



UTM
UNIVERSITI TEKNOLOGI MALAYSIA

UNIVERSITI TEKNOLOGI MALAYSIA
FACULTY OF COMPUTING, UTMJB
SEMESTER 1, SESSION 2024/2025

DATABASE CONCEPTUAL DESIGN

SECD2523 DATABASE

SECTION 09

LECTURER'S NAME:
DR HASLINA HASHIM

BY THE GROUP:
Group 7

PROJECT TITLE:
POSTGRADUATE SUPERVISION MANAGEMENT SYSTEM

GROUP MEMBERS:

NAME	MATRIC NUMBER
1. PUAN KANG WEI	A23CS5043
2. ZAGIDULLIN RUSLAN	X24EC0005
3. WAN AHMAD AMIRUL IMAN BIN WAN AHMAD YUSMI	A19EC0174
4. GHADEER MAHMOUD MOHAMMED	A23CS4008

TABLE OF CONTENTS

1.0 Introduction	3
2.0 Data Flow Diagram.....	4
2.1 Context Diagram.....	4
2.2 Parent Diagram (Level 0)	4
2.3 Child Diagram (Level 1)	5
2.3.1 Process 1.0 <Identity and Academic Entry Verification>	5
2.3.2 Process 2.0 <Progress Tracking>.....	5
2.3.3 Process 3.0 <Scheduling Appointment>.....	5
2.3.4 Process 4.0 <Booking Appointment>	5
3.0 Data & Transaction Requirement	6
3.1 Proposed Business Rule	6
3.2 Proposed data & transactional	7
3.3 Data Entry	9
3.4 Data Update/Delete	10
3.5 Data Queries	11
4.0 Database Conceptual Design	11
Introduction.....	11
Conceptual vs Logical vs Physical ERD	12
Conceptual Database Design	13
4.1 Conceptual ERD	13
Workflow Description	13
4.2 Enhanced ERD (EERD).....	15
What is an Enhanced ERD (EERD) in the Context of Our Program ?	16
Key Features of EERD.....	16
5.0 Data Dictionary.....	18
5.1 Description of Entity.....	18
5.2 Description of Relationship	18
5.3 Description Attributes	19
6.0 Summary	21

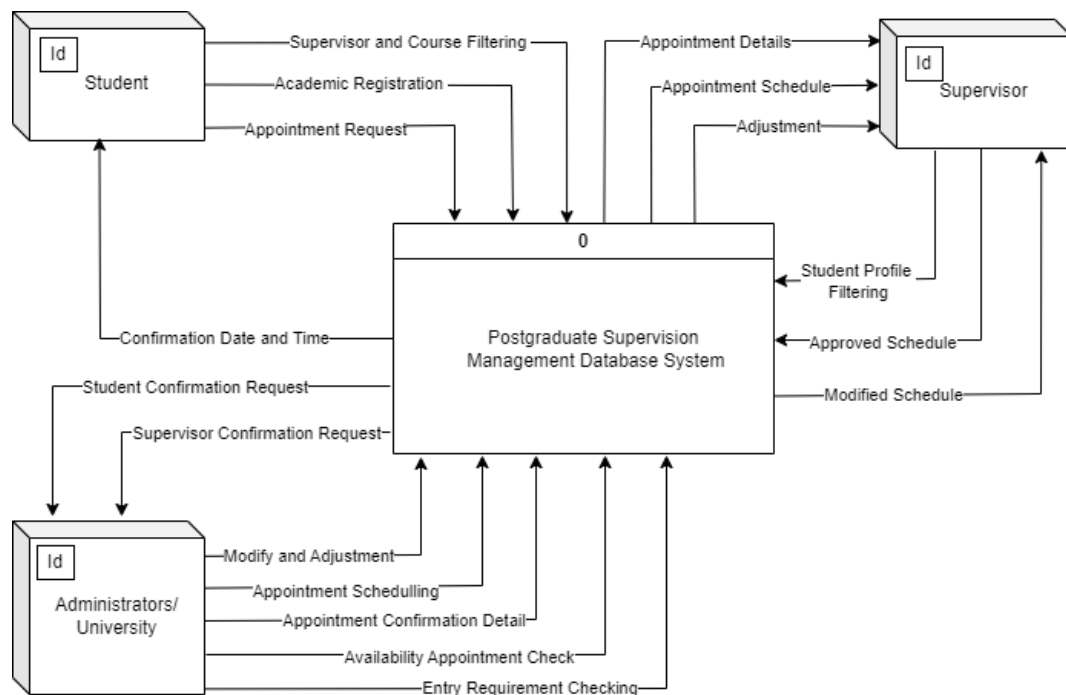
1.0 INTRODUCTION

Postgraduate education is widely recognized for its pivotal role in enhancing research capabilities, bolstering academic reputations, and generating financial gains for educational institutions. However, the effectiveness of postgraduate supervision remains a complex and evolving aspect of academia. As the demand for high-quality supervision increases, particularly amidst the diverse backgrounds of postgraduate students, the supervisory role becomes increasingly challenging.

