Faculty of Computing
UNIVERSITI TEKNOLOGI MALAYSIA

SECD2523-06 – DataBase

STUDENT MANAGEMENT SYSTEM

PHASE 1

PROJECT SETUP

SECTION   : 06

LECTURER'S NAME   : Dr. Layla Hasan

DATE   : 1.11.2024

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Recently there are a lot of students enrolling in different universities every year, because of their high ranking and reputation. And from that the students expect an efficient and high level of management. The university system may use an inefficient database system or a file-based approach which will make it difficult to maintain the growing volume of students' information recorded. And this requires a new system that uses the database approach to maintain the student's information efficiently and effectively.

An effective student management system is the base of providing quality services for the different students and makes it easier for the different faculties to maintain and manipulate this information. From that the development of a new student management system will be effective, it will enhance the overall processing and retrieval of information, reduce data redundancy and the overall student registration experience.

2.0 Background Study:

The student management system is one of the biggest system (if not the biggest) in all of the universities in the world, the student management system has various department that function in a specific rhythm for each one of students, and all of these department are very related to each other, all of them have the same student information that is continuously updating.

UTM has an estimation of more than 20000 students in the main campus in Johor Bahru and more than 4500 students in Kuala Lumpur, this is including an estimation of 3000 foreign students and 9000 postgraduates.

Students management system is a system that's responsible for student enrollment in the college, also responsible for students faculty registration, student taken subjects and dropped subjects.

3.0 Problem Statement:

Student management at UTM currently is facing some challenges/problems since the current management system is unable to handle paperwork and delays efficiently, these problems include:

1. **Students face some delays in completing the registration process:**

   The waiting time for students from the beginning of their university enrollment until their

faculty registration is quite lengthy, also the waiting time between the faculty procedures and issuing the matric number is as well quite lengthy.

2. **Depending on the human workforce rather than automating the process:**

   mostly the university depends on the human workforce in terms of data collecting, entry and processing, which is delaying the sequencing processes and resulting in data loss.

3. **Accessing/Manipulating student information from the system is difficult:**

   Staff members and administrators might find it very difficult to obtain, access, retrieve or change a single piece or multiple pieces of student information from the current system.

4.0 Proposed solutions:

To solve existing problems in evaluating and utilizing student data at UTM, a database-driven Student Management System (SMS) is recommended to be implemented. This system will facilitate the ways of addressing the needs of the student, administrative staff, and faculty members by the automation of most routine tasks as well as improve the ways that data is managed within the system.

For the students, the SMS will act as an easy-to-use tool to help them complete their registration and enrollment in the faculties. It will also enable students to apply for courses, view their records, and check status of enrollment via the internet and the university platform. Through this platform they will be able to submit the updating and dropping courses and receive the confirmation online, after the request is sent the faculty members will receive it and have the options to accept it or reject it based on the student's information and the university rule. After replying to the request, the students will be notified on the university platform to do further actions.

For the administrative staff, tasks like entry of data, processing of data will be eased by the system, the system will ensure that the information required for the enrollment and registration is completed from the student side, so that the staff won't have to check the application for missing information and notify the students. The staff will notify the students about the enrolment status via email (since the students are not registered yet and don't have an account in the system). If the student is accepted the system will automatically store the student's information in the database. And based on the student information the system will generate reports automatically without involving the administrative staff members. This will eliminate delays and mistakes; it will grant staff members easy access to students' information. Some of the functional features such as report generation will assist in efficient resources management.

For faculty members, the system will allow them to display the information of all students (all this information will be retrieved from the database). This information includes names, matric number, total credits, completed courses, current semester courses, CGPA. They will also be able to review the available courses, update them and add courses to the faculty that students of the faculty must register

for. For the acceptance / rejection of the students requests the system will display the student information as stated above along with course information such as: name, code, credit hour, section, number of students in the section, and the teacher responsible for the section. After they reply to the request, for example drop course, the system will automatically update the section student number and remove the student information from the section and notify the teacher responsible for the section.

Furthermore, the proposed system will improve efficiency, cut down on waiting time, improve the current resource management, ease the work in different departments with the help of tools, and fix most of the problems that are facing the current system.

4.1 Feasibility Study

4.1.1 Economic feasibility:

Development Costs:

- Hardware Acquisition: central server, cable connections.
- Software development: DBMS, database application software, database tools.
- Staff training: scheduled training courses for staff members

Production Costs:

- System maintenance.
- Staff salaries.

-The Hardware cost for a giant database for Student Management System is calculated based on the fact the total number of operating parts of the system in UTM Johor Bahru is three with all of them operating usually together every time.

-The assumed number of UTM Johor Bahru is 2000 students enrollment, 9000 visa applicants and visa renewal, 2100 students facing issues, per year.

The assumption is made by the fact that UTM is globally ranked as the 344 best university globally according to USnews.

