the system.</p>	<p>Allowing an end-to-end connection from the question paper setting to the outcome achievement can be succeeded by integrating a remarkable feature for mapping the questions to the course outcomes on a database management system. This can be used by faculty to directly map the questions to the COs by simply entering the question number and its corresponding outcome.</p> <p>The questions will be further given marks for the responses for each student upon grading of exam papers. This will also be entered into the integrated system by the instructor rather than an Excel file. The calculation of the score will automatically update the achievement status of specific outcomes. Teachers and higher management can view, update, and print class records as needed enhancing the performance monitoring capability of the current system.</p>

Teachers will evaluate students and update marks in the SPM.	1. Faculty 2. Student 3. SPM	<p>Upon receiving exam papers from students, the faculty member must manually tally the CO achievement for each student based on the scores that they receive from their responses to the questions in the exam. This is accomplished simultaneously while they mark answer scripts. This process consumes unnecessary time and space on system hardware for the instructor and is prone to human-error.</p> <p>Eventually, the evaluation process poses higher costs from time consuming activities such as correcting possible human mistakes.</p>	<p>Mapping of questions to COs is not arranged in a database system thereby requiring faculty to tally the outcome achievements for each student as a manual task to be carried out concurrently while grading papers. There is also a redundant step of inserting the achievement tally into the database by a system administrator upon transfer of files from course instructors.</p>	<p>Instructor's responsibility to tally outcome achievements in concurrence with the grading procedure should be eliminated.</p> <p>The mapping of COs to questions for the Midterm and Final term examinations in the SPM allow direct access to faculty to manage their class records. insertion of marks for each question into the system will indicate the achievement status of specific outcomes. Multiple CO achievements will eventually indicate PLO achievement. The success status will be automatically updated without any extra hassle.</p> <p>Teachers and higher management can view, update, and print class records as needed enhancing the performance monitoring capability of the current system.</p>
Report Generation Requests from UGC for University or Department Evaluation	1. UGC 2. University 3. Higher Mgt 4. Admin	<p>Currently, the system may receive requests for data reports on student performance and class attendance records, but it lacks the analytic features that are required for tabulating information and graphing data. This leads administrators or analysts to use various other software to obtain, arrange and compile data according to the given parameters.</p> <p>The request handling mechanism for creating data reports is manual.</p> <p>For assurance of system maintainability and scalability, the system must contain data illustration features such as a graphical report generation software.</p>	<p>The external software used by the administrators or analyst are not integrated into the university system. This produces less output per unit of time leading to higher costs and delay in the request completion.</p>	<p>A graphical report generation software will consist of various functionalities such as data gathering and processing as well as organizing and depicting them in various illustrations such as graphs, tables, illustrations, etc.</p>

Rich Picture (TO-BE):



Six-Elements (TO-BE)

Process	System Roles					
	Human	Non-Computing Hardware	Computing Hardware	Software	Database	Network & Communication
1. Admin creates user accounts	<p>Admin 1) Extracts students' and faculties' information from iRAS 2) Updates information into the SPM Database 3) Creates new user accounts upon request</p> <p>Development Team and IT Experts Builds and maintains the SPM system.</p> <p>Internet Service Providers Provides the Internet service to the data sources, SPM users and SPM system.</p>	<p>Paper & Stationary Used to collect information in forms from users which do not have accounts in iRAS such as parents and UGC.</p> <p>Access Request Form Used by others for requesting access to the system such as parents or external analysts.</p>	<p>Computers 1) SPM administrators will use computers to access iRAS for data collection. 2) New account users (parents and analysts) will use the computer to view the data. 3) Faculties will use the computer to read and update.</p> <p>Database Server Used by iRAS to store data and by SPM developers to collect data.</p> <p>Networking Devices (Router, Switch, Bridge, Hub): Used to access iRAS, SPM</p>	<p>Operating Software Used by iRAS and SPM</p> <p>iRAS Used as a source of data from which the accounts will be created.</p> <p>SPM Educational program management system that the administrators will create the accounts for its respective users.</p>	<p>iRAS Database Used by the Admin as a source of information for user accounts.</p> <p>Excel Files User account data may be stored in excel files which will then be used by SPM.</p> <p>SPM Database The user account information will be stored here including usernames / account names, etc.</p>	<p>Internet It is used to access and store data from iRAS to SPM.</p>