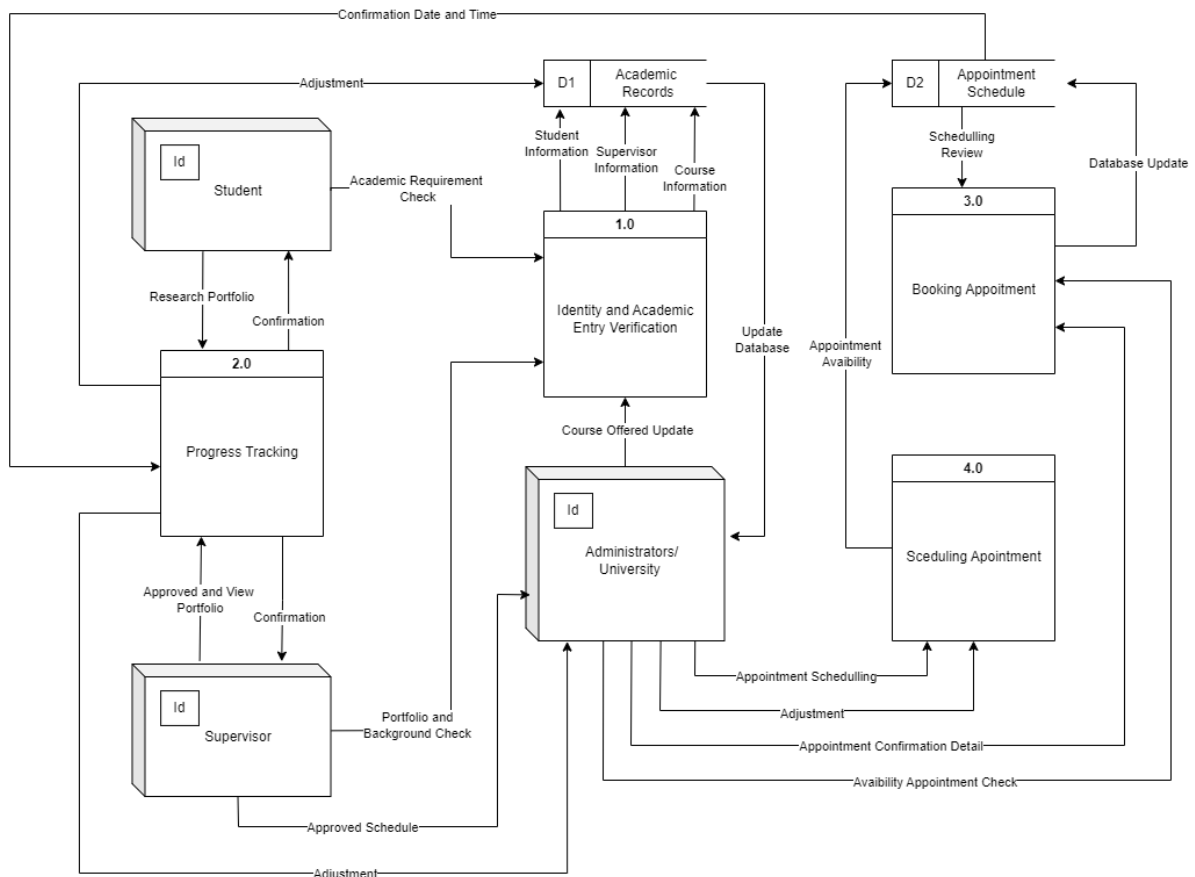
Therefore, the development of this Postgraduate Supervision Management Database System is an innovative solution, the postgraduate supervision management system would address the issues of identity verification, secure communication, and reliable information access. This holistic approach would create a trustworthy, efficient, and user-friendly platform for both students and supervisors, ultimately enhancing the postgraduate experience. We hope to improve the scheduling and booking process, minimize wait times and enhance the overall user's experience. Indirectly, this will help university especially supervisor to reduce the burden on staff and increase the efficiency.