Cost Benefit Analysis (CBA)

Estimated cost	
Development cost	
Hardware	40000
Software Development	50000
Staff training	10000
Production cost	
System maintenance	150000 per year
Staff salaries	120000 per year

Estimated Benefits	
Increased sales revenues	(First year = 112500) + 10% every year
Reduce the operational cost	2500 per week
Reduction in Waiting Time/Productivity Gain	3000 per week

Assumptions	
discount rate	10%
annual change in production costs	5%
annual change in benefits	10%
sensitivity factor (cost)	120%
sensitivity factor (benefit)	110%

Costs	Year 0	Year 1	Year 2	Year 3
Hardware	48,000			
Software Development	60,000			
Staff training	12,000			
Total	120,000			
Production Costs				
System maintenance		18,000	18,900	19,845
Staff salaries		144,000	151,200	158,760
Annual prod. Cost		162,000	170,100	178,605
(PV)		147272.7	140579	134189
Accumulated cost		267,273	407,852	542,041

Benefits				
Increased sales revenues		123,750	148,500	178,200
Reduce the operational cost		132,000	145,200	159,720
Reduction in Waiting Time/Productivity Gain		158,400	174,240	191,664
Accumulated benefits		414,150	588,390	780,054
Gain or Loss		146,877	180,538	238,013
Profitability Index	1.98			

As our Profitability Index 1.98 is more than 1 it means that the new system is economically feasible and a good investment.

4.1.2 Technical Feasibility:

The required hardware technical resources for the new system are already available in the current system but a few adjustments would be needed for them to be compatible with the new system operations. The only required hardware that is not available in the current system is the central server and few cable connections, that's needed for the amount of incoming student traffic.

The staff with the technical skills needed to achieve the required hardware adjustments and develop the new software are available within the organization.

Thus, the project is Technically feasible.

4.1.3 Operational Feasibility:

The new system will minimize users' waiting time and reduce the uncertainty and frustration associated with the data correctness, it will also enhance the user experience in the Student Management System and make it a more reliable option. so, it will be liked and used by the users what makes it operationally feasible.

5.0 Objective:

The objective of this proposed system is to design and develop an efficient and effective system

that eliminates the flaws in the current system, which will improve:

1. reducing the time for completing the registration and enrollment processes.
2. automating the routine processes such as : data entry, data collection, producing reports and data processing to prevent data loss or delay.
3. enhancing data retrieving process, for staff and administrators to obtain any kind of information with ease.

6.0. Scope:

The main purpose of this project is to design, implement and deploy an efficient Student Management System (SMS)). It will firstly eliminate concerns with regard to process flow and data management, secondly, it will be designed to satisfy concerns of primary users for better usability and performance.

Students:

The system will allow students to Submit the required documents and applications for enrollment and faculty registration online via system platform, access personal academic records, profile, courses schedules, and enrollment status. They may also be able to submit, register, drop, or modify their courses requests online, but they cannot change their faculty or modify some information, such as matric number and their CGPA.

Administrative Staff:

The administrative staff will be able to process the students' requests for enrollment and registration, change the student's private information if there is required information that needs to be changed, and display all students / staff information and notify them if there are any actions required. However, they cannot change some student's information such as the faculty related information or their CGPA.

Faculty Members:

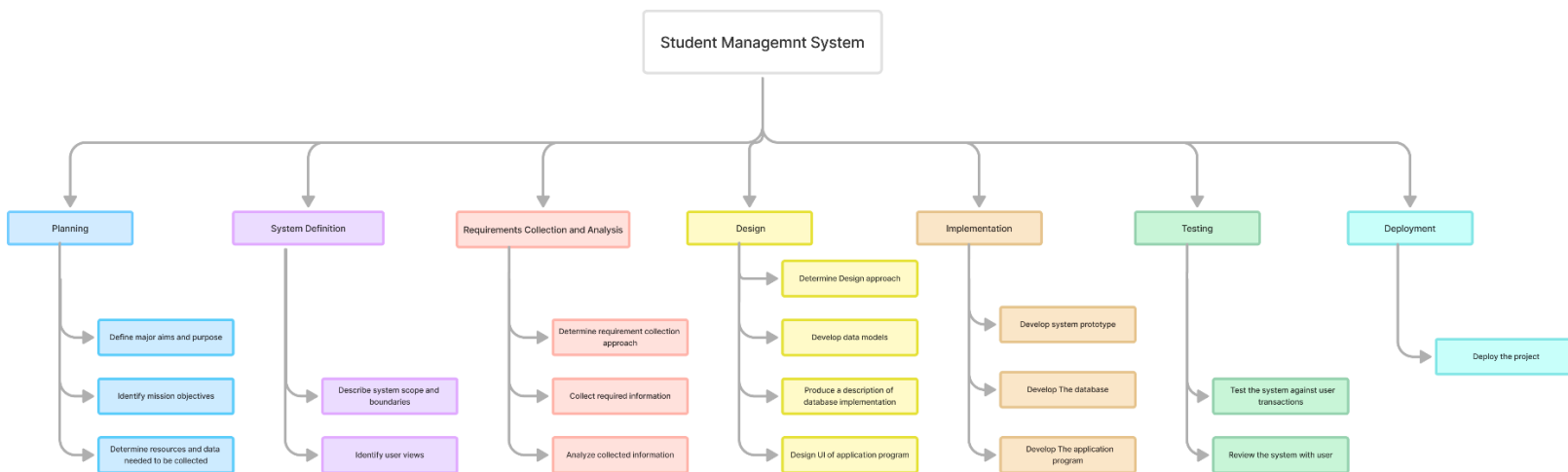Faculty members will be able to access student data such as students records and courses, to