2. Retrieve, Insert or Update PLOs and COs into SPM	IEB Provides PLO or any updates to Higher Mgt. Higher Management Inserts PLO into SPM. Admin Adds or updates PLO to SPM. Faculty Studies PLO and CO mapping.	Book Contains details of the PLO. Pen and Paper For mapping all the CO with the received PLO from IEB.	Computer 1) IEB will use the computer to create PLO which will be provided to the universities. 2) IEB can also mail higher management of universities about PLOs or any changes made to it. 3) Faculties view current PLOs and the mapped COs. Mobile Used for communication between stakeholders. Networking Devices (Router, Switch, Bridge, Hub): Used to access the Internet.	SPM Used to create, read, update, and/or delete details about PLOs and COs. Outlook Used for communication between Faculties and IEB. Operating System Any OS used by the users, Windows, Mac.	SPM Database For storing mapping of PLOs to COs. IEB Database Retrieving the PLO details from IEB. CMS Database Send curriculum changes into the SPM.	Internet 1) Used by faculties to access IEB website and update SPM. 2) Used by IEB to update and store PLO in their database.
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3. Set or Change Curriculum based on PLO	<p>Higher Management</p> <p>1) Consult with board on designing program curriculum to cover current PLOs set forth by IEB.</p> <p>2) Send defined curriculum or changes to UGC for approval</p> <p>UGC</p> <p>1) Review the curriculum for adherence to PLOs.</p> <p>2) Approve or deny the curriculum.</p> <p>Admin</p> <p>Make changes to curriculum based on change request approvals from higher management.</p>	<p>Paper and Stationary</p> <p>1) Conduct drawings and mappings to design curriculum</p> <p>2) Taking important notes and drawing rough sketches during board meetings.</p> <p>Curriculum Booklet</p> <p>Used to provide a manual version of curriculum for students, parents, UGC, etc.</p> <p>Board Room</p> <p>Specific room designated for board meetings.</p> <p>Change Request Form</p> <p>Printed version of a change request that is to be implemented in the database.</p>	<p>Computer</p> <p>1) Higher Management and designated faculties use computers to determine and create curriculum report for specific programs offered by the university.</p> <p>1) UGC will use the computer to view current curriculum of various programs and provide multiple feedback if necessary.</p> <p>Mobile</p> <p>Stakeholders have reliable communication through phones.</p> <p>Printer</p> <p>Used for printing change request forms, templates, curriculum booklets, course information, etc.</p> <p>Networking Devices (Router, Switch, Bridge, Hub):</p> <p>Used to access the Internet for viewing online materials.</p>	<p>Skype</p> <p>Members of educational institutions, UGC, IEB and others can hold teleconferences.</p> <p>Email</p> <p>1) Used for minor communication among members such as sending important files and scheduling appointments.</p> <p>2) UGC sends feedback to institutions regarding curriculum approval requests or current flaws or appraisals on the current curriculum.</p> <p>SPM</p> <p>Used for reviewing PLOs for mapping all COs to them.</p> <p>Curriculum Management System (CMS)</p> <p>1) Add new courses as due to PLO update.</p> <p>2) Make changes to course information as a result from new research and policies.</p>	<p>SPM Database</p> <p>Use the database to obtain the PLOs.</p> <p>CMS Database</p> <p>Use the database for version management of curriculum as changes are made to program requirements and PLOs through the future.</p>	<p>Internet</p> <p>1) Used by UGC to view shared updates to curriculum.</p> <p>2) Higher Management communicates files, requests, and changes to curriculum through the network.</p>
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4. Set Question Papers according to COs and conduct exams	<p>Faculty 1) Retrieve COs associated with specific course. 2) Format and set question papers for examinations according to the collected COs. 3) Set classroom schedule for assessments. 4) Conduct examinations and collect test papers.</p> <p>Student Sit for examinations and submit attempted test papers to faculty.</p>	<p>Table & Chair To use during exams.</p> <p>Pen and Paper 1) For attempting the exams. 2) Questions may be printed on paper.</p> <p>Clock Setting time for the exam.</p> <p>Room Specific room for exams.</p>	<p>Computer 1) Used by faculties to access the COs from the software. 