2.0 DATA FLOW DIAGRAM

2.1 Context Diagram

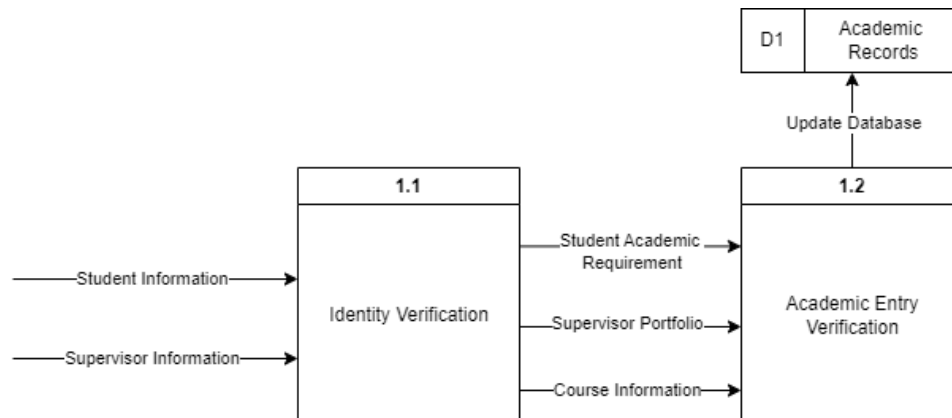


2.2 Parent Diagram (Level 0)

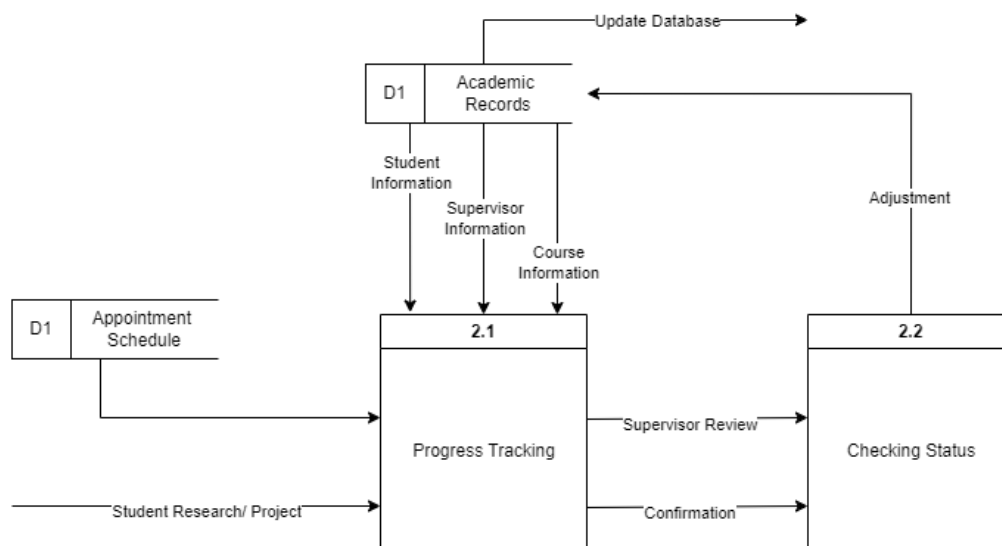


2.3 Child Diagram (Level 1)

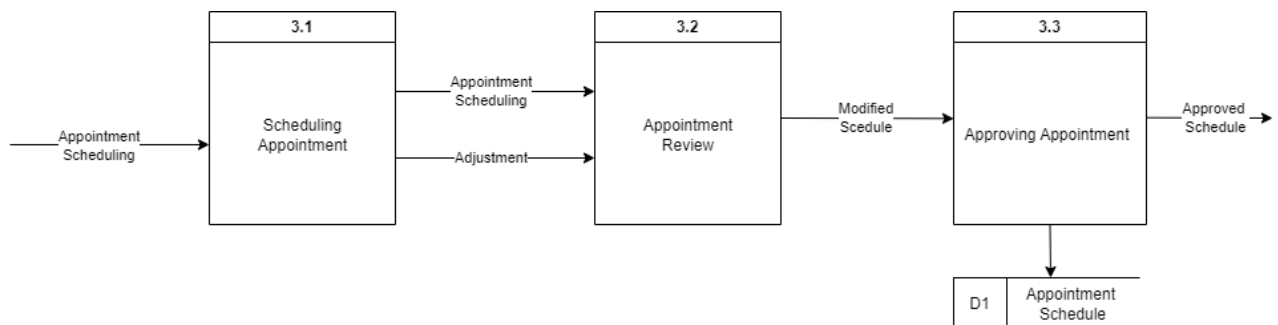
2.3.1 Process 1.0 <Identity and Academic Entry Verification>



