UTM
UNIVERSITI TEKNOLOGI MALAYSIA
Faculty of Computing

Phase 2 - Database Conceptual Design (ERD)

SECD2523 - Database

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Section 03 (Group - 11)

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1.0. Introduction

Dorms are part of the university experience, especially at universities serving diverse and scattered student populations. Manually running dorm operations such as room assignments, student registration, maintenance, and communication has become less effective and more error-prone. Universities struggle to build an optimal living experience with growing student enrollments and finite administrative budgets. A Dormitory Management System (DMS) proposes to address these issues by implementing an automated, web-based system that supports the whole dormitory process, student application and room allocation to complaint resolution and facility management. It would be web-based, with students able to access dorm services anywhere, at any time. Administrators will also have real-time information, workflow automation, and dashboards that support sound decision-making and resource allocation. Its implementation is anticipated to reduce administrative workload, improve service delivery, and significantly add to the student experience, aligned with modern digital transformation goals in higher education institutions.

2.0. Data Flow Diagram (DFD) (To-Be)

2.1 Context Diagram

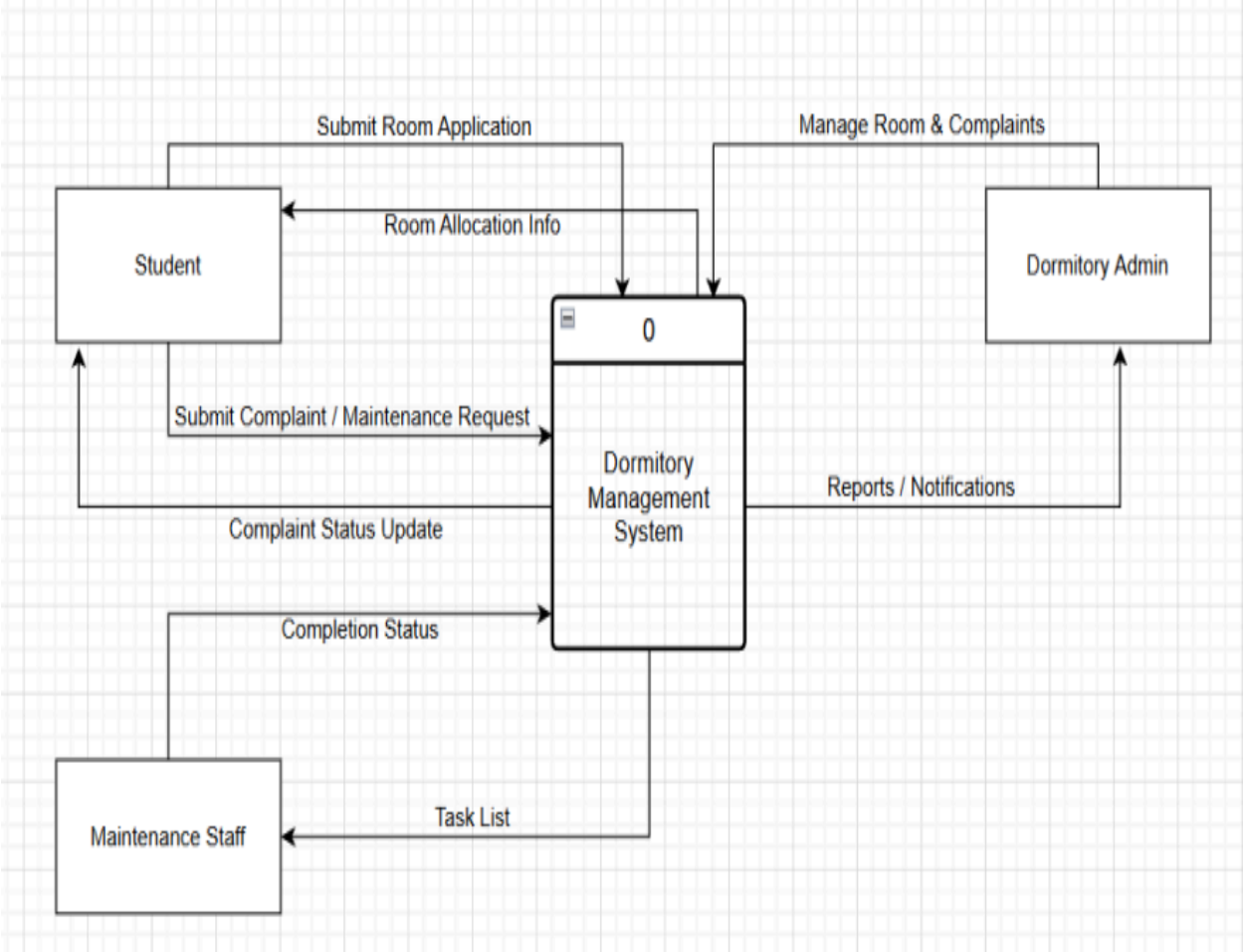

Figure.2.1. Context Diagram

2.2 Parent Diagram (Level 0)

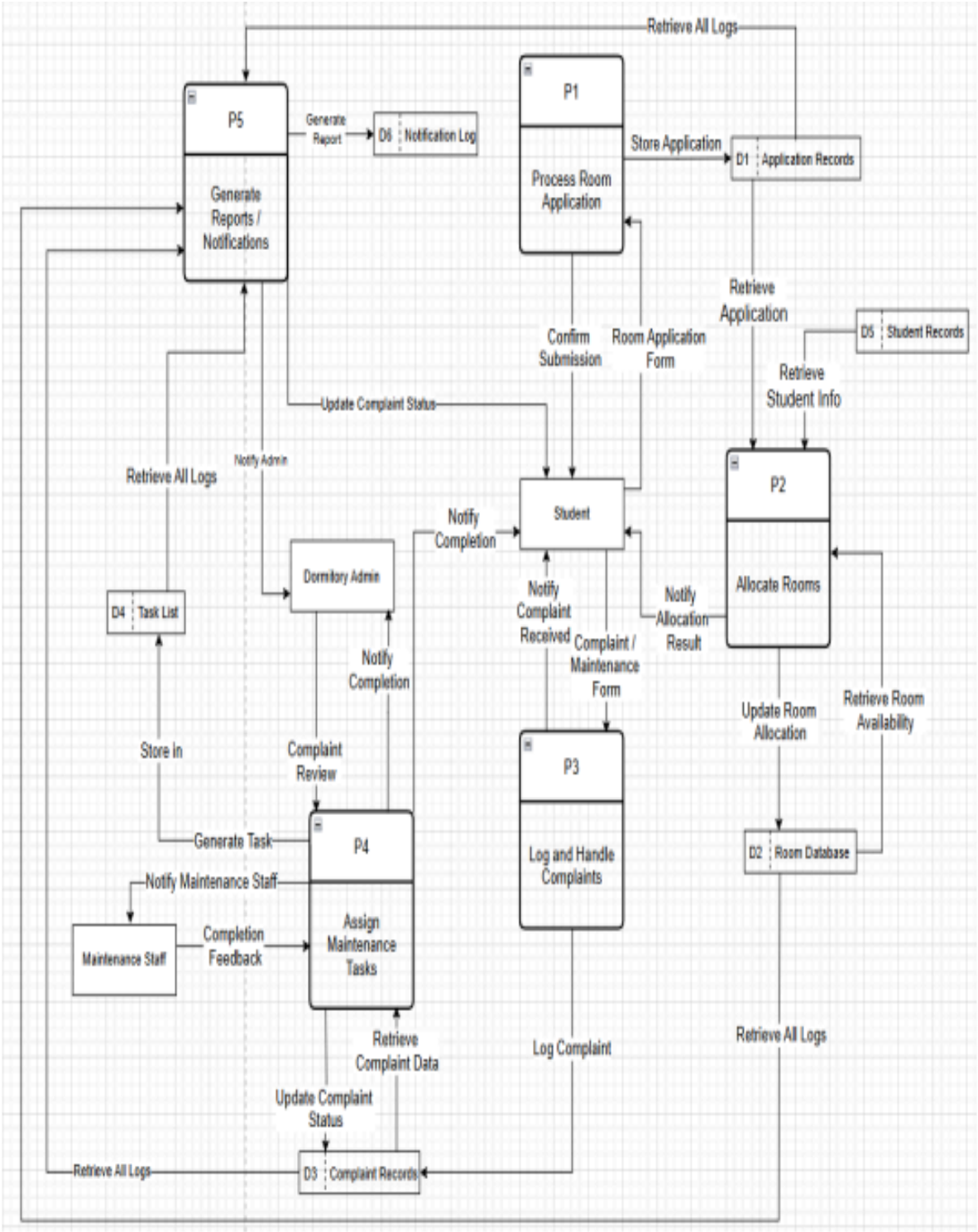

Figure.2.2.Parent Diagram (Level 0)