2) Faculties also use it to take online exams and interact with students when required. 3) Students use it to attend online exams if necessary.</p> <p>Mobile Phones Virtual examinations may require mobile phones for scanning and uploading pdfs to virtual examinations.</p> <p>Printer Used by faculties to print out question papers for students.</p> <p>Database Server Used by faculties to access and collect the COs to set questions.</p> <p>Networking Devices (Router, Switch, Bridge, Hub): Used by faculties and students to access the Internet.</p>	<p>SPM The software from which the faculty will collect COs.</p> <p>Google Classroom Used by faculties and students during exams.</p> <p>Operating system Any OS used by the users such as Windows and Mac.</p> <p>Printing Software To view question in PDF to send the answer in PDF.</p> <p>PDF Viewer To view the questions or send the answers in PDF format.</p>	<p>SPM Database 1) Students and faculties can access COs from this. 2) Students can view current COs and skills required for achieving those goals.</p>	<p>Internet 1) Used by faculties to access SPM software and its database. 2) Used by faculties and students during exams.</p>
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5. Teachers evaluate students and update marks in SPM	<p>Faculty 1) Update database with the achieved COs marks of the student. 2) Send the Exam paper back to the Student.</p> <p>Student Request faculty to return graded exam papers.</p>	<p>Pen and Paper The exam paper is graded virtually or marked with a red pen.</p>	<p>Computer Used by faculty members to store the exam result and update the database with achieved COs.</p> <p>Database Server Used by faculty members to access and store or update the database.</p> <p>Mobile Used for communication between faculty members and students.</p> <p>Networking Devices (Router, Switch, Bridge, Hub): Used by faculty members to access the Internet.</p>	<p>SPM Store the updated data of the student.</p> <p>OS Any OS such as Windows, Mac</p>	<p>SPM Database It is used to store the updated data of the Student.</p>	<p>Internet Connection It is used by the faculty to access the SPM software and the database.</p>
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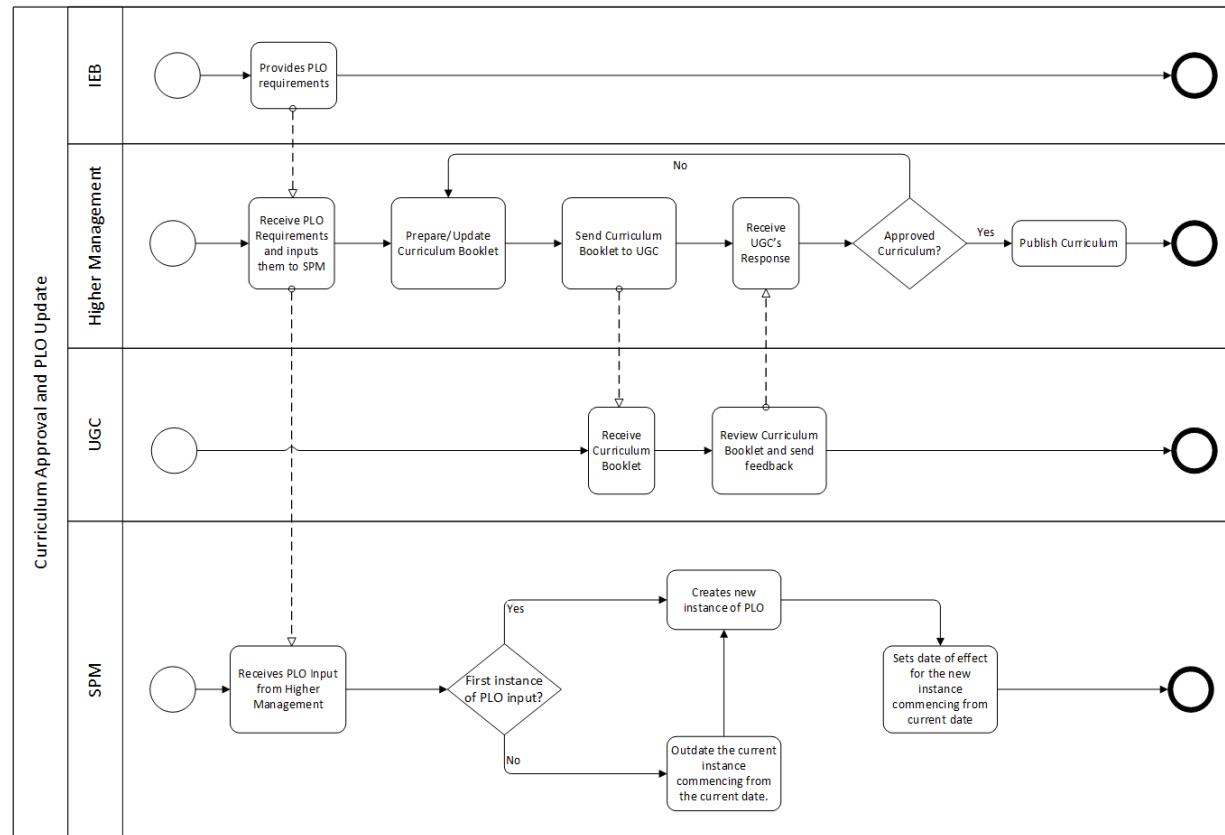
6. Tally Attendance, Highlight Assessment Dates, View and Manage Records	Faculty Take attendance in classroom, either mark them tardy, present or leave blank in case of absence. Student Check their attendance record and take precautions as to not go over the maximum limit of classes missed for a specific course. Admin View and update changes to attendance records on occasional requests.	Paper Needed for printed attendance records to higher authority for assuring student and faculty punctuality.	Computer 1) Used by faculties in classrooms to record attendance on the attendance management system. 2) Used by administrators to make any requested changes to existing attendance records. Printer Print attendance records upon request for reference or as needed. Networking Devices (Router, Switch, Bridge, Hub): Used to access the Internet for recording attendance on the system.	Attendance Management System (AMS) Used to manage attendance records in the AMS Database by faculties and administrators. SPM Retrieve attendance records from AMS to account for as a factor to the overall calculation of student grades and thereby also their CGPA for each semester.	AMS Database Used to record attendance for a long lifetime. SPM Database Used to clone attendance data from AMS to generate student grades and calculate CGPA.	Internet Used To access both, SPM and AMS servers for database management.
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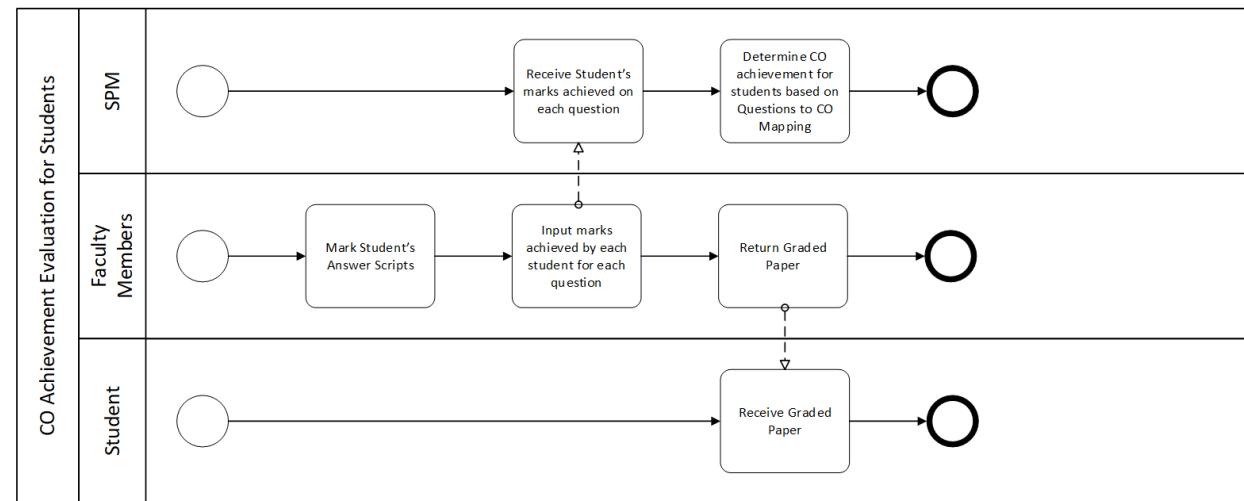
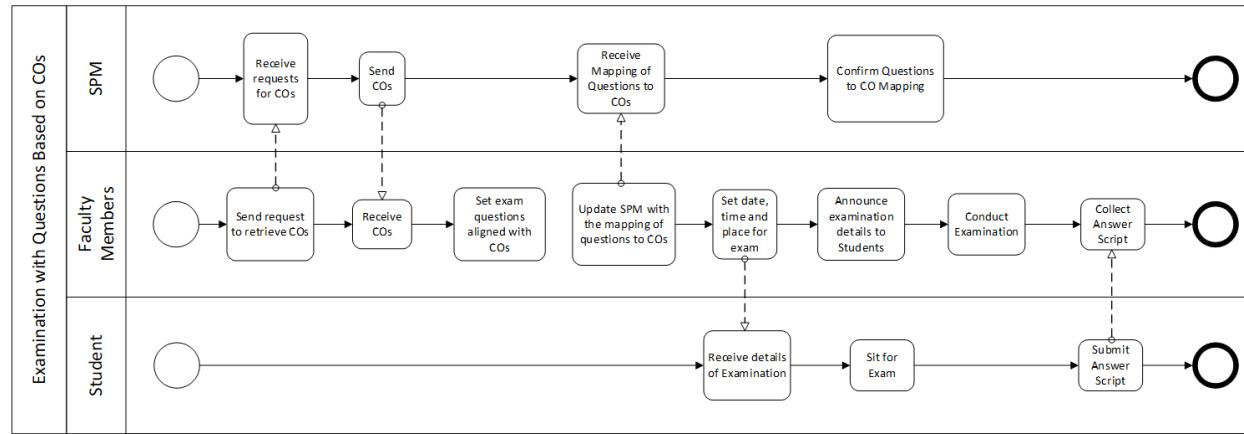