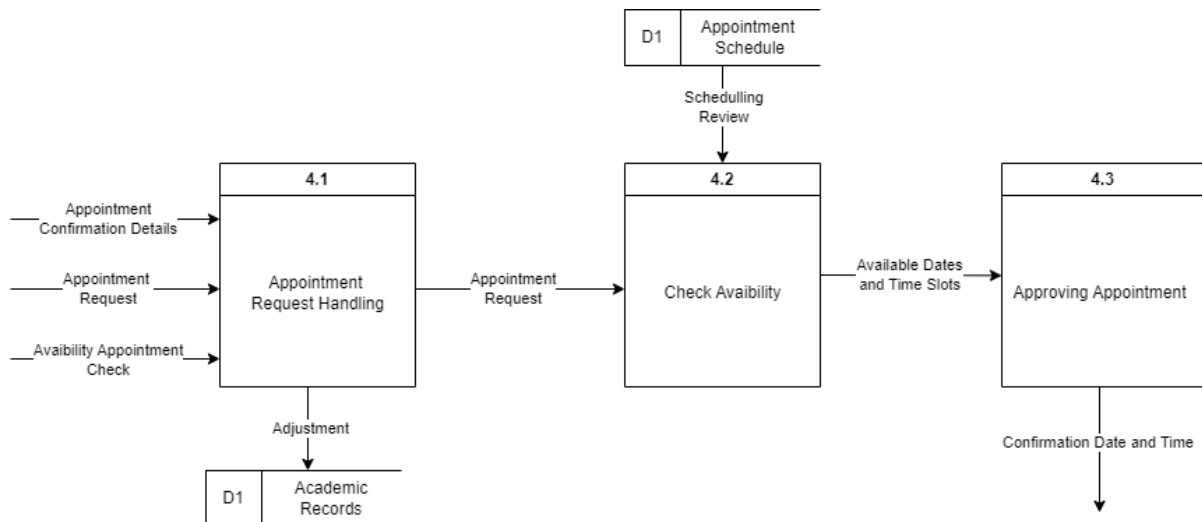
2.3.2 Process 2.0 <Progress Tracking>



2.3.3 Process 3.0 <Scheduling Appointment>



2.3.4 Process 4.0 <Booking Appointment>



3.0 DATA & TRANSACTION REQUIREMENT

3.1 Proposed Business Rule

Students:

- Using a centralized database, search and filter supervisors according to their availability, credentials, and research area.
- Use the system to safely submit and update your professional credentials and grades.
- Schedule meetings with supervisors by utilizing an electronic calendar system.
- Get meeting and deadline reminders and notifications automatically.
- Go to the supervisor's profile to see their credentials, experience, and ability to supervise.

Supervisor:

- Maintain and update their profiles, taking into account their credentials, areas of study, and current supervision load.
- Examine pupils' digital portfolios and academic records to determine their appropriateness and preparedness.
- Arrange student meetings and make any adjustments to appointment calendars.
- Track academic progress, share documents, and have secure conversations with students.

- Using the system, provide the students comments and assessments on their project proposals.

Administrator:

- Oversee system registration, using official papers (such as university IDs) to confirm the identity of supervisors and students.
- Access and update supervisor and student data, making sure all information is correct and up to date.
- Monitor system activity, such as the number of registered users, active students, and supervisors.
- Facilitate system-wide announcements and updates, ensuring smooth communication among stakeholders.
- Provide technical support for resolving user issues related to account management, document uploads, or communication barriers

3.2 Proposed data & transactional

Students:

Requirements for Data:

Name, student ID, and contact details are examples of personal information.

Academic records include current enrollments, grades, and completed courses.

Professional qualifications include published work, research experience, and certifications.

Meeting Details: Meeting History, Scheduled Meetings.

Notifications: Reminders for meetings, deadline alerts, and supervisor comments.

Needs for Transactions:

Look for supervisors according to their qualifications, research field, and availability.

Update and submit your credentials and academic records.

Use the calendar system to plan and reschedule meetings with supervisors.

Get and respond to reminders and messages about meetings.

View and access the profiles of supervisors.

Supervisors:

Name, Department, Contact Details, and Credentials are all part of the profile.

Research Details: Current Research Projects, Areas of Expertise.

The number of current students and the available capacity make up the supervision load.

Student Information: Availability of academic records and digital portfolios for students.

Calendar: A list of appointments, meetings, and times that are available.

Progress tracking: Keeping track of students' academic achievements, feedback, and project updates.

Needs for Transactions:

Keep profiles up to date with qualifications and specializations.

View and assess the academic records and portfolios of students.

Arrange to meet with students or modify existing meetings.

Evaluate and comment on the project proposals submitted by the students.

Using a safe method, share documents and monitor student progress.

Administrators:

Requirements for Data:

User data includes identity verification records and profiles of all enrolled students and supervisors.

Logs of user activity, such as logins, changes, and meeting schedules, are called system activity logs.

Announcements: A list of previous and upcoming system-wide alerts.

Support Requests: Recording technical problems and how they were fixed.

Needs for Transactions:

Utilize official documentation to register and authenticate users.

As needed, access and update student and supervisor records.

Keep an eye on system utilization and activity, especially users who are actively using the system.

Organize and distribute announcements throughout the system.

Fix technical problems with accounts, uploading documents, or gaining access to the system.

3.3 Data Entry

Student Data Entry:

During registration, students supply their address, phone number, email, academic records, gender, date of birth (DOB), full name, and student ID.

- * Students enter required files into the system, including portfolios and academic records

- When scheduling an appointment, students can provide information such as the desired time, date, and goal of the meeting.

- * Students submit project proposals by uploading pertinent files and providing a title and description

Supervisor Data Entry:

In order to register, supervisors must supply their Supervisor ID, full name, gender, phone number, email address, credentials, and areas of competence.

- * In the system, supervisors update their availability and supervision load.

- * When evaluating project proposals, supervisors enter evaluation information or comments.

Appointment Data Entry:

- * Students and supervisors can edit appointment entries to reschedule or cancel meetings; the system keeps track of appointment details, including Appointment ID, date, time, purpose, Student ID, and Supervisor ID.

Project Proposal Data Entry:

Students enter information about their proposals, such as the title, description, submission date, and proposal ID. Proposals are evaluated by supervisors, who then change the status (e.g., Pending, Approved, Rejected).

Administrator Data Entry:

By checking submitted credentials and inputting approval information into the system, administrators confirm and authorize user registrations for supervisors and students. Adding new supervisor profiles or changing current user information are examples of updates that administrators enter into the system.