2.3 Child Diagram (Level 1)

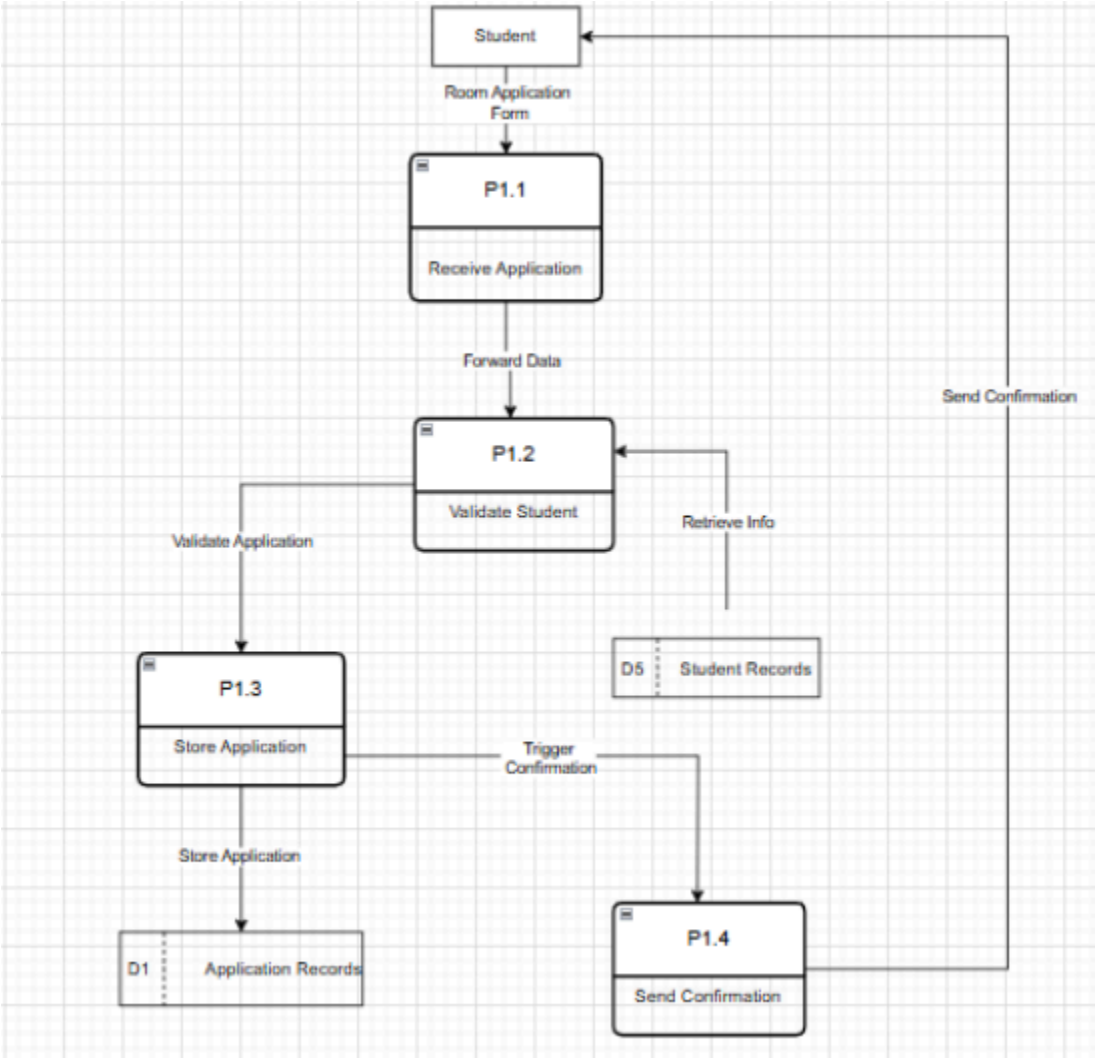

Figure.2.3.Child Diagram (Level 1)