7. Request, Progress Reports, Report Cards, or Transcripts from SPM	<p>Student 1) Request for specific progress Reports based on midterm, final, or semester results. 2) They can also request for transcript based on current GPA and credits earned.</p>	<p>Paper Students may want to print a hard copy of the transcript.</p>	<p>Computer 1) Used for requesting progress reports or transcripts. 2) View progress reports, transcripts.</p> <p>Printer Print hard copy of transcript</p> <p>Networking devices (Router, Switch, Bridge, Hub): Used to access the Internet</p>	<p>SPM 1) Queries the database to collect the required and relevant information of the student to generate a progress report or transcript, e.g. marks, grades, courses, credits, etc. 2) Calculate the relevant information from the student's data such as marks or grades. 3) Create a web page for the student to view and download electronic copies of their transcript.</p> <p>Operating System Any OS used by the users, Windows, Mac.</p> <p>Printing Software Printing software used for printing progress reports transcript.</p> <p>PDF Viewer To view reports or transcript in PDF format.</p>	<p>SPM Database Provide the SPM software with the information it queries from the database.</p>	<p>Internet To access the SPM software.</p>
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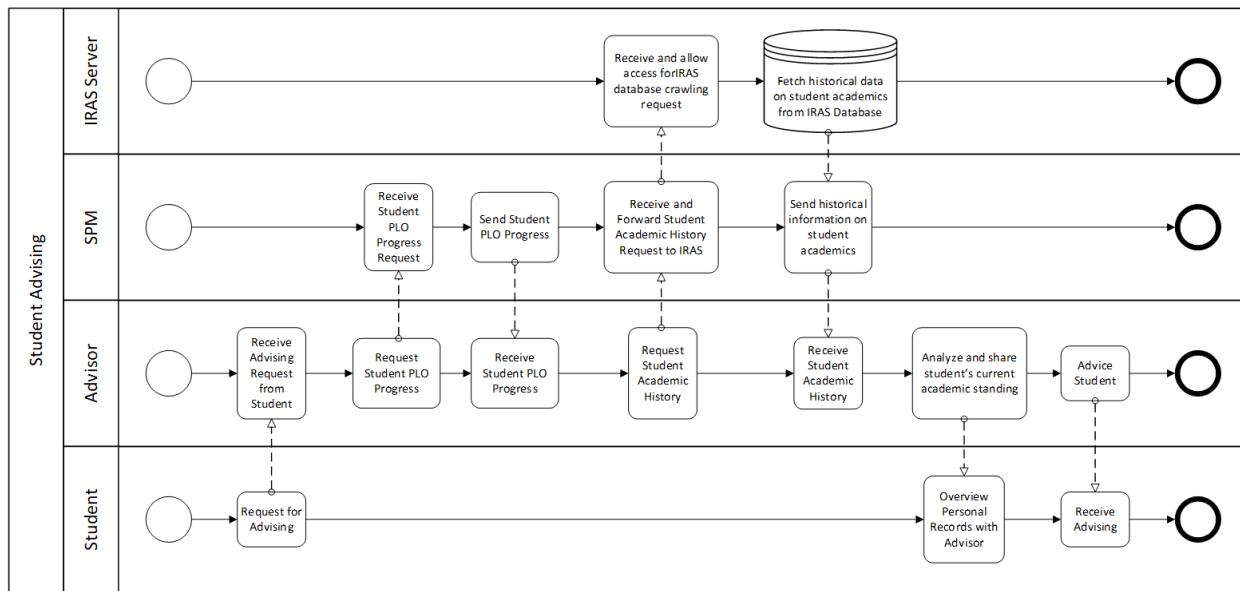
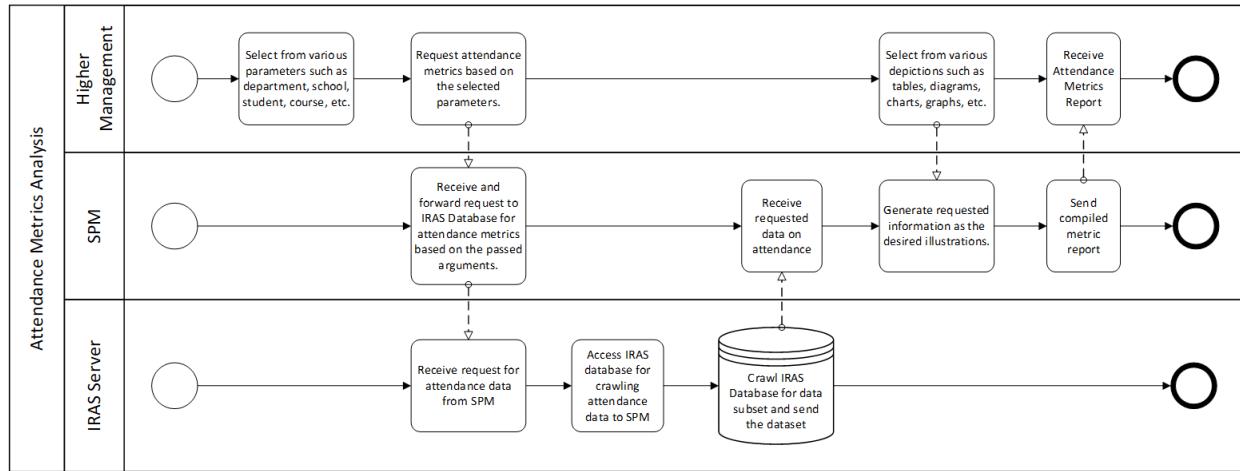
8. UGC Request Reports on Student Success Info for performance appraisal of departments or universities.	UGC 1) UGC may request student performance reports based on a particular department or the whole university. 2) They may provide feedback regarding their evaluations. Data Analyst Admin will prepare a report on students' performance based on given parameters.	Paper and Stationary a) UGC may send out an application requesting to evaluate using SPM. Information Request Form Used for requesting SPM development team for information and data on specific universities, depts, etc.	Printer/Fax 1) Used to print out reports to send to UGC. 2) Reports may also be faxed. Laptop/PC & other devices 1) UGC will need a computer or phone to access SPM. 2) UGC may use one for evaluating and sending results. Networking Devices (Router, Switch, Bridge, Hub): Used to access the Internet.	SPM 1) SPM will contain all individual student evaluations. 2) Organizes and calculates individual data to show various trends of the department, school, or university. Operating System Any OS used by the users, e.g. Windows, Mac. Printing Software Printing software used for printing the curriculum.	SPM Database Will contain all data regarding COs and PLOs for individual students.	Internet To access SPM. b) Reports may be requested or sent via email which is accessed by using the Internet.
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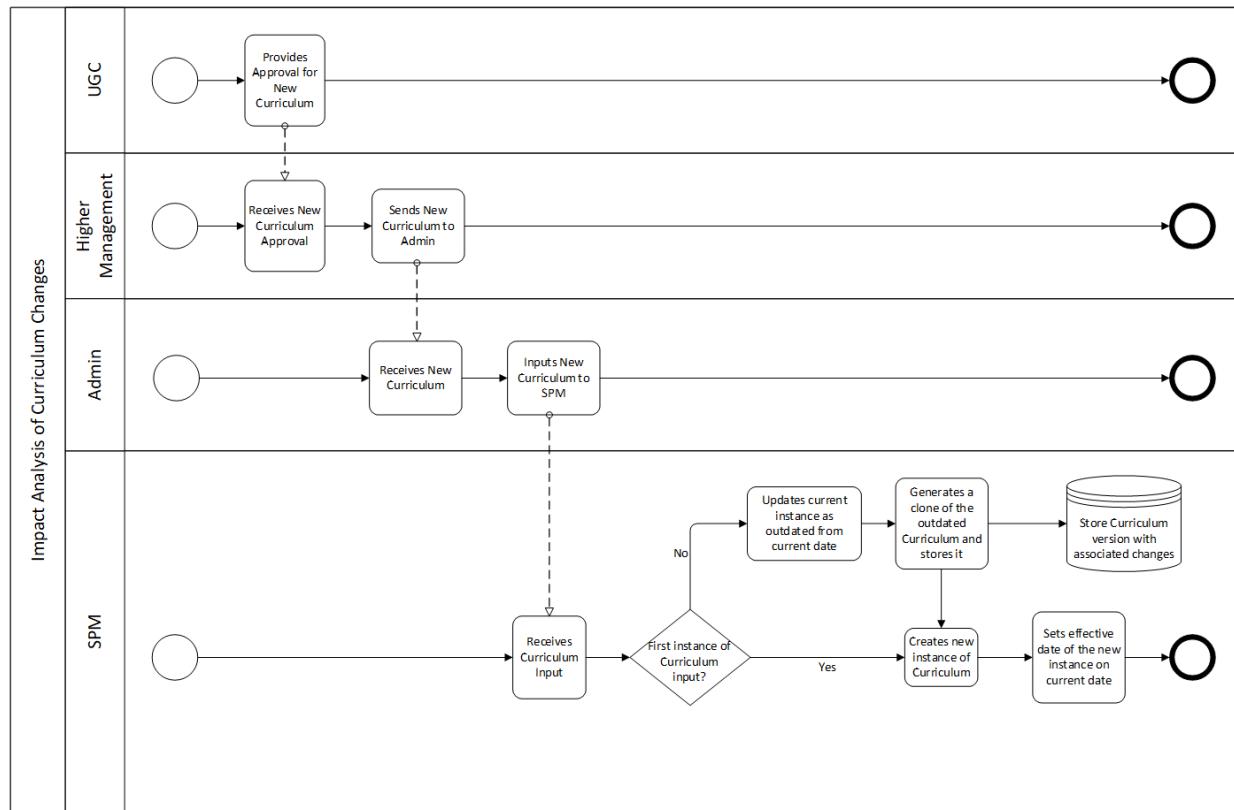
9. Arrange, compare, and depict data through graphs, tables, and other illustrations.	Higher Management Conduct studies on student performance records, attendance records, and faculty evaluations. 2) Create and print reports using a graphical report generation software. Admin Perform studies and create reports based on given parameters as required or ordered from higher management.	<p>Paper Needed for printing out hard copies of generated reports.</p>	<p>Computer</p> <p>1) Used for viewing and analyzing data through SPM. 2) Administrators use computers to design special reports based on given parameters.</p> <p>Printers Used for printing hard copy of reports.</p>	<p>SPM Retrieves performance records for analysis.</p> <p>AMS Retrieves attendance records for assessing student punctuality.</p> <p>CMS Retrieve data on curriculum changes to compare versions.</p> <p>Graphical Report Generation Software Create graphs, tables and other illustrations based on manual input or requests from IRAS, SPM, AMS or CMS.</p> <p>Outlook Send reports to those with a shared interest.</p> <p>Operating System Any OS used by the users, e.g. Windows, Mac.</p> <p>Printing Software Printing software used for printing the curriculum.</p> <p>File Format Conversion Software Used for converting reports into different format for supporting various views.</p>	<p>SPM Database</p> <p>1) Conduct studies based on student performance records such as PLOs, COs, grades, and CGPA.</p> <p>2) Conduct studies on historical records to detect process performance improvement, process bottlenecks, course content difficulty and managerial effectiveness in PLOs.</p> <p>AMS Database</p> <p>1) Gather attendance records for creating graphs based on student punctuality.</p> <p>2) Compare punctuality ratios with other ratios published by universities.</p> <p>CMS Database Compare the changes in curriculum and its impact on student performance based on historical records in the SPM Database.</p>	<p>Internet Used to access all the databases on the server for information retrieval and data analysis.</p>
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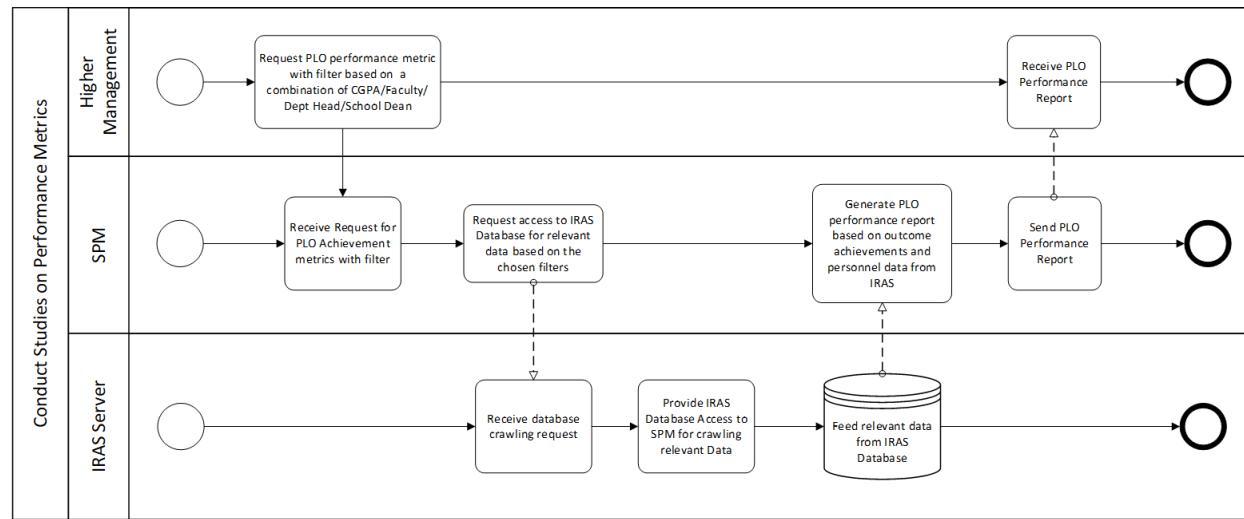
BPMN 2.0 Diagram:









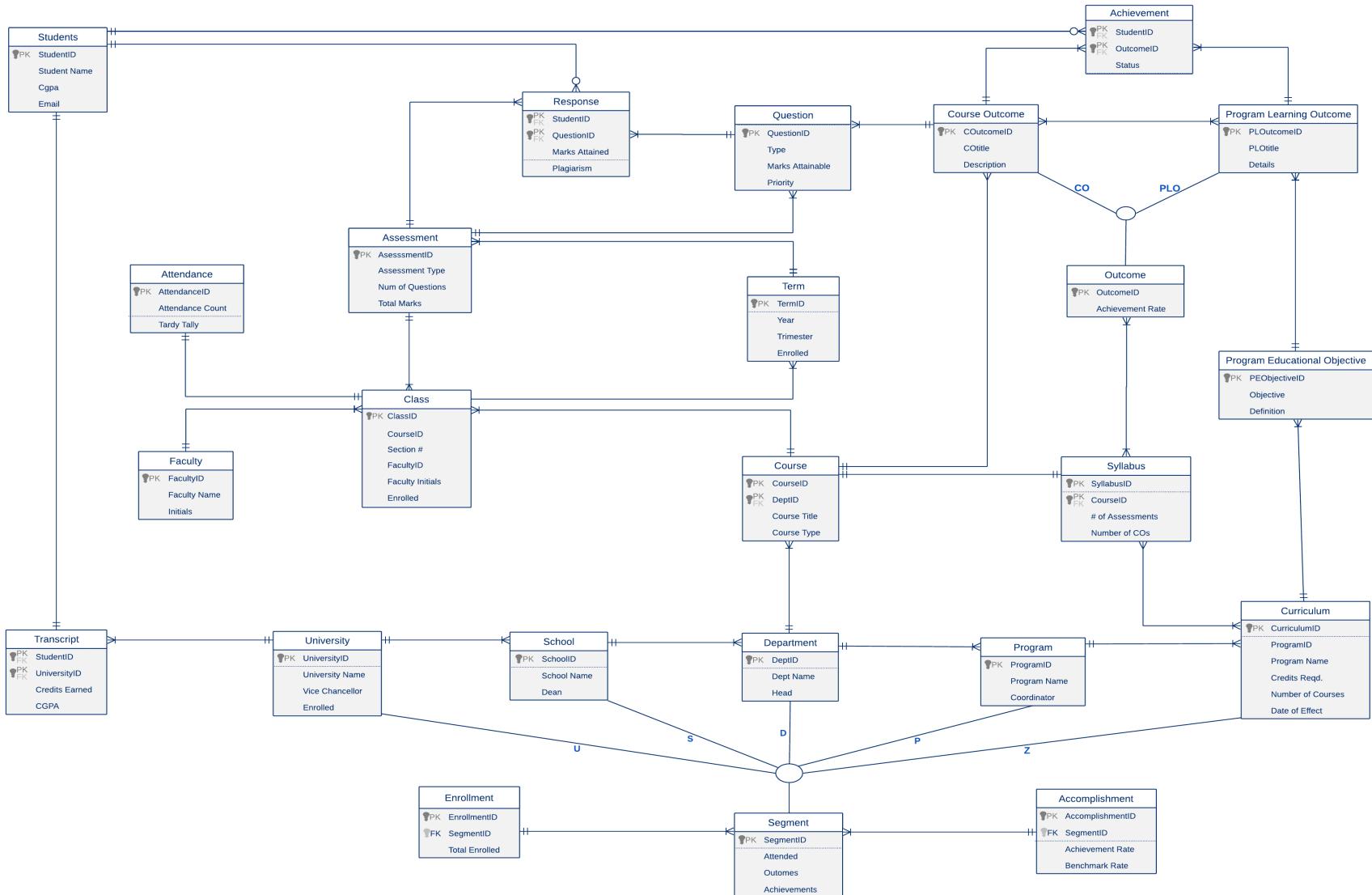


Report 3: Logical System Design

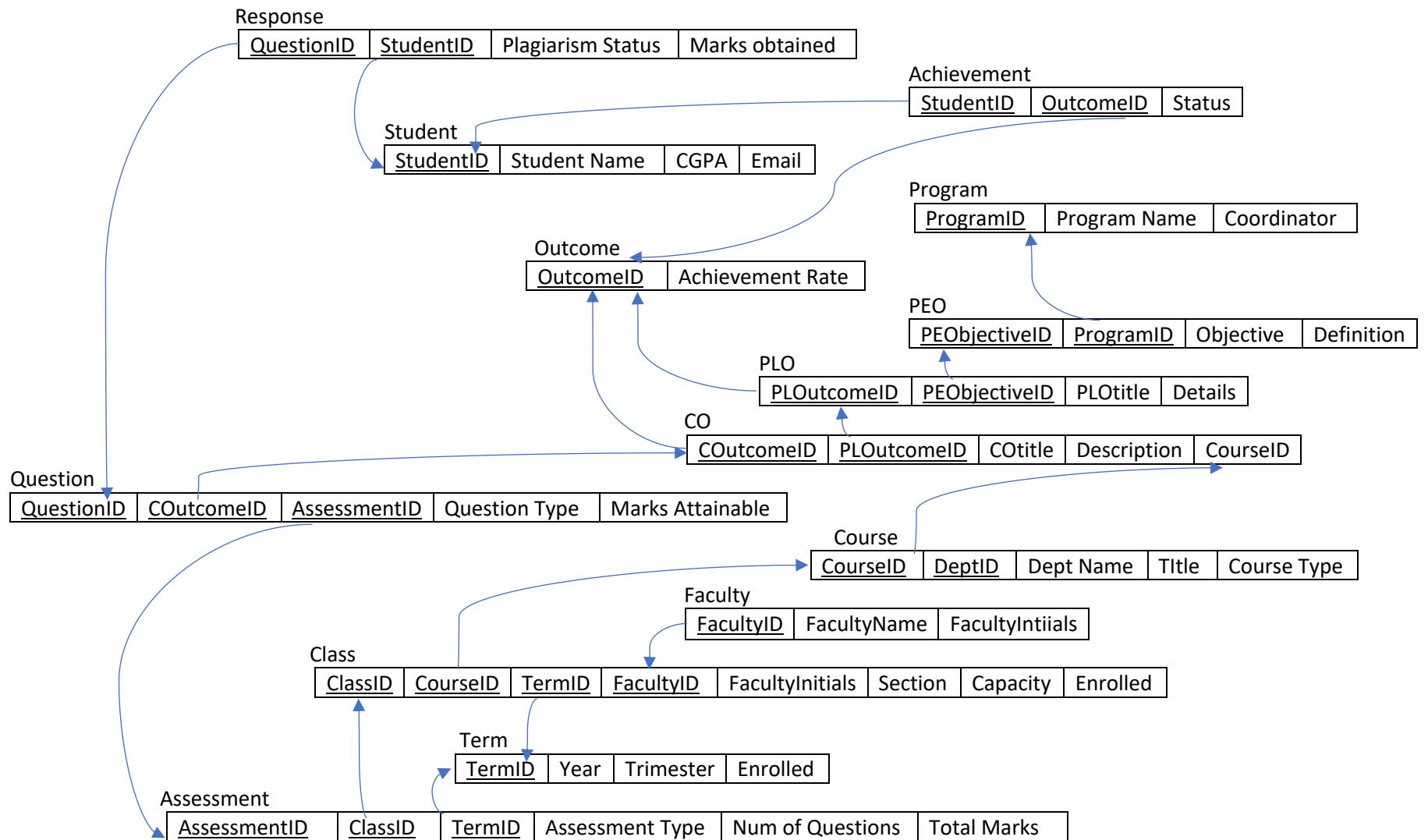
Business Rules

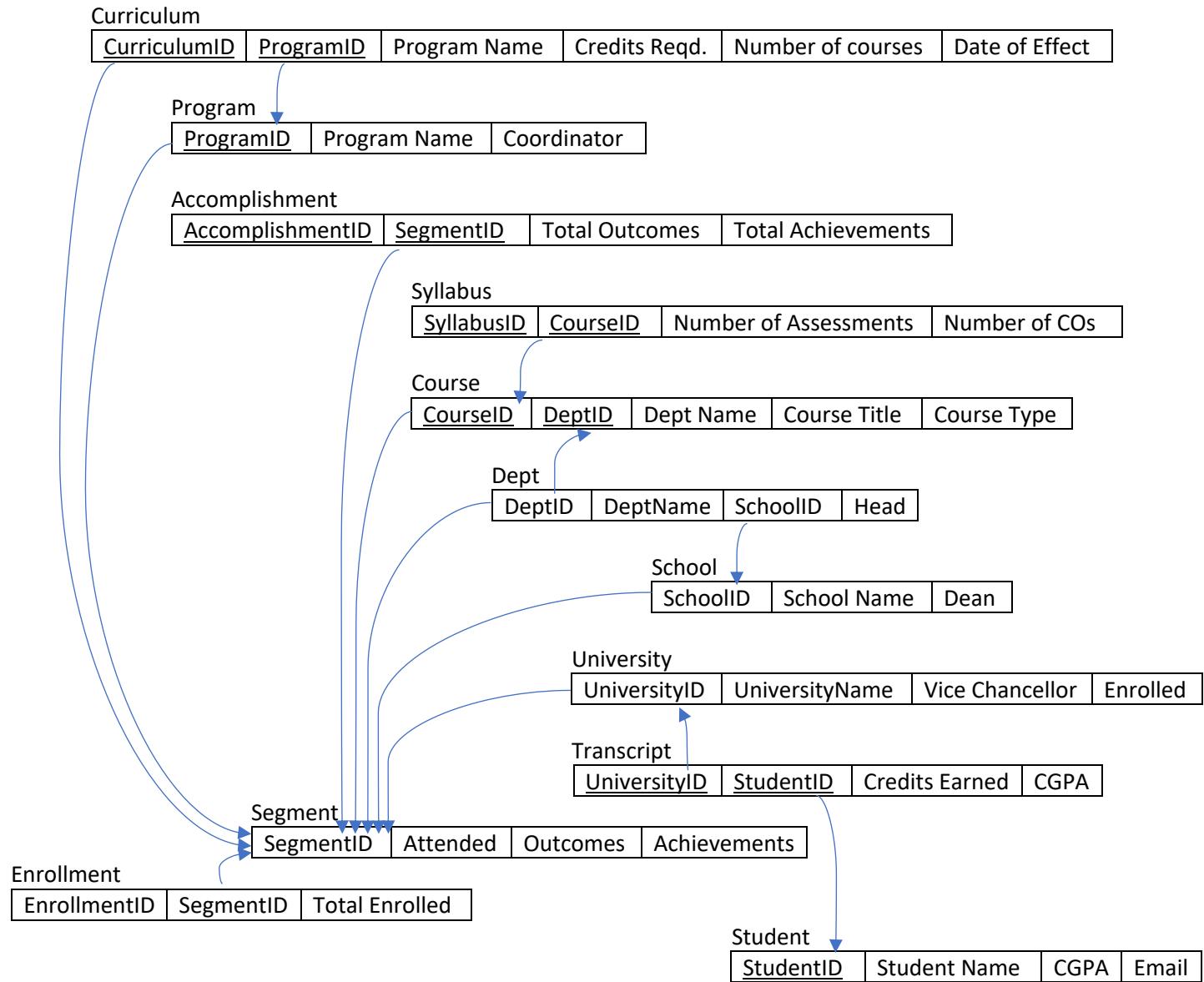
- Approved curriculum can be inserted into the system by higher management through an interactive web application including number of courses, credits required and a grading scale.
 - There will be a follow up procedure to enter the Program Educational Objectives (PEOs) and their mapping to Program Learning Outcomes (PLOs) for the specific program.
 - Course details (syllabus information) can be entered during the curriculum setting or later
- Individual syllabus can be defined by entering the number of course outcomes for a specific course as well as their mapping to the PLOs.
- Faculty members can set the number of assessments planned for the semester term and map the exam questions to a single course outcome for PLO coverage.
- Instructors can insert individual scores for every question in each assessment during the enrollment term that can automatically compute and track total marks, grades, and outcome achievements for each student, course, and beyond.
- Instructors and higher management can retrieve individual records of each student according to CGPA, outcome achievements, success rate as well as performance metrics based on course, section, department, etc.
- Higher management can also create, view and print reports based on various records regarding student pass / fail ratio, average score, CO achievement rate, PLO achievement coverage, course evaluation, program effectiveness, etc.

Entity Relationship Diagram



Relation Schema





Relation notation

Relation	Attribute	Symbol	Relation	Attribute	Symbol	Relation	Attribute	Symbol
Response	StudentID	s	CO	COutcomeID	x	Question	QuestionID	q
	QuestionID	q		CourseID	c		CoutcomeID	x
	MarksObtained	r1		PLOutcomeID	y		AssessmentID	a
	PlagiarismStatus	r2		COtitle	x1		QuestionType	q1
Course	CourseID	c	Achievement	Description	x2	Outcome	MarksAttainable	q2
	DeptID	d		OutcomeID	o		OutcomeID	o
	DeptName	d1		StudentID	s		AchievementRate	o1
	CourseTitle	c1		Status	v1		PLOutcomeID	y
	CourseType	c2	Assessment	AssessmentID	a	PLO	PEObjectiveID	k
Class	ClassID	l		ClassID	l		PLOTITLE	y1
	CourseID	c		TermID	t		Details	y2
	TermID	t		AssessmentType	a1		TermID	t
	FacultyID	f		NumOfQuestions	a2		Year	t1
	FacultyInitials	f1		TotalMakrs	a3		Trimester	t2
	SectionNum	l1		EnrollmentID	e		Enrolled	t3
	Enrolled	l2		SegmentID	Δ	Progarm	ProgramID	p
Curriculum	CurriculumID	z	Transcript	Enrolled	e1		ProgramName	p1
	ProgramID	p		UniversityID	u		Coordinator	p2
	ProgramName	p1		StudentID	s	Accomplishment	AccomplishmentID	g
	CreditsReqd	z1		CreditsEarned	m1		SegmentID	Δ
	NumOfCourses	z2		CGPA	m2		Total Outcomes	g1
	EffectiveDate	z3		SegmentID	Δ		Total Achievements	g2
University	UniversityID	u	Segment	Attended	Δ1	Department	DeptID	d
	UniversityName	u1		Outcomes	Δ2		DeptName	d1
	Vice Chancellor	u2		Achievements	Δ3		SchoolID	s
	Enrolled	u3		AttendanceID	b		Head	d2
School	SchoolID	h	Attendance	ClassID	l	Faculty	FacultyID	f
	SchoolName	h1		PresenceCount	b1		FacultyName	f1
	Dean	h2		TardyTally	b2		FacultyInitials	f2
	StudentID	s	PEO	PEObjectiveID	k	Syllabus	SyllabusID	i
Student	StudentName	s1		ProgramID	p		CourseID	c
	CGPA	s2		Objective	k1		NumOfExams	i1
	Email	s3		Definition	k2		NumOfCOutcomes	i2