3.4 Data Update/Delete

Student Data Update/Delete

Update: Using their accounts, students can amend personal data such their address, phone number, or email. Students have the ability to edit documents they have submitted, such as updated academic records or portfolios. Students have the ability to change or cancel appointment details. Prior to final submission, students can revise the details of their project proposals.

Delete: Students have the option to remove an appointment they have submitted from the schedule by canceling it. • Students have the ability to remove unsubmitted draft project proposals.

Supervisor Data Update/Delete

Update: Supervisors have the flexibility to modify their supervision load to reflect current commitments and update their profiles, including credentials, specializations, and availability. • If required, supervisors can alter comments or proposal assessments.

Delete: Supervisors have the ability to delete appointments from the schedule and erase out-of-date or inaccurate information from their accounts.

Appointment Data Update/Delete

Update:

Students or supervisors have the ability to change the dates, times, and goals of appointments. • Either manually or automatically, appointment statuses (such as Pending, Confirmed, and Canceled) are changed.

Delete: When either person cancels an appointment, it may be erased.

Project Proposal Data Update/Delete

Update: Project proposal statuses, such as Pending, Approved, or Rejected, can be changed by supervisors. • Prior to the supervisor reviewing the proposal, students have the opportunity to edit its details.

Delete: Students have the option to remove rejected suggestions. • Proposals that are duplicated or invalid can be removed by administrators.

Administrator Data Update/Delete

Update: To fix mistakes or update information, administrators have the ability to change user profiles (of students or supervisors). • Administrators have the ability to modify database structure and appointment policies, among other system settings.

Delete: In the event of inactivity, mistakes, or infractions, administrators have the authority to remove user accounts (students or supervisors). • Duplicate or out-of-date records can be eliminated from the system by administrators.

3.5 Data Queries

1- Show the student information list.

2- Show the supervisors' information list.

3-Show the student's schedule of previous and future appointments.

4-Show the student's past academic records.

5-Show each supervisor's attendance record.

6-Show the time slots that are available for appointments with supervisors.

7-Show the scheduling availability for each supervisor.

8-Show the related costs according to the chosen research services.

9-Determine and show the total amount of unpaid fees based on the dates and services provided by the student.

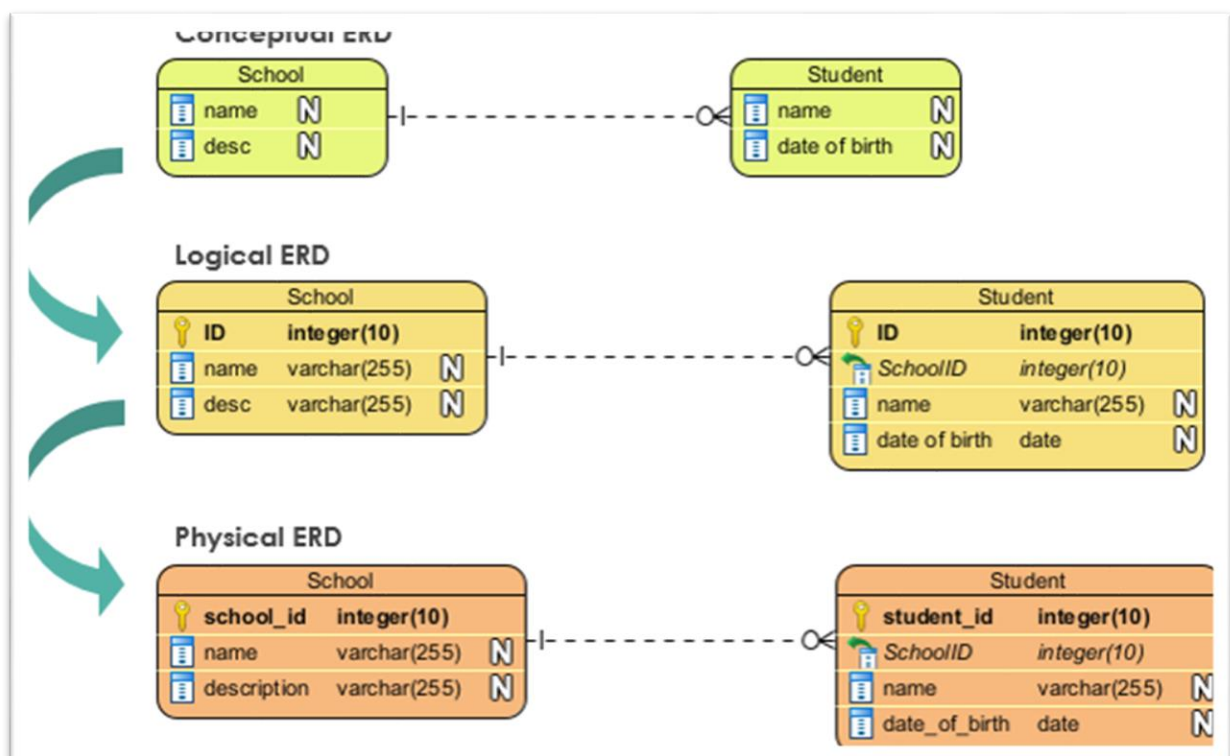
4.0 DATABASE CONCEPTUAL DESIGN

Introduction

In the realm of data management, designing a database system that meets the unique needs of an organization is a multifaceted task. It involves a meticulous process that unfolds in three distinct phases: conceptual, logical, and physical database design. These levels of design are crucial in creating a database that not only captures the essence of the data but also ensures its integrity, efficiency, and security. In this article, we embark on a journey through these three levels, exploring their significance, differences, and how they come together to shape a robust database system.