simplify monitoring the course registration and class size and to track students overall performance. They are also able to accept or reject the students' courses related requests.
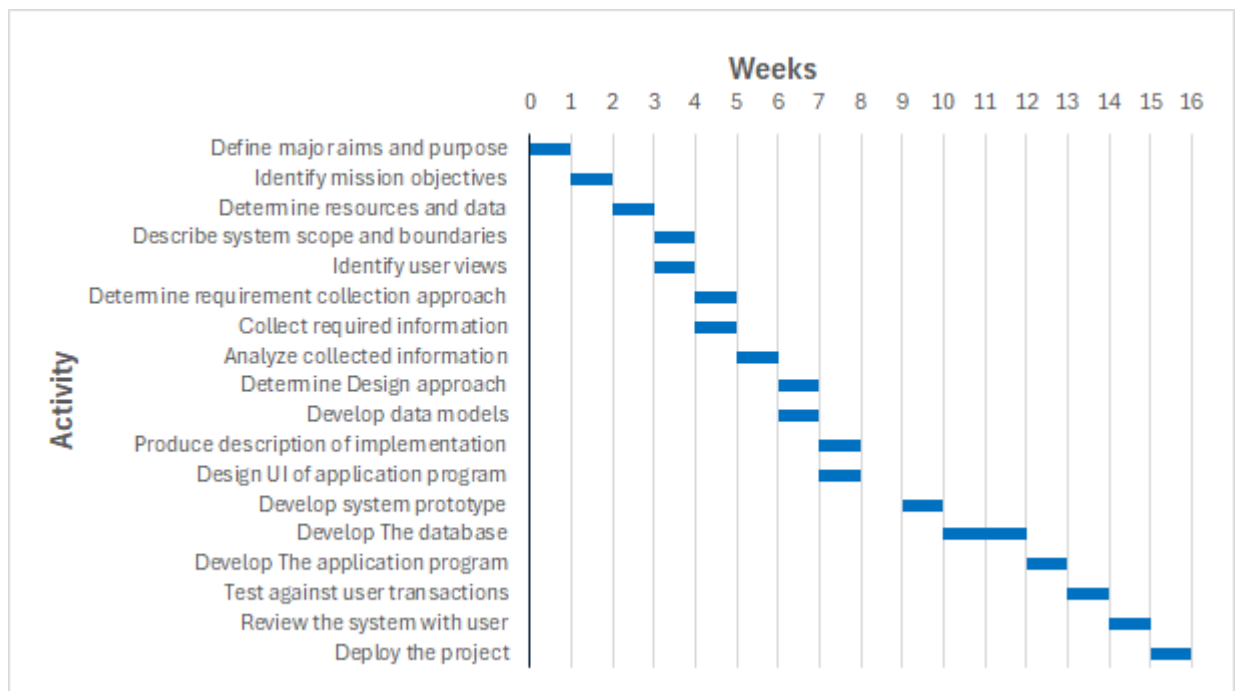
7.0. Project Planning:

- **Project Manager:** Responsible for overall project oversight, coordination, and stakeholder management. (Abdalla Ali)
- **System Analyst:** Responsible for analyzing the current system and determining the weak points and improvement opportunities (Ali Isameldin)
- **Data Administrator:** Plan the database and determine the standards and policies. (Abdalla Ali)
- **Database Administrator:** Create and implement the physical design, security and integrity control. (Moaz Jalal)
- **Database Designer:** Create the logical and physical design of the database. (Moaz Jalal)
- **UI/UX Designers:** Design intuitive and user-friendly interfaces for the application program. (Othman Hassan)
- **Software Developers:** Tasked with the development and implementation of the Application program. (Eyad Aimen, Othman Hassan)
- **Quality Assurance/Testers:** Conduct rigorous testing protocols to ensure the reliability, functionality, and performance of the implemented system. (Othman Hassan, Ali Isameldin)

7.2 Work Breakdown Structure (WBS):

Student Managemnt System

- Planning
  - Define major aims and purpose
  - Identify mission objectives
  - Determine resources and data needed to be collected
- System Definition
  - Describe system scope and boundaries
  - Identify user views
- Requirements Collection and Analysis
  - Determine requirement collection approach
  - Collect required information
  - Analyze collected information
- Design
  - Determine Design approach
  - Develop data models
  - Produce a description of database implementation
  - Design UI of application program
- Implementation
  - Develop system prototype
  - Develop The database
  - Develop The application program
- Testing
  - Test the system against user transactions
  - Review the system with user
- Deployment
  - Deploy the project