Relations

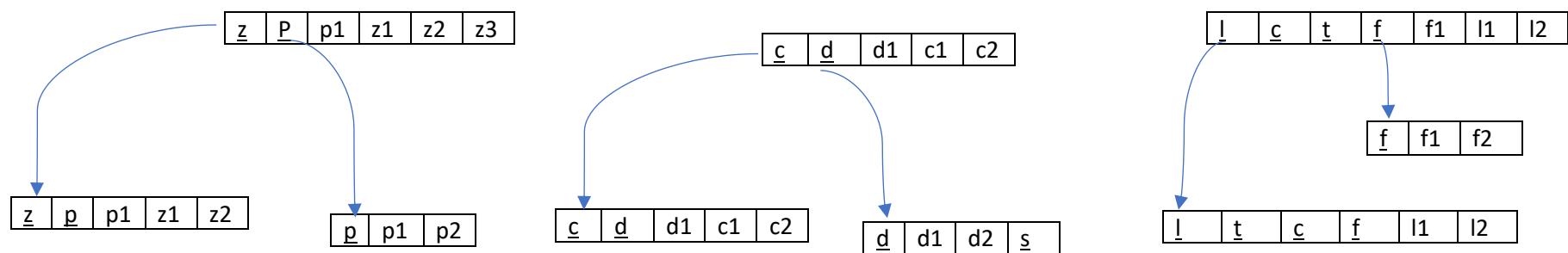
Identifier	Attribute	Identifier	Attribute
$q, s \rightarrow$	$r1, r2$	$h \rightarrow$	$h1, h2$
$x \rightarrow$	$c, y, x1, x2$	$q, a \rightarrow$	$x, q1, q2$
$l, c, t, f \rightarrow$	$f1, l1, l2$	$o \rightarrow$	$o1$
$z \rightarrow$	$p, p1, z1, z2, z3$	$y \rightarrow$	$k, y1, y2$
$u \rightarrow$	$u1, u2, u3$	$t \rightarrow$	$t1, t2, t3$
$u, s \rightarrow$	$m1, m2$	$p \rightarrow$	$p1, p2$
$i \rightarrow$	$c, i1, i2$	$g, \Delta \rightarrow$	$g1, g2$
$s \rightarrow$	$s1, s2, s3$	$d \rightarrow$	$d1, d2$
$o, s \rightarrow$	$v1$	$f \rightarrow$	$f1, f2$
$a \rightarrow$	$l, t, a1, a2, a3$	$k \rightarrow$	$p, k1, k2$
$e, \Delta \rightarrow$	$e1$	$b \rightarrow$	$l, b1, b2$
$c \rightarrow$	$d, d1, c1, c2$	$\Delta \rightarrow$	$\Delta1, \Delta2, \Delta3$

Normalization

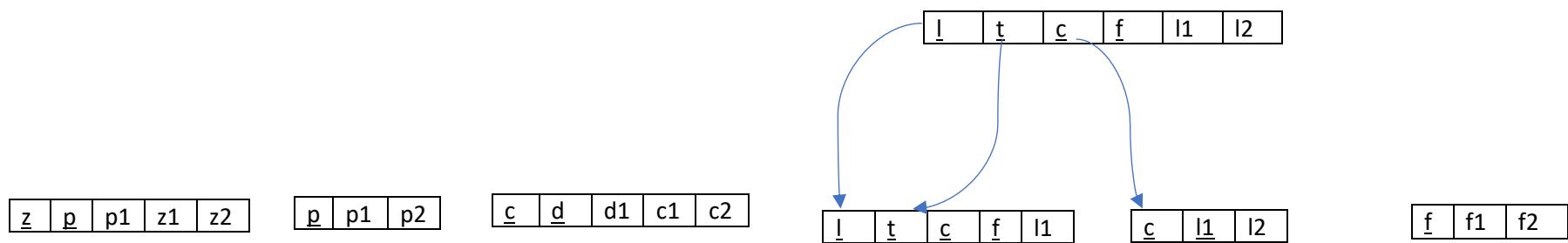
1NF:

<u>z</u>	p	p1	z1	z2	z3	<u>p</u>	p1	p2	<u>c</u>	<u>d</u>	d1	c1	c2	<u>d</u>	d1	d2	<u>s</u>	<u>l</u>	<u>t</u>	<u>c</u>	<u>f</u>	l1	l2	<u>f</u>	f1	f2	<u>c</u>	<u>l1</u>	l2
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2NF



3NF:



Relations in Boyce-Codd Normal Form

Relation	Key ->	Attributes
Response	questionID, studentID ->	marks_obtained, plagiarism_status;
CO	coutcomeID ->	courseID, ploutcomeID, co_title, description
Class	46ssessm, 46sess ->	facultyID, sectionID
Curriculum	curriculumID ->	programID, num_of_courses, credits_reqd, effective_date
University	46ssessmentID ->	university_name, vice_chancellor, enrolled
Transcript	46ssessmentID, studentID ->	credits_earned, cgpa
Syllabus	syllabus ->	courseID, num_of_exams, num_of_outcomes
Student	studentID ->	student_name, cgpa, email
Achievement	outcomeID, studentID ->	achievement_status
Assessment	assessemntID ->	46ssessm, 46sess, exam_type, num_of_questions, total_marks
Enrollment	enrollmentID, segmentID ->	total_enrolled
Course	courseID ->	deptID, course_title, course_type
School	schoolID ->	school_name, dean
Outcome	outcomeID ->	achievement_rate
PLO	ploutcomeID ->	peobjectiveID, plo_title, details
Term	46sess ->	year, trimester, enrolled
Program	programID ->	program_name, coordinator
Accomplishment	accomplishmentID, segmentID ->	total_outcomes, total_achievements
Department	deptID ->	dept_name, dept_head, schoolID
Faculty	facultyID ->	faculty_name, faculty_initials
Attendance	attendanceID, 46ssessm ->	presence_count, tardy_tally
Segment	segmentID ->	attended, outcomes, achievements
PEO	peobjectiveID ->	programID, objective, definition
Question	questionID, 46ssessmentID ->	coutcomeID, marks_attainable
Section	courseID, sectionID ->	enrolled, class_schedule

Data Dictionary

tbl_university

Attribute Name	Data Type	Size	Description	Example
universityID	VARCHAR	10	Primary key of the university table for basic information	IUB
university_name	VARCHAR	50	Name of the university indicated by the universityID	Dhaka University
vice_chancellor	VARCHAR	30	Name of the current Vice Chancellor in the school	Tanweer Hasan
enrolled	MEDIUMINT UNSIGNED	6	Total number of students enrolled in the current enrollment term	31788

tbl_transcript

Attribute Name	Data Type	Size	Description	Example
universityID	VARCHAR	10	Foreign key for generating university report for a specific student	IUB
studentID	CHAR	7	Foreign key to specific student whose transcript is generated	14330212
credits_earned	TINYINT UNSIGNED	1	Record of total credits earned throughout the entire enrollment	66
cgpa	DECIMAL	(3,2)	Cumulative CGPA automatically calculated based on grades	3.4

tbl_term

Attribute Name	Data Type	Size	Description	Example
termID	TINYINT UNSIGNED	1	Primary key identifying a specific enrollment used for various indexing purposes.	221
year	SMALLINT	4	Used to represent the year of the enrollment term.	2022
trimester	TINYINT	1	Used to represent either Summer, Spring or Autumn semester.	Summer
enrolled	SMALLINT	5	Indicates the number of students enrolled for the specific term.	8994

tbl_faculty

Attribute Name	Data Type	Size	Description	Example
facultyID	CHAR	8	A primary key of specific length used for accessing relevant information within the system.	44133401
faculty_name	VARCHAR	30	The name of the faculty as indicated directly through the unique identifier key.	Md. Abu Sayed
faculty_initials	VARCHAR	5	A specific abbreviation set for common identification of faculty throughout system and outwards.	ASY

tbl_class

Attribute Name	Data Type	Size	Description	Example
classID	VARCHAR	8	Primary key as a concatenation of courseID and section number	CSE303.2
termID	TINYINT UNSIGNED	1	Foreign key to the term table for specifying timeframe of the classes being held	182
facultyID	CHAR	8	Foreign key to faculty talbe for relating course instructor details	44133401
sectionID	TINYINT UNSIGNED	1	Unique identifier for different sections of a course	1
num_of_exams	BIT	4	Indicates the number of exams planned to be taken for the course under a specific enrollment term	3
capacity	CHAR	3	The number of students enrolled in the class room.	30

tbl_assessment

Attribute Name	Data Type	Size	Description	Example
assessmentID	TINYINT UNSIGNED	1	Primary key identifies instance of an assessment taken by a specific class during an enrollment term.	12
classID	VARCHAR	8	Foreign key specifying the class for which an assessment is taken also implied the term as link.	CSE441.1
termID	TINYINT UNSIGNED	1	Foreign key specifying the year & semester the assessments are recorded for.	202
exam_type	VARCHAR	10	Specifies the type of the assessment such as quiz, final, project, etc.	Mid
num_of_questions	TINYINT UNSIGNED	1	Specifies the number of questions to map for a particular assessment	5
exam_percentage	TINYINT	1	Indicates the percentage weight of the assessment for the total grade calculation	30
total_marks	TINYINT UNSIGNED	1	Specifies the total marks carried by the assessment	70

tbl_question

Attribute Name	Data Type	Size	Description	Example
questionID	SMALLINT	5	Specifies the question for a specific assessment	321
assessmentID	TINYINT UNSIGNED	1	Foreign key indicating the assessment for which the questions are set	12
outcomeID	SMALLINT	3	Indicates the course outcome that the question is mapped to for outcome achievement evaluation	114
marks_attainable	TINYINT	1	Indicates the total weight that the question carries for a specific assessment	20

tbl_score

Attribute Name	Data Type	Size	Description	Example
questionID	SMALLINT	4	Primary key used identifying assessment and its questions whose record is being kept	321
studentID	CHAR	7	A foreign key specifying the student whose score is being represented through the record	1773271
score	DECIMAL	(5,2)	The percentage grade of either a question, assessment, or an entire class for a specific semester	18
plagiarism_status	BIT	1	This represents whether a response by a student was suspected as being plagiarised or not.	0

tbl_coutcome

Attribute Name	Data Type	Size	Description	Example
coutcomeID	TINYINT	1	A specific index used for the internal identification and access mechanism for modification	114
courseID	CHAR	6	The course for which the outcomes are dedicated towards	CSE303
poutcomeID	TINYINT	1	Indicates the PLO to which the CO is mapped to (Singular Mapping)	12
co_title	VARCHAR	25	Indicates the domain or topic for the outcome to cover	Logical Reasoning
description	VARCHAR	300	Explains the outcome goals	"Reasoning ... "
plo_trace	VARCHAR	11	Indicates the set of PLO indices to which the CO is mapped to	123A4CD