Conceptual vs Logical vs Physical ERD

Databases are the backbone of modern information systems, serving as repositories for organized and structured data. When designing a database, it's crucial to follow a structured approach that involves three distinct levels: conceptual, logical, and physical database design. Each level has its unique purpose and plays a vital role in creating a robust and efficient database system. In this article, we will explore these three levels, delve into the differences between them, and provide examples to illustrate their significance.



Example 1

Conceptual Database Design

Conceptual database design is the highest level of abstraction in the database design process. At this stage, designers focus on understanding the problem domain and defining the overall structure of the database without getting into technical implementation details. The primary goal is to create a clear and comprehensive representation of the data and its relationships.

Problem Description: Imagine a university wants to create a database to manage student information. In the conceptual design phase, the primary concern is identifying the main entities and their relationships within the university context. Key entities might include students, courses, instructors, and departments. Relationships could include a student enrolling in courses, instructors teaching courses, and departments managing courses.

Example:

- Entities: Student, Course, Instructor, Department
- Relationships: Student enrolls in Course, Instructor teaches Course, Department manages Course

4.1 Conceptual ERD

Our conceptual

I try describe conceptual design

Workflow Description

User Onboarding and Role Differentiation:

1. **Students** and **Supervisors** register through the platform, and their data is stored in the Users table.
2. Based on their role (Student or Supervisor), their additional information (e.g., program enrollment or department expertise) is stored in the Students or Supervisors table.
3. Students are linked to their respective academic programs via the Programs table

Supervision Assignment

1. **Supervisory Roles** are assigned to establish relationships between students and supervisors.

2. The Supervisory_Roles table defines the type of supervision (Primary or Secondary) and records the assignment date. This table handles the many-to-many relationship, allowing:
 - a. A student to have multiple supervisors.
 - b. A supervisor to oversee multiple students.

Appointment Scheduling

1. Students request appointments with their assigned supervisors through the system.
2. The Appointments table stores booking details, including the date, status (Pending, Confirmed, or Cancelled), and mode (Online or In-person).
3. Supervisors manage their appointments, confirming or rescheduling as needed.

Session Management

1. Each scheduled appointment generates an entry in the Sessions table, which tracks:
 2. The specific time and date.
 3. The status of the session (Scheduled, Completed, or Cancelled).
 4. Supervisors and students can refer to these records for tracking past or upcoming sessions.

Secure Communication

1. Students and supervisors communicate using the Messages table, where:
 2. Messages include the sender, receiver, timestamp, and content.
 3. The Is_Read flag helps track whether a message has been seen.
 4. This ensures secure, traceable, and efficient communication for discussing academic or project-related matters.

Analytics and Reporting

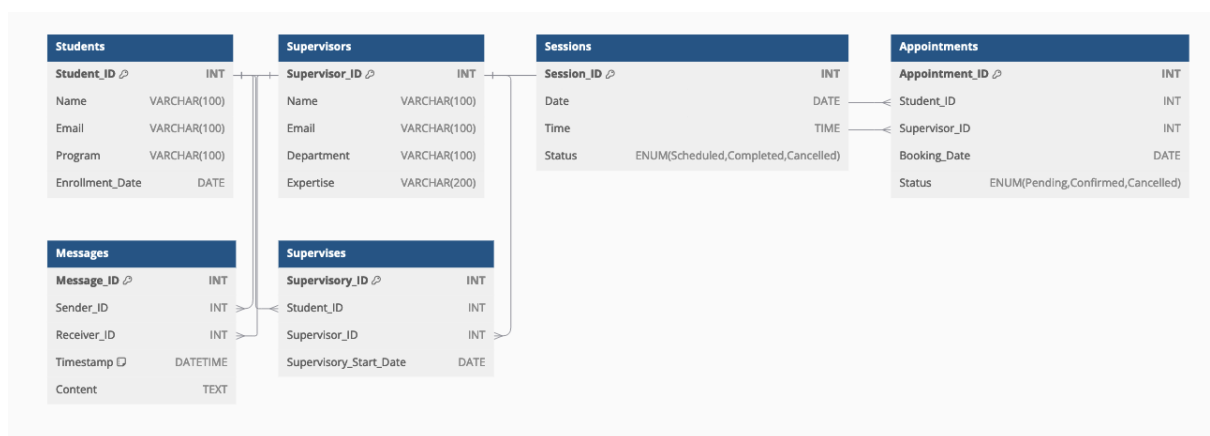
1. Administrators and supervisors can analyze data from:
 2. The Appointments table for trends in scheduling and cancellations.
 3. The Supervisory_Roles table for workload distribution.
 4. The Messages table for communication activity.
 5. This data supports decision-making and helps identify inefficiencies or bottlenecks

Data Flow Example (End-to-End)

1. A **student** logs into the system and requests an appointment with their **supervisor**.
2. The system:

3. Checks the Supervisory_Roles table to verify the student-supervisor relationship.
4. Creates an entry in the Appointments table, marked as "Pending."
5. The **supervisor** reviews and confirms the appointment, updating its status in the Appointments table.
6. A **session** is automatically scheduled in the Sessions table, and both parties are notified.
7. After the session, its status is updated (e.g., "Completed"), and any follow-ups are tracked via messages or new appointments.