7.3 Gantt Chart:

8.0 Requirement Analysis:
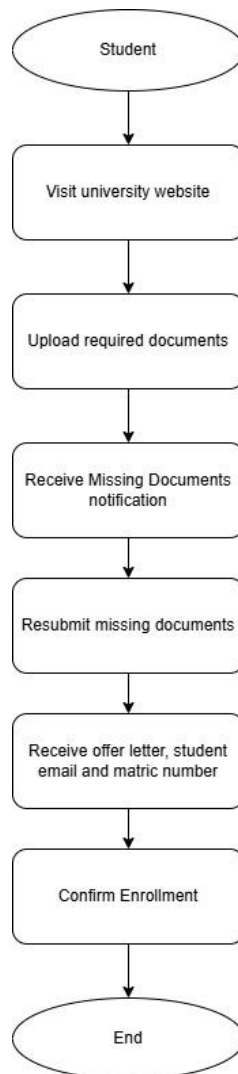
Student:

1. University Enrollment:

Diagram 8.1.1: Student enrollment in university process

In this process The student submits his application by uploading them through The university website, Following that UTM's office receives and reviews the documents,After getting approved, an offer letter, student and email gets sent to the student to confirm the enrollment process.
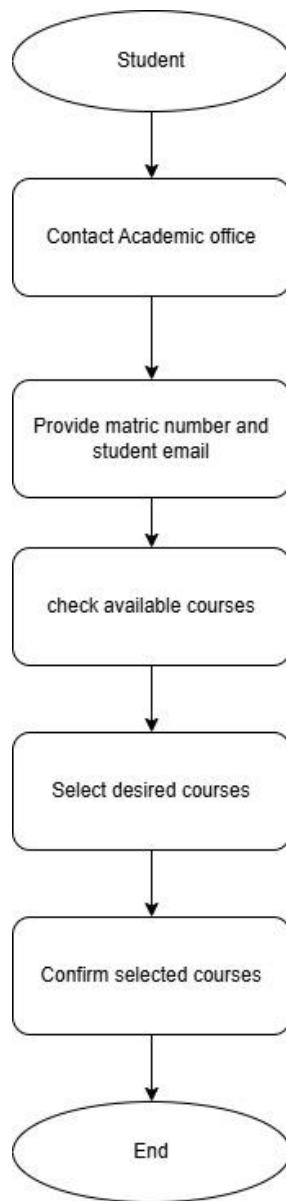
2. Course Registration

Diagram 8.1.2: Student Course Registration process

Upon enrolling in the university The next step for the student becomes clear which is course registration. This process starts with visiting the academic office to check for the available courses choosing the subjects he wants to administer. Following this flow the student receives a confirmation letter from the academic office to confirm the course registration.
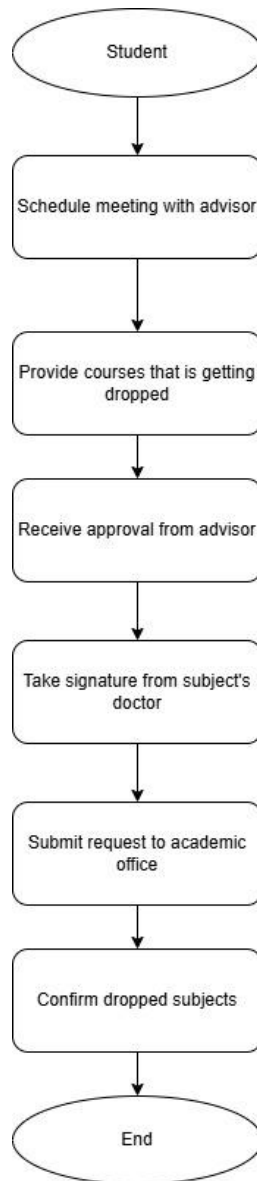
3. Dropping Courses:

Diagram 8.1.3: Student Dropping courses Process

Sometimes some minor inconveniences happen for the student which results in this specific process, before submitting the drop request, Firstly the student must schedule a meeting with the academic advisor to provide the courses which are getting dropped, the student takes the approval from the advisor and then proceeds to take signature from the subject's doctor, after all this steps the student submits the request to the academic office who proceed to confirm the dropping request.

Administrative Staff:
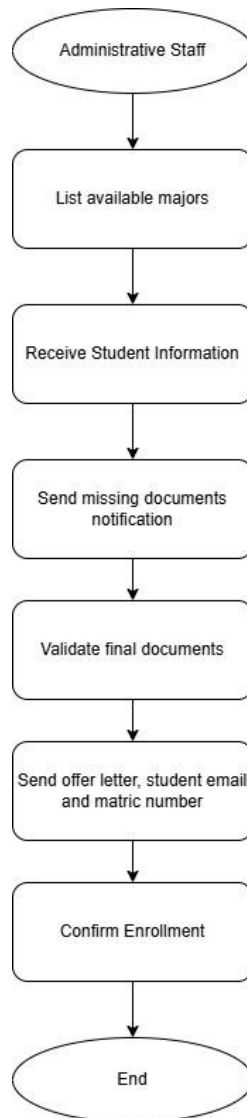
1. Student Enrollment:

Diagram 8.1.4 Enrolling student in university Process

   This Process Initiates by Listing the available majors in the university website, After that the student uploads the required documents listed by the university administers. The documents get checked and reviewed which leads to notifying the student about the missing documents he didn't upload, Following that the student reuploads the documents and the university immediately sends the offer letter, student email and matric number to confirm the enrollment.

Faculty Members:
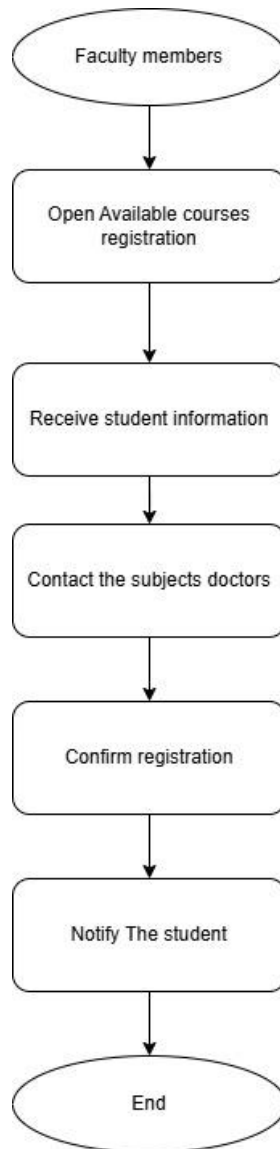
1-Student Registration:

Diagram 8.1.5 Registering Students in courses Process

       The student registration process starts with Listing the available courses for the student to choose from, Then the student sends his info for the members. Following this flow the faculty members contacts the subjects doctor to check if the course is still available, if the course is still available the members will confirm the registration and notify the student immediately.
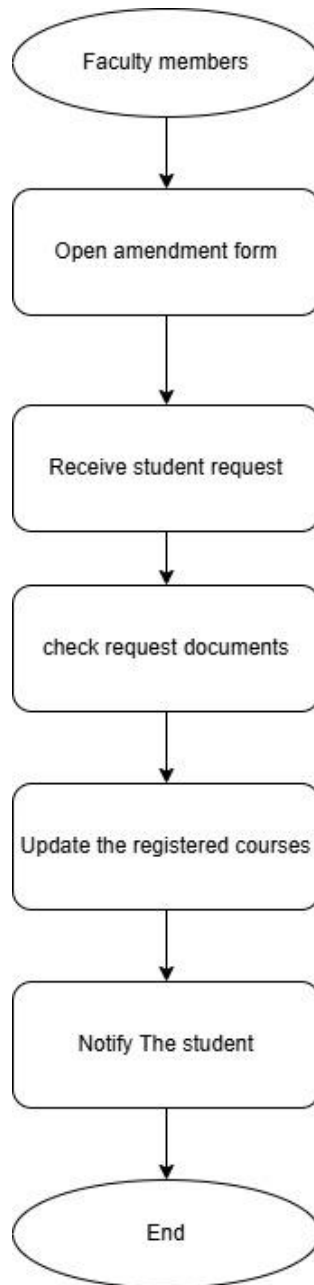
2-Update course information:

Diagram 8.1.6 Updating Students courses Process

The course Updating workflow begins with faculty members accessing the amendment form system. Upon receiving student requests, faculty members review and verify all submitted documentation. Once verified, they update the registered courses in the system according to the requested changes. Finally, faculty members notify students about the status of their amendment request, completing the process.

9.0 Transaction requirement (data entry, data update/delete, data queries):

1. Students enter the required information for enrollment, such as name, passport number, phone number, email, academic certificate, and faculty that the student wishes to enroll for.
2. Faculty members enter their identification information, such as name or identification number and password in order to see the various student requests and approve it / deny it and add course information such as, course name, course code and credit hours that the students can register to.
3. Students select the courses from a list of courses they can register to submit the registration request.
4. Students enter their identification information, such as name or matric number and password to access their academic records and submit the various requests.

9.2 Data update/delete:

1. Faculty members can update/delete student records.
2. Faculty members can update/delete courses based on students' requests.
3. The system will Update/delete the available courses.

9.3 Data queries:

1. Display students' information.
2. Display student registered courses.
3. Display students' faculty enrollment requests.
4. Display student academic records.
5. Display students' course registration requests.
6. Display students' amendment requests.
7. Display students drop course requests.
8. Display course information.

10.0 Benefit and summary of the proposed system:

The proposed system will automate some of the processes which will reduce the data entry processes, improve the efficiency of the system, and reduce costs. For example, when issuing the offer letter the system will automatically produce the document after the university approval (no need to re-enter the data again). Also the system can update the student academic records after the end of each

semester without the need to re-enter the student grades and do the calculation manually.

The benefits for the students are: ease of enrollment for the university, ease of accessing their academic information and ease of submitting any request regarding the courses.

The benefits for the staff members are: ease of access to the student requests, manage the students requests faster, reduce data entry operations and errors and provide the digital records for the students and there is no need for physical files.

11.0 Summary:

The proposed system is a general Student Management System in UTM or major worldwide universities, that faces several problems mainly delay and loss of data, due to the large number of applicants both locally and globally (almost 10000 students annually), these problems can generate larger issues within the same system or in other related systems, Each of these major problems are considered to be an opportunity to enhance the current system to speed up its processes, fix its current issues and provide better user experience.

the objective of this proposed is as mentioned before enhancement and there is a given proposed solution for achieving it, The proposed solution as all of the solution will require a feasibility to make sure the system is beneficial, the feasibility shall include the technical, operational and financial feasibility to cover the cost of all parts and aspect of the system, when the system was determined to beneficial the project planning is the next phase, where the human resources are to be assigned in the most suitable position, The project should be broken down into small parts to be assigned to the human resource individuals, using top-down approach and displaying the project parts and the needed activities using Work Breakdown Structure(WBS) chart, The time span of the project is to be estimated using Pert and Gantt charts.

The final step is the requirement analysis which focuses on studying the current system (as-is system) workflow and process, and the study of the transaction processes including data entry, data change (update/delete) and data queries to see if it meets the user needs in the current system, a summary of the benefits of the proposed system shall be given to abstract the perks in fewer sentences,

and general summary of the whole report to give a general idea about the work that will be and had been done.

SECD2523-06 – DataBase

STUDENT MANAGEMENT SYSTEM

PHASE 2

CONCEPTUAL DESIGN

SECTION : 06

LECTURER'S NAME : Dr. Layla Hasan

DATE : 7.12.2024

| No.	Name	Metric No.
1	Moaz Adil Abdugadir Jalal	A23CS3025
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1. Introduction

Recently there are a lot of students enrolling in different universities every year, because of their high ranking and reputation. And from that the students expect an efficient and high level of management. The university system may use an inefficient database system or a file-based approach which will make it difficult to maintain the growing volume of students' information recorded. And this requires a new system that uses the database approach to maintain the student's information efficiently and effectively. An effective student management system is the base of providing quality services for the different students and makes it easier for the different faculties to maintain and manipulate this information. From that the development of a new student management system will be effective, it will enhance the overall processing and retrieval of information, reduce data redundancy and the overall student registration experience.