tbl_ploutcome

Attribute Name	Data Type	Size	Description	Example
ploutcomeID	CHAR	1	A hexadecimal value representing the 13 PLO indices	B
peo_complex	VARCHAR	1	A special complex variable used for identifying all the PEOs mapped to the identified PLO	1
plo_title	VARCHAR	40	The title of the PLO identified	Design
details	VARCHAR	250	The description of the PLO uniquely identified	"An Ability to ... "

tbl_peobjective

Attribute Name	Data Type	Size	Description	Example
peobjectiveID	BIT	2	Primary key to represent any of the few program educational objectives under a specific program.	2
programID	VARCHAR	5	Foreign key to the program under which the PEOs are set for curriculum evaluation.	CSE
objective	VARCHAR	35	Specifies the topic of concentration for the indicated PEO.	Critical Thinking
definition	VARCHAR	300	Explains the specific objective of the PEO indicated by the primary key	"Education system is based on ... "
peo_weight	TINYINT	4	Expresses the number of COs carried onto this PLO for achievement rate evaluation.	10

tbl_syllabus

Attribute Name	Data Type	Size	Description	Example
syllabusID	INTEGER UNSIGNED	6	Autofills based on department, version, and course number	3
courseID	CHAR	6	Foreign key to the course for which the syllabus is specified	CSE303
num_of_exams	BIT UNSIGNED	4	Total number of exams planned for the semester	3
num_of_outcomes	BIT UNSIGNED	4	Number of outcomes expected to be achieved by the students	4

tbl_course

Attribute Name	Data Type	Size	Description	Example
courseID	CHAR	6	Primary key identifying a course and its details	CSE481
deptID	VARCHAR	7	Foreign key to the department table for identifying the specific department offering the course	CSE
course_title	VARCHAR	50	Specifies the title of the course	Algorithms
course_type	VARCHAR	10	Specifies the type of the course either foundation, core, major, minor, optional, etc.	Foundation

tbl_curriculum

Attribute Name	Data Type	Size	Description	Example
curriculumID	TINYINT UNSIGNED	1	One of the composite keys for a curriculum indicating its specific version in the system	CSEV2
programID	VARCHAR	5	Foreign key to the program table linking more basic program information	CSE
num_of_courses	TINYINT UNSIGNED	1	Total number of courses required to meet graduation requirements	50
credits_reqd	TINYINT UNSIGNED	1	Total number of credits required for graduation from a specific program	143
effective_date	DATE	DD-MM-YY	The exact date when the curriculum took effect for the specific program	2016-04-07

tbl_program

Attribute Name	Data Type	Size	Description	Example
programID	VARCHAR	10	Primary key for identifying the specific program being accessed through the system.	CEN
program_name	VARCHAR	50	The name of the program that is being indicated through the unique identifier.	Computer Engineering
coordinator	VARCHAR	30	The name of the person in charge of coordinating all the activities pertaining to a specific program	Md. Ashraful Amin
deptID	VARCHAR	7	Foreign key indicating the department that offers this specific program	CSE

tbl_dept

Attribute Name	Data Type	Size	Description	Example
deptID	VARCHAR	7	Primary key for uniquely identifying a specific department among many others.	CSE
dept_name	VARCHAR	50	Name of the department as identified by the primary key	Computer Science & Engineering
dept_head	VARCHAR	30	Name of the Honorary Head of Department for the specific department identified under the key.	Dr. Mahady Hasan
schoolID	VARCHAR	5	Foreign key indicating the school of the university under which the department operates.	SETS

tbl_student

Attribute Name	Data Type	Size	Description	Example
studentID	CHAR	7	Primary key for accessing personal information from the student table	1822240
student_name	VARCHAR	35	Indicates the full name of student	Naimul Aziz
cgpa	DECIMAL	(3,2)	Cumulative GPA of the student based on grade history	3.1
email	VARCHAR	30	Contact Information of the identified student	1822240@iub.edu.bd

tbl_achievement

Attribute Name	Data Type	Size	Description	Example
outcomeID	VARCHAR	1	Primary Key for either a CO or PLO	11
studentID	CHAR	7	Foreign key to Student whose achievement for a particular outcome is being tracked	1330321
achievement_status	BIT	1	Indicating success / failure status of the specific outcome for a specific student	1

tbl_school

Attribute Name	Data Type	Size	Description	Example
schoolID	VARCHAR	5	Primary key for indicating a specific school in a university	SETS
school_name	VARCHAR	50	Name of the school identified by the unique identifier	School of Engineering & Technology Sciences
dean	VARCHAR	30	The honoary Dean of School for the specific school as identified	Yusuf Mahbubul Islam

tbl_outcome

Attribute Name	Data Type	Size	Description	Example
outcomeID	VARCHAR	3	Foreign key representing either a CO or PLO to calculate its overall achievement rate.	213
achievement_rate	DECIMAL	(4,2)	The achievement rate of the specific outcome is calculated	63.88

tbl_accomplishment

Attribute Name	Data Type	Size	Description	Example
accomplishmentID	TINYINT UNSIGNED	1	Primary key that identifies a specific type of record for a particular enrollment term	C
segmentID	VARCHAR	10	Foreign key to either a course, department, school, program, or curriculum to calculate its ratios.	CSE
achievement_ratio	DECIMAL	(5, 3)	Depiction of the rate of achievements for all students per attempt represented in percentage.	71.8

tbl_attendance

Attribute Name	Data Type	Size	Description	Example
attendanceID	TINYINT	1	Primary key indicates the session number for a specifc course or a section of it	221
classID	VARCHAR	8	Foreign key to retrieve attendance sheet of a specific section	CSE317.2
presence_count	TINYINT	5	Indicates the number of attendance tallies in the sheet	1478
tardy_tally	TINYINT	4	Indicates the number of late attendance tallied in the sheet	46

tbl_segment

Attribute Name	Data Type	Size	Description	Example
segmentID	TINYINT UNSIGNED	1	A special primary key that indicates multiple foreign keys as segments for analysis.	SETS
attended	VARCHAR	5	An alternative method of counting student body indicating total	14678
total_outcomes	SMALLINT	5	The number of attempted outcomes calculated by accounting for all the students and their courses.	71338
total_achievements	VARCHAR	5	The total number of achievements for an entire segment calculated as number of students passed	57368

tbl_section

Attribute Name	Data Type	Size	Description	Example
courseID	CHAR	6	Foreign key indicating a specific course for schedule sections among various faculty members	ENG101
sectionID	BIT	5	A unique integer value serves as part of the composite	11
capacity	BIT	5	A discrete value measuring the number of students enrolled in the class	30
class_schedule	TIME	HH-MM-SS	Indicates the time slot for a specific course	3:30:00

tbl_enrollment

Attribute Name	Data Type	Size	Description	Example
enrollmentID	TINYINT UNSIGNED	1	Primary key indicating a specific term or a timespan during which enrollment studies are kept	221
segmentID	VARCHAR	10	Specific segments of university that are separated for conducting effectiveness studies.	SoB
attendance_ratio	DECIMAL	(5, 2)	A percentage representation of a ratio between number of students enrolled versus those attended	83.7

Report 4: Physical System Design

Course Planner Input Forms: Assessment Entry & Question Mapping

Course

 🔍

Assessment Entry

Section

 ▼

Assessment Type

 ▼

Total Questions

This field must be a positive whole number for valid consideration.

Total Marks

The total score must be a whole number for grade calculation procedures.

Show Entry After Submission

Submit

Select Course & Section

 ▼

Question Mapping

Assessment Num

 ▼

Question

 ▼

Course Outcome

 ▼

Marks Attainable

The total score must be a whole number for grade calculation procedures.

Check me out

Submit

Syllabus Viewer Input Form for Selection Parameters

The screenshot shows a user interface for a 'Syllabus Viewer'. On the left, there's a header 'Syllabus Viewer' and a welcome message 'Welcome to the Syllabus Viewer.' Below this is a note: 'This feature allow users to input either a course ID or a title.' There are two input fields: a dropdown labeled 'Select Program' and a text input field for 'CourseID or CourseTitle' with a magnifying glass icon. On the right, there's a table titled 'Course Outcome' with three columns: 'Outcome', 'Title', and 'CO Description'. The table is currently empty.

```
public function feed(Request $request)
{
    $id = $request->course; // Input parameters

    $course_title = DB::table('course')->where('courseID', $id)->value('course_title');

    $coutcomes = DB::select
        (DB::raw
            ("SELECT CO.coutcomeID % 10 as co_id, co_title,
            CO.description as co_description, plo_trace
            from coutcome as CO, course as C, syllabus as S
            where FLOOR(CO.coutcomeID / 10) = S.syllabusID
            and S.courseID = C.courseID and C.courseID = '$id'"));

    return response()->json([$coutcomes, $course_title]);
}
```

Syllabus Viewer Output Form: Syllabus Course Outcomes

CSE Syllabus Viewer

Welcome to the Syllabus Viewer.

This feature allow users to input either a course ID or a title.