Table	Purpose
Users	Stores basic user details and differentiates between roles (Student/Supervisor).
Students	Stores student-specific details, such as enrollment and program.
Supervisors	Contains supervisor-specific details like department and expertise.
Programs	Links students to their academic programs for better organization.
Supervisory_Roles	Manages many-to-many relationships between students and supervisors, with role-specific data.
Appointments	Tracks student-supervisor meetings, including status and mode.
Sessions	Provides detailed scheduling and status updates for each appointment.
Messages	Facilitates secure communication between users, with message tracking.



4.2 Enhanced ERD (EERD)

What is an Enhanced ERD (EERD) in the Context of Our Program ?

An **Enhanced ERD (EERD)** is an advanced version of a standard Entity-Relationship Diagram (ERD) that incorporates additional features to better model complex systems. It allows for a more accurate representation of the data structure, relationships, and constraints in a database.

Key Features of EERD

Generalization and Specialization (Superclass/Subclass):

- a. These concepts enable the representation of shared attributes and behaviors for multiple entities.
- b. For your system, the entity Users serves as a superclass for both Students and Supervisors.

Additional Attributes:

- c. EERD allows the inclusion of extra attributes for better detailing.
- d. For instance, attributes like Mode (online/offline) and Location in Appointments provide context for meetings.

Inheritance Modeling:

- e. Inheritance ensures that subclasses (Students, Supervisors) can inherit common properties (like Name and Email) from their superclass (Users).

Multi-level Relationships:

- f. Complex relationships, such as "a student can have multiple supervisors with distinct roles (primary/secondary)," are modeled using intermediary tables like Supervisory_Roles.

Lifecycle and Status Tracking:

- g. Entities like Sessions track the lifecycle of appointments, including states like "Scheduled" or "Completed."

In the context of our **Postgraduate Supervision Management Database System**, EERD offers the following advantages:

Supports Complex User Roles:

- a. By introducing Users as a common superclass for all users, the system becomes more scalable and modular.
- b. Students and Supervisors are specialized subclasses with unique attributes, ensuring clear separation of roles.

Detailed and Semantic Relationships:

- c. Relationships like Supervisory_Roles add semantics to the connections between students and supervisors, specifying their roles (e.g., primary or secondary supervisor) and the date of assignment.

Closer Representation of Real-world Scenarios:

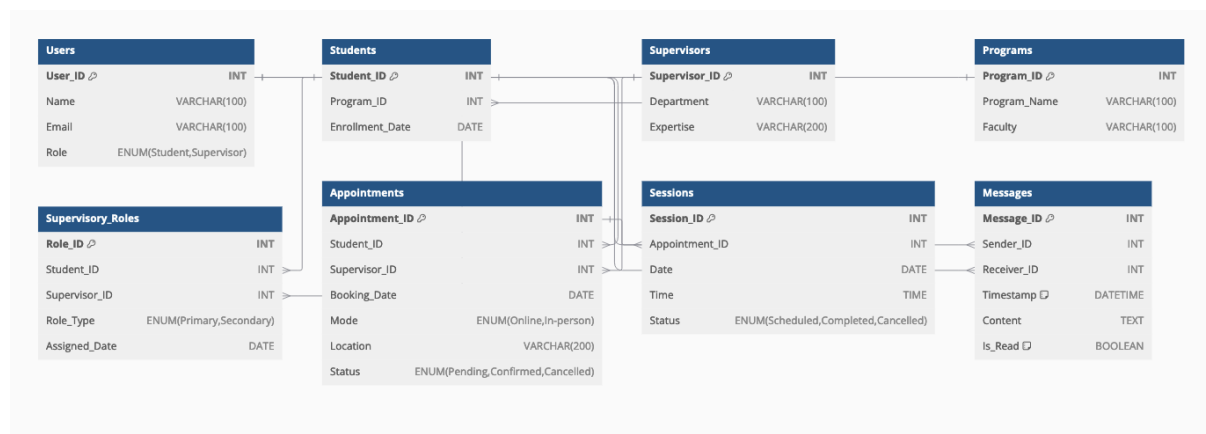
- d. Expanded attributes (e.g., Mode and Location in Appointments) align the data structure more closely with real-world processes.

Flexibility and Scalability:

- e. EERD accommodates future changes more easily than a standard ERD. For example, adding a new type of user or a new role wouldn't require a complete redesign.