2. Data Flow Diagram

2.1 Context Diagram
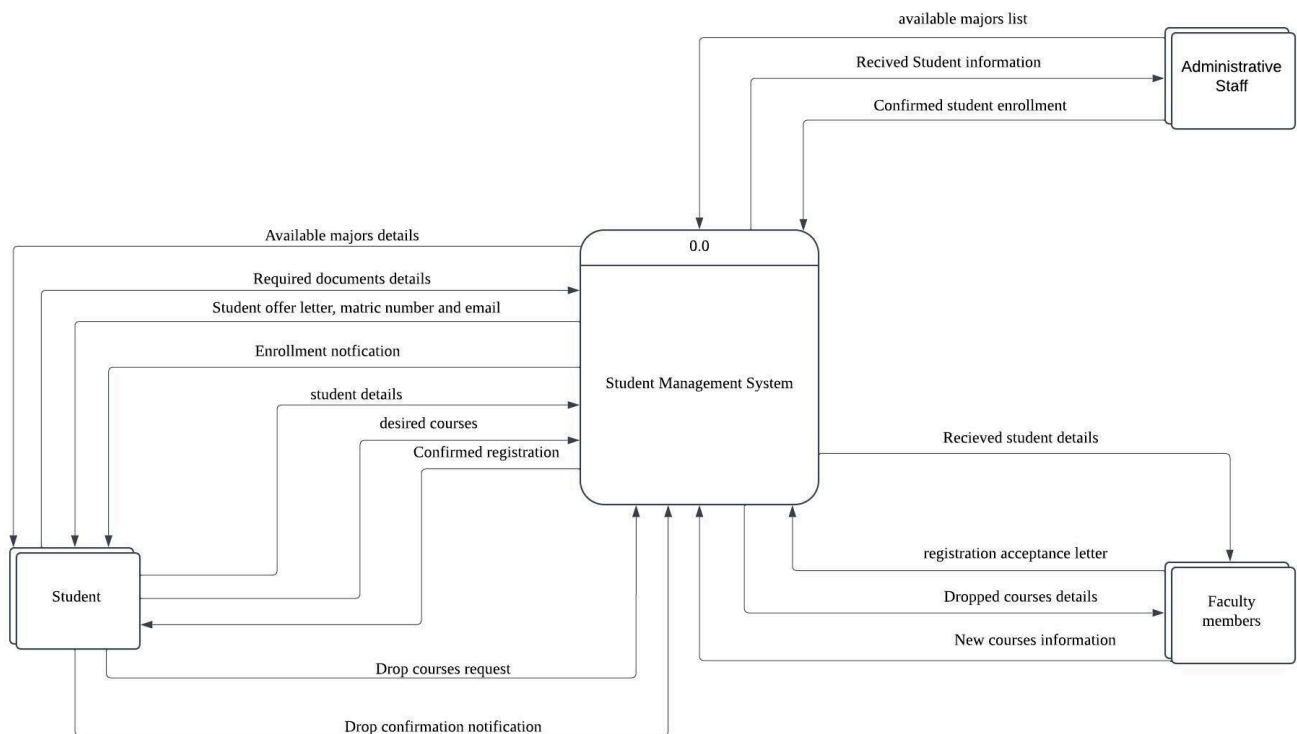
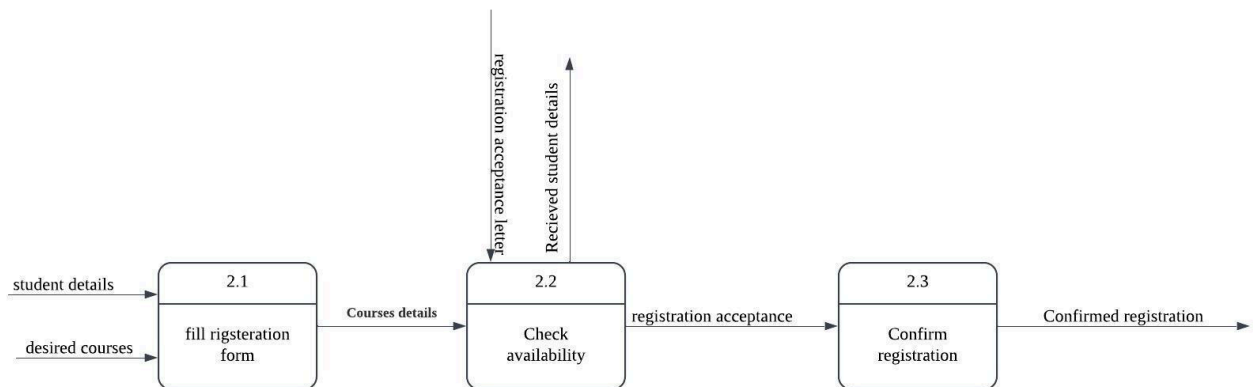## 2.2 Parent Diagram (Level 0)
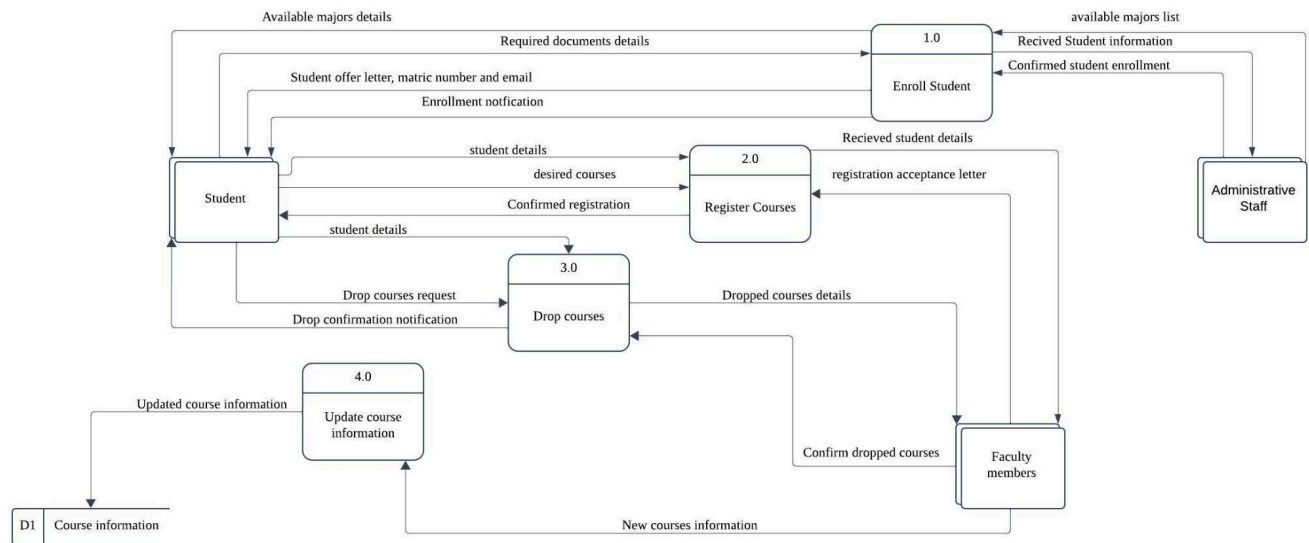
2.3 Child Diagram (Level 1)