2.3.1. Child diagram 1

P1 Application

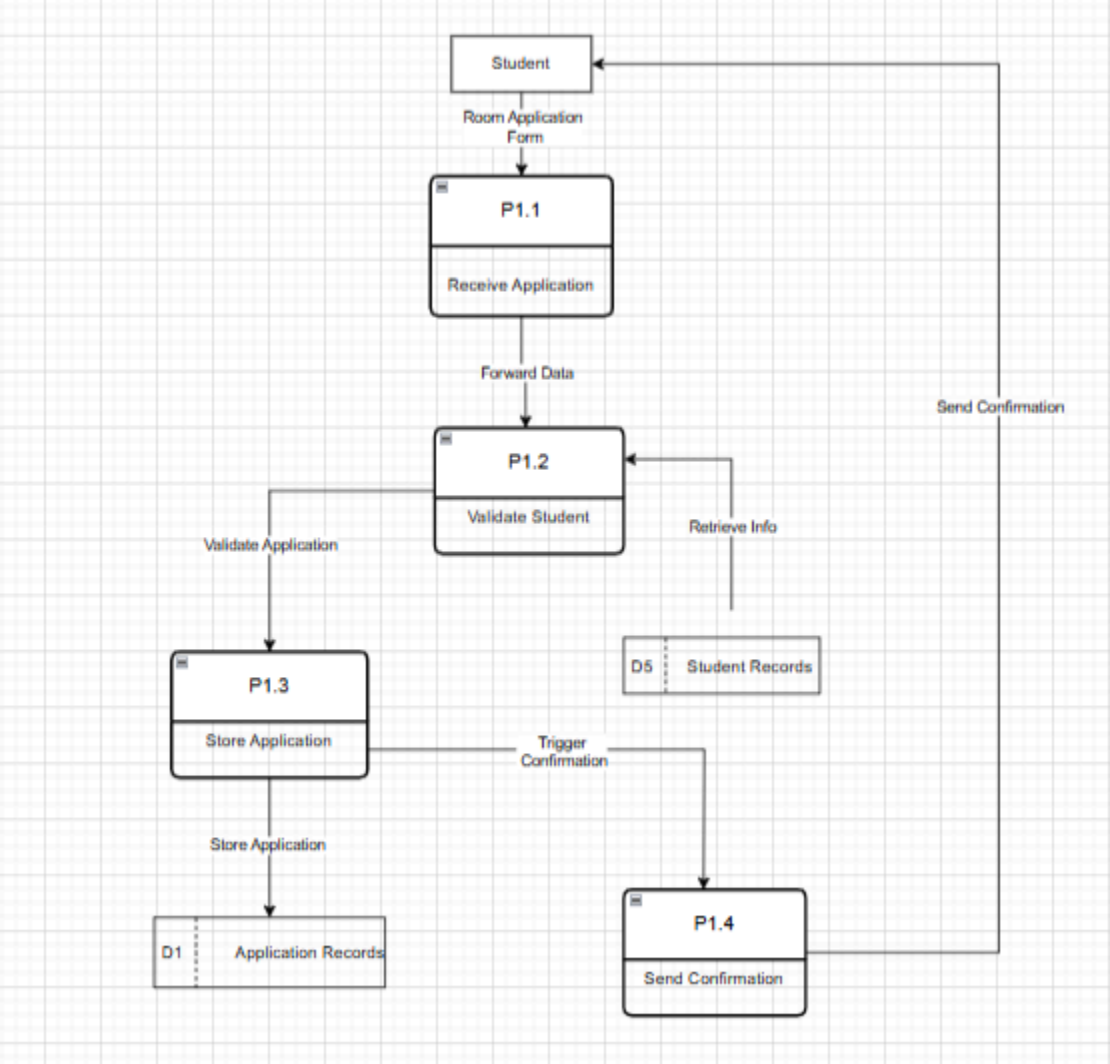

Figure.2.3.1. Child diagram 1

2.3.2. Child diagram 2

P2 Room Allocation

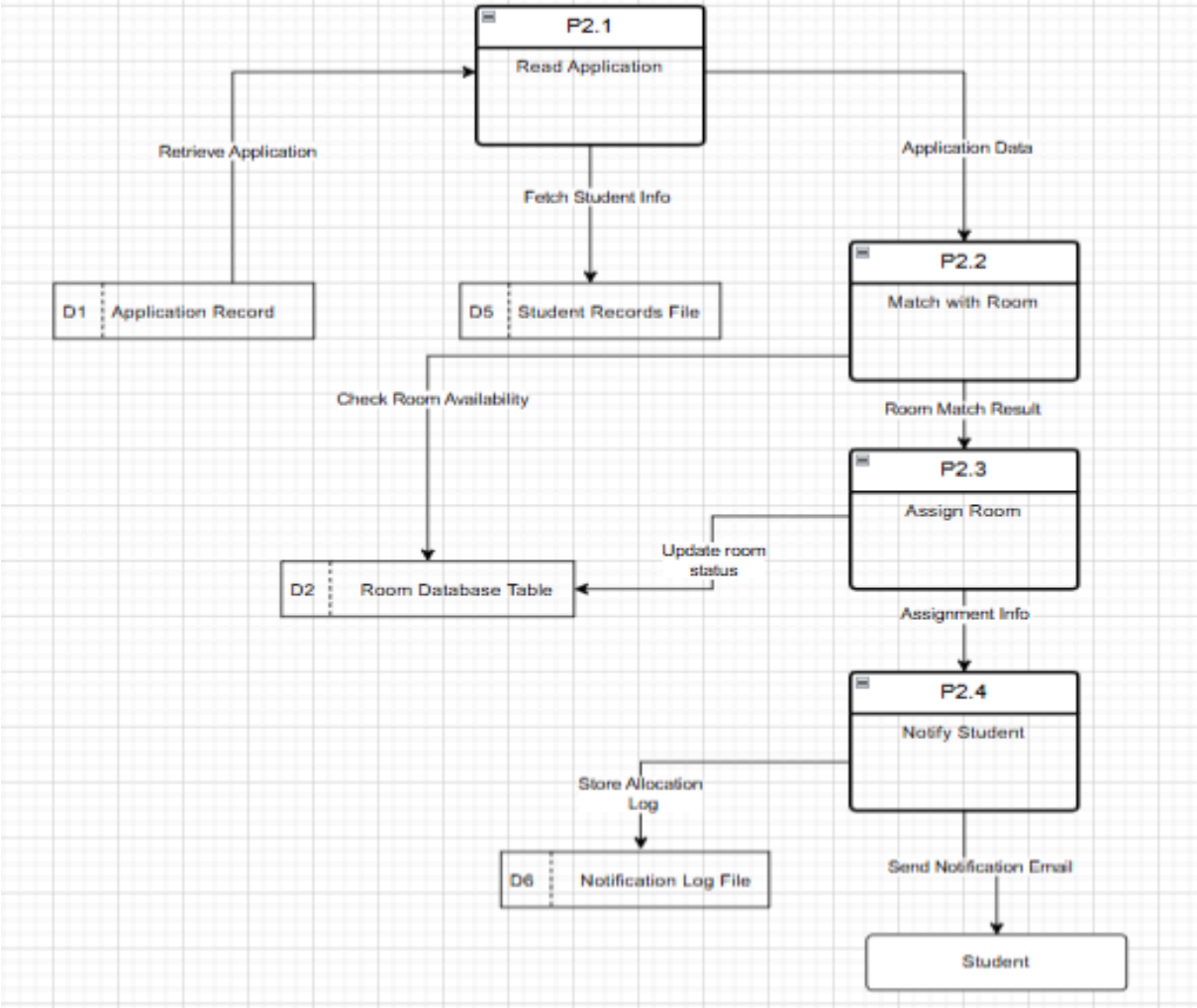

Figure.2.3.2. Child diagram 2

2.3.3. Child diagram 3

P3 Complaint