Comprehensive Lifecycle Representation:

- f. Separate entities like Sessions ensure that the lifecycle of interactions, such as appointments and meetings, can be fully tracked.



5.0 DATA DICTIONARY

5.1 Description of Entity

Entity	Description	Occurrence
Users	Initial visitor's information	The visitor able to go through every public information
Students	Student's Information	Users need to register as a student and verified by admin to enable student's function like appointment and message for supervisor application
Supervisors	Supervisors's Information	Users need to register as a supervisor and verified by admin to enable supervisor's function like receiving messages and appointment from student.
Programs	Program's information	Program related is offered to students contain project that need student-supervisor relationship in long period.
Supervisory_Roles	Public information about project with supervisor and the student involved	The project that completely get supervisor will be record and public to public
Appointments	Appointments 's information	The student able to apply to be supervise by a curtain supervisor for their initial project presentation thought making appointment to them.
Sessions	Sessions 's Information	Supervisor can organise the appointment that created to a curtain session.
Messages	Messages 's Information	Student and supervisor can communicate with each other to fulfil their need

5.2 Description of Relationship

Entity	Multiplicity	Relationship	Multiplicity	Entity
Users	1...1	register	1...1	Students
	1...1	register	1...1	Supervisors
Students	1...*	inquiry	1...*	Supervisors
	0...*	send	1...1	Messages
	1...*	book	1...1	Appointments
	1...1	enrol	1...1	Programs
Supervisors	1...*	accept	0...*	Appointments
	1...*	organize	1...1	Session
	0...*	send	1...1	Messages
	1...*	public	1...1	Supervisory_Role
Supervisors_Role	1...*	view	1...*	Users

5.3 Description Attributes

Entity	Attributes	Description	Data Type	Null	Multi-Valued
Users	User_ID	Uniquely identify a visitor (PK)	INT	No	No
	Name	Name of visitor	VARCHAR (100)	No	No
	Email	Email visitor	VARCHAR (100)	No	No
	Role	Role of visitor for registration	ENUM("Student", "Supervisor")	No	No
Students	Student_ID	Uniquely identify a student (PK)	INT	No	No
	Program_ID	Foreign key of Programs which identify a program (FK)	INT	No	No
	Enrollment_Date	Date of enrolment	DATE	No	No
Supervisors	Supervisor_ID	Uniquely identify a supervisor (PK)	INT	No	No
	Department	Department of supervisor	VARCHAR (100)	No	No
	Expertise	Expertise of supervisor	VARCHAR (200)	Yes	No
Programs	Program_ID	Uniquely identify a program (PK)	INT	No	No
	Program_Name	Name of program	VARCHAR (100)	No	No
	Faculty	Faculty of program	VARCHAR (100)	No	No
Supervisory_Roles	Role_ID	Uniquely identify a supervisory role (PK)	INT	No	No
	Student_ID	Foreign key of Student which identify one or more student (FK)	INT	No	Yes
	Supervisor_ID	Foreign key of Programs which identify a supervisor (FK)	INT	No	No
	Role_Type	Type of supervisory role	ENUM("Primary", "Secondary")	No	No
	Assigned_Date	Date assigned of the supervisory	DATE	No	No
Appointments	Appointment_ID	Uniquely identify an appointment (PK)	INT	No	No
	Student_ID	Foreign key of Student which identify a student (FK)	INT	No	No

	Supervisor_ID	Foreign key of Student which identify a supervisor (FK)	INT	No	No
	Booking_Date	Date of appointment booked	DATE	No	No
	Mode	Mode of appointment	ENUM("Online", "In-person")	No	No
	Location	Location of appointment	VARCHAR(200)	Yes	No
	Status	Status of appointment	ENUM("pending", "Confirmed", "Cancelled")	No	No
Sessions	Session_ID	Uniquely identify a session (PK)	INT	No	No
	Appointment_ID	Foreign key of Student which identify one or more appointment (FK)	INT	No	Yes
	Date	Date of session	DATE	No	No
	Time	Time of session	TIME	No	No
	Status	Status of session	ENUM("Scheduled", "Complete", "Cancelled")	No	No
Messages	Message_ID	Uniquely identify a message (PK)	INT	No	No
	Sender_ID	Foreign key of Student which identify either student or supervisor (FK)	INT	No	No
	Receiver_ID	Foreign key of Student which identify a student or supervisor (FK)	INT	No	No
	Timestamp	Timestamp of message	DATETIME	No	No
	Content	Content of message	TEXT	No	No
	is_Read	Status of message	BOOLEAN	No	No

6.0 SUMMARY

The postgraduate supervision management system provides considerable benefits from three viewpoints. For students, it streamlines the process of finding suitable supervisors using a centralized database, encrypted communication and document sharing to protect sensitive information, and coordinated communication with real-time notifications. Supervisors gain from a less supervisory load, secure communication tools to protect student data, and better tracking via audit logs and notifications. For the university, the system improves data security and compliance, centralizes supervisor information for better monitoring, and boosts the institution's reputation by providing a secure, supportive academic environment for both students and teachers.