2.3.1 Process 2.0 <Register Courses>

3. Data & Transaction Requirement

3.1 Proposed business rule:
Student:

1. Enrolls at the university.

2. View the courses.

3. Drop courses.

4. Pay tuition fees.

Staff at faculty:

1. Registers students at the specified faculty.
2. Manage students' issues regarding courses.
3. Update courses and their information.

3.2 Proposed data & transactional:

3.2.1 Proposed data requirement:

Student:

This table will include students' matric number as a primary key, students name, address, list of courses that contains the course codes of the registered courses by student, degree, faculty number as a foreign key to link to Faculty table and transaction ID to link to Transaction table. The student can enroll at the university, pay the tuition fees, be registered by the faculty and enroll to new courses and manage current courses (drop courses requests).

Faculty:

This table will include faculty number as a primary key, a multivalued matric number containing the registered students matric numbers in the faculty and it is used as a foreign key and a multivalued staff ID as a foreign key containing the IDs of the faculty members.

The faculty has faculty members, and administered by university

Faculty member:

This table will include staff ID as a primary key, name and faculty number as a foreign key. The faculty member can manage student information and the student registered courses activities (enroll and drop), and can update the courses' information.

University:

This table has information about the university. It contains university name as a primary key, university address, and faculty numbers inside it and it is used as a foreign key to link the faculty table.

The students can enroll at the university and the university administers its faculties.

Administrative staff:

This table is for the administrative staff in the university, it will contain staff name, and ID.

The administrative staff can process students' enrollment requests and belong to a university.

Course:

This table contains course code used as a primary key, faculty name used as a foreign key, course name, section number and credit hours.

This table is accessed by the Student and Faculty, it can be viewed and deleted by the students from their registered courses and updated by the Faculty.

Transactions:

This table contains the transaction id as a primary key, amountPaid, bills, and matric number to link to the Student table.

This table is accessed by students which can transfer the tuition fees.

3.2.2 Proposed transactional requirement:

Data entry:

1. Students enter the required information for enrollment, such as name, passport number, phone number, email, academic certificate, and faculty that the student wishes to enroll for.
2. Faculty members enter their identification information, such as name or identification number and password in order to see the various student requests and approve it / deny it and add course information such as, course name, course code and credit hours that the students can register to.
3. Students select the courses from a list of courses they can register to submit the registration request.
4. Students enter their identification information, such as name or matric number and password to access their academic records and submit the various requests.

Data update/delete:

1. Faculty members can update/delete student records.
2. Faculty members can update/delete courses based on students' requests.
3. The system will Update/delete the available courses.

Data queries:

1. Display students' information.
2. Display student registered courses.
3. Display students' faculty enrollment requests.
4. Display student academic records.

5. Display students' course registration requests.

6. Display students' amendment requests.

7. Display students drop course requests.

8. Display course information.

4. Database Conceptual Design

4.1 Conceptual ERD

4.2 Enhanced ERD (EERD)

Person

ID {PK}
name
    fName
    lName

{Mandatory, OR}

AdministrativeStaff

Own

1..*

1..1

University

universityName {PK}
universityAddress
facultyNo[] {FK}

1..1

1..1

Enroll

1..1

1..1

Administrate

Transaction

transactionID {PK}
bills
amountPaid
matricNo {FK}

1..*

Student

degree
address
courses[]
transactionID[] {FK}
facultyNo {FK}

Register

1..*

1..1

1..*

Faculty

facultyNo {PK}
facultyName
matricNo[] {FK}
staffID[..] {FK}

1..1

Has

1..1

1..*

Faculty member

facultyNo {FK}

1..1

Manage

1..1

1..1

Transfer

0..*

Enroll

1..*

Course

courseCode {PK}
courseName
sectionNo
creditHours
facultyName {FK}

1..*

Update

0..*

5. Data Dictionary

5.1 Description of Entity

entity	description	occurrence
student	Student information	Students can enroll in university, make transfers based on the university fees, and get registered in a faculty while being managed by faculty members along with student courses.
faculty	Faculty's information	Faculty has faculty members, registers students in a faculty and gets administered by the university.
course	Course's information	Course is enrolled by the student, it also gets updated and managed along with the student by the faculty members.
university	University's information	a University has administrative staff who get enrolled along with students, and administrate the faculties.
transaction	Transaction's information	The transaction gets transferred by the student.
adminstrativeStaff	administrative staff's information	administrative staff is a part of the university, handles the enrollment of students helping the university.
faculty members	faculty members's information	faculty members are a part of a faculty, manages courses, students and updates the course information.

5.2 Description of Relationship

Entity	Multiplicity	Relationship	Multiplicity	Entity
student	1…1	register	0…*	faculty
	1…*	manage	0…*	course

	1…1	enroll	0…*	university
	0…*	enroll	0…*	course
	1…1	transfer	1…1	transaction
faculty	1…*	register	1…1	student
	1…1	administrate	1…*	university
	1…*	has	1…1	faculty member
university	0…*	enroll	1…1	student
	1…*	administrate	1…1	faculty
	1…*	has	1…1	Administerative eStaff
course	0…*	manage	1…*	student
	1…1	update	0…*	faculty member
	0…*	enroll	1…*	student
transaction	1…1	transfer	1…*	student
administerative staff	1…*	enroll	1…1	student
	1…1	has	1…*	university
Faculty member	1…1	has	1…*	faculty
	1…*	manage	1…1	course
	0…*	update	1…1	course

5.3 Description of Attributes

Entity	Attributes	Description	Datatype	Null	Multivalued
student	MatricNo	Uniquely identifies a student (PK)	Varchar(10)	no	no
	name	Name of student	Varchar(20)	no	no
	fName	First name of student	Varchar(10)	no	no
	lName	Last name of student	Varchar(10)	no	no
	degree	Degree of student	varchar(50)	no	no
	address	Address of student	Varchar(40)	no	no

	FacultyNo	Foreign key of faculty which uniquely identifies the faculty	INT	no	no
	transactionID	Foreign key of transaction which uniquely identifies the transaction	Varchar(20)	no	yes
	Courses	the courses of student	varchar(100)	no	yes
faculty	FacultyNO	Uniquely identifies a faculty (PK)	INT	no	no
	FacultyName	Holds the name of each faculty in the university.	Varchar(20)	no	no
	MatricNo	Foreign key of student which uniquely identifies the student (FK)	Varchar(10)	no	yes
	StaffID	Foreign key of faculty member which uniquely identifies the faculty members.	Varchar(10)	no	yes
university	UniversityName	Uniquely identifies a university (PK)	Varchar(30)	no	no
	UniversityAddress	Address of University	Varchar(40)	no	no
	facultyNo	Foreign key of faculty which uniquely identifies the faculty (FK)	INT	no	yes
course	CourseCode	Uniquely identifies a course (PK)	Varchar(10)	no	no
	CourseName	Name of course	Varchar(25)	no	no

	SectionNo	Number of the section	INT	yes	no
	CreditHours	The credit hours of course	INT	no	no
	FacultyName	Foreign key of faculty which uniquely identifies the faculty (FK)	Varchar(20)	yes	no
transaction	TransactionID	Uniquely identifies a transaction (PK)	Varchar(20)	no	no
	bills	bills paid by transaction	Varchar(100)	no	no
	MatricNo	Foreign key of student which uniquely identifies the student (FK)	Varchar(10)	no	no
	AmountPaid	The amount paid by transaction	INT	no	no
administrative Staff	AdministerID	Uniquely identifies an administer (PK)	Varchar(10)	no	no
	name	Name of student	Varchar(20)	no	no
	fName	First name of administer	Varchar(10)	no	no
	lName	Last name of administer	Varchar(10)	no	no
faculty member	staffID	Uniquely identifies a faculty member (PK)	Varchar(10)	no	no
	name	name of faculty member	Varchar(20)	no	no
	fName	First name of faculty member	Varchar(10)	no	no
	lName	last name of faculty member	Varchar(10	no	no
	facultyNo	Foreign key of faculty with uniquely identifies (FK)	INT	no	no

6. Summary

During this phase, our group is able to learn more of the ground on which the student management system is established in terms of functionality because the database conceptual design has been accomplished. We improved the proposed business rules, data needs and transactional needs in order to fulfil the goals of the system. Also, we designed the context data flow diagram, the parent data flow diagram, and the child data flow diagram. A Conceptual Entity-Relationship diagram or ERD was also created as well as an Enhanced ERD and the data dictionary that accompanied it.

Through the data flow diagrams as a result it became easier to identify how different entities and processes relate to one another to form the architecture of the system. At level (0), within the parent diagram and at level (1), within child diagrams both demonstrate a detailed account of processes like student enrollment, course registration as well as modifications to courses.

From the Data and Transaction Requirements, we learned that the new system should be powerful enough to solve the problems of delays, inefficiency, and data management.

Both the Conceptual ERD and Enhanced ERD defined the core database structure, drew out relationship details between entities and acted as roadmaps to the proposed system. It made it easier to understand the various fields displayed under the tabs, and the flows between them were easier to perceive due to the existence of the data dictionary.