Computer Science & Engineering ▾

CSE317 

CSE317: Numerical Methods

Outcome	Title	CO Description
CO1	Error Detection	Analyze sources of errors in mathematical operations on the computer
CO2	Major Numerical Methods	Recognize major numerical methods and their merits and pitfalls
CO3	Computational Cost	Calculate the computational cost of a range of numerical methods
CO4	Numerical Methods & Tools	Select and use softwasre tools, basd on their numerical methods, for a range of problems
CO5	Estimation	Estimate the accuracy in approximated numerical solutions

```
success: function (response)
{
    // Coutcome Tbody Appending...
    var index;
    var text = '<tr scope = "row"> ';
    for(index = 0; index < response[0].length; index++)
        text += ('<td>CO' + response[0][index]['co_id'] + '</td><td>' + response[0][index]['co_title'] + '</td><td>' +
            response[0][index]['co_description'] + '</td></tr>');

    $('#coutcome-tbody').html(text);
    // Coutcome Tbody Appended!

    // ...More Code
}
```

Curriculum Viewer Output Form: PLO – CO Map

CSE216

CSE216 PLO – CO Mapping

Outcomes	CO1	CO2	CO3	CO4	CO5
PLO1	x		x		
PLO2	x		x		
PLO3		x			
PLO4	x				
PLO5			x		
PLO6		x	x	x	x
PLO7	x	x	x		
PLO8				x	
PLO9		x		x	
PLO10					
PLO11			x		
PLO12				x	
PLO13				x	

```

var thead_text = '<tr><th scope = "col">Outcomes</th>;  

for(index = 1; index <= response[0].length; index++)  

    thead_text += ('<th class = "align-top" scope = "col">CO'  

        + index + '</th>');  

text += '</tr>;  

$('#outcome-thead').html(thead_text);  
  

var tbody_text = '';  

var trace = '';  

for(index = 1; index < 14; index++)  

{  

    // tbody_text manipulation: See Code...  

}  

$('#outcome-tbody').html(tbody_text);

```



Curriculum Viewer Output Form: PLO – PEO Map

The screenshot shows a user interface for a curriculum viewer. At the top, there is a dropdown menu labeled "Select Program". Below it, the title "CSE PLO - PEO Mapping" is displayed. The main content is a table with 13 rows, each representing a PLO (Program Learning Outcome) and its mapping to three PEOs (Program Educational Objectives). The columns are labeled "Outcome", "Title", "PEO1", "PEO2", and "PEO3". The rows are numbered PLO1 through PLO13. The "PEO1" column contains "x" marks at positions PLO1, PLO2, PLO3, PLO4, PLO5, PLO6, PLO7, PLO8, PLO9, PLO10, PLO11, PLO12, and PLO13. The "PEO2" column contains "x" marks at positions PLO1, PLO2, PLO3, PLO4, PLO5, PLO7, PLO8, PLO9, PLO10, PLO11, PLO12, and PLO13. The "PEO3" column contains "x" marks at positions PLO1, PLO2, PLO3, PLO4, PLO5, PLO6, PLO7, PLO8, PLO9, PLO10, PLO11, and PLO12.

Outcome	Title	PEO1	PEO2	PEO3
PLO1	Knowledge	x	x	x
PLO2	Requirement Analysis	x	x	
PLO3	Problem Analysis	x	x	
PLO4	Design	x	x	
PLO5	Problem Solving	x	x	x
PLO6	Implementation			x
PLO7	Experiment Analysis		x	x
PLO8	Community Engagement and Engineering	x	x	x
PLO9	Teamwork	x	x	x
PLO10	Communication	x	x	x
PLO11	Self-directed	x	x	x
PLO12	Ethics	x	x	x
PLO13	Process Management	x	x	x

```
// Corresponding Query for Data Fetch
$peobjectives = DB::table('peobjective')->select('peobjectiveID', 'objective', 'definition')->get();
```

Curriculum Viewer Output List: PLO Details

Learning Outcomes for CSE Program



PL01: Knowledge

An ability to select and apply knowledge, techniques, skills, and modern tools of the computer science and engineering discipline

PL02: Requirement Analysis

An ability to identify, analyze and solve a problem by defining the computing requirements of the problem through effectively gathering of the actual requirements

PL03: Problem Analysis

An ability to select and apply the knowledge of mathematics, science, engineering, and technology to computing problems that require the application of principles and applied procedures or methodologies

PL04: Design

An ability to design computer based systems, components, or processes to meet the desired requirements

PL05: Problem Solving

An ability to apply mathematical foundations, simulation, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.

PL06: Implementation

An ability to apply design and development principles in the construction of software systems of varying complexity

PL07: Experiment Analysis

An ability to conduct standard tests and measurements; to conduct analyze, and interpret experiments; and to apply experimental results to improve solutions (products or processes)

PL08: Community Engagement and Engineering

An ability to appreciate human behavior, culture, interaction and organization through studies in the humanities and social sciences. A knowledge of the impact of computing solutions in a local and global context

PL09: Teamwork

An ability to function effectively as a member or leader of a technical team to accomplish common goals

PL010: Communication

An ability to apply written and oral communication in both technical and non-technical environments; an ability to communicate with a range of audience; and an ability to identify and use appropriate available technical literature;

PL011: Self-directed

Recognition of the need for and an ability to engage in self-directed continuing professional development; be prepared to enter a top-ranked graduate program in Computer Science and Engineering

PL012: Ethics

An understanding of and a commitment to address professional, ethical, legal, security, social issues and responsibilities including a respect for diversity

PL013: Process Management

A commitment to quality, timeliness, and continuous improvement

```
// Corresponding Query for Data Fetch
$ploutcomes = DB::table('ploutcome')->select('ploutcomeID', 'plo_title', 'details', 'peo_complex')->get();
```

Curriculum Viewer Output Form: PEO Definitions

Educational Objectives for CSE Program



PEO1: Critical Thinking

Education system is geared more towards making student acquire knowledge but fails to capture their imagination. We want to change that by introducing the students to the exciting world of logic, rationalization, and decision making through games and apps. We will introduce the students to various development, analysis, synthesis tools and engage them in research early in their studies.

PEO2: Conscientious Design

A broad liberal arts curriculum covering computer science as well as related technical subjects will provide students with a deeper understanding of the engineering issues and trade-offs that cross disciplines. Courses in humanities and social sciences will equip them with the knowledge and awareness to become responsible members of society who understand the social, political, economic, and environmental impact of their decisions. Graduates will become ethical professionals with the ability to work individually or in multidisciplinary teams to design sustainable solutions to complex real-world problems under real-world constraints.

PEO3: Efficient Implementation

A strong emphasis is placed on developing the students' ability to identify and analyze a problem, and to then define the computing requirements appropriate to its solution with regard to factors such as efficiency, sustainability, scalability, available resources and constraints. We ensure that our students are kept up-to-date with knowledge and practice of the most current tools and techniques, and that they develop an appreciation for continued improvement through self-training or formal graduate study. Graduates will possess the ability to design and implement efficient and future-proof software solutions to problems of varying size and complexities using modern software development principles and practices.

Learning Outcomes for CSE Program



```
// Corresponding Query for Data Fetch
$peobjectives = DB::table('peobjective')->select('peobjectiveID', 'objective', 'definition')->get();
```

Score Tracker I/O: Student Wise Scores for Specific Assessment



```
$dataset = DB::select(DB::raw("SELECT questionID, marks_attained from score as SC, assessment as A
where floor(SC.questionID / 10) = A.assessmentID and exam_type = '$exam_type' and studentID = '$student'"));
return response()->json([$dataset, $maximum]);
```

Report 5: Conclusion

Problem & Solution

1. The constraints of being provided the physical environment for teamwork cooperation along with the availability of remote workstations allowed both ease and convenience along with a new experience of learning.
2. The amount of information for storage had its limitations. Thereby, data processing cannot be trained with a semester's worth of data. As more information is passed into the system over time, software can be scaled to the fed data and its requirements.
3. The initial design phase of the software was very hectic due to requirements ambiguity. The resolution to the dilemma is to capture all possible scenarios for all the different stakeholders of the system. Frequent users of the system are the primary target for satisfaction delivery through which the process can be improved collaboratively.

Additional Features and Future Development:

1. As the outcome achievements stack into the system with more data insertion and usage percentage increases from more information requests, the system should allow for user management to ensure secure access of critical data that is crucial for higher management decisions as well as academic improvement plans.
2. Tracking of achievements for individual students can be well provided by allowing a student portal for viewing their own current progress, set personal goals and specify their important objectives for better learning management. This would be most effective with a student who has been involved in the outcome-based learning process for the longest reign.
3. Decision making strategies can be enhanced by automatic report generation of academic performance for each course, program, department or school at the end of each enrollment term to dedicate to the continuity of the education system with regards to outcome-based learning.

Recommendations:

The 4 core features of the newly designed system provide an efficient integrated functionality to the respective users. It is both scalable and modular within its own environment. Proper maintenance and adherence to the latest standards of programming with respect to speed, efficiency and usability of the software must be practiced. Latest frameworks, libraries, APIs, and dependencies must be used and installed according to the needs of the software. The concurrent phases of analysis, design, and development provides a deeper understanding of the software's nature and thereby the effectiveness of the outcome-based learning. The long-term goal for the software is to be fed real data for training to become a full-fledged system that will be both accessible and modifiable by various users for improvement. The key to the software success is to provide relevant functionality so as to improve the system within its own environment through usage.

Conclusion

Educational standards around the globe are shifting their focus to outcome-based learning and the implementation of the academic process with adherence to learning outcomes and program objectives are being made more efficient through the usage of software to manage such changes in educational quality. There is a whole dimension of patterns to consider when adjoining outcomes as a metric for performance evaluation and the accomplishment goals toward outcome-centric achievements can be made easier through longer plans of study. Some of the learning benefits from this project included the capability to understand the high level of complexity that databases can possess especially those dealing with numerical data. The experience from this project will allow the spread of knowledge and education in a suitable manner for all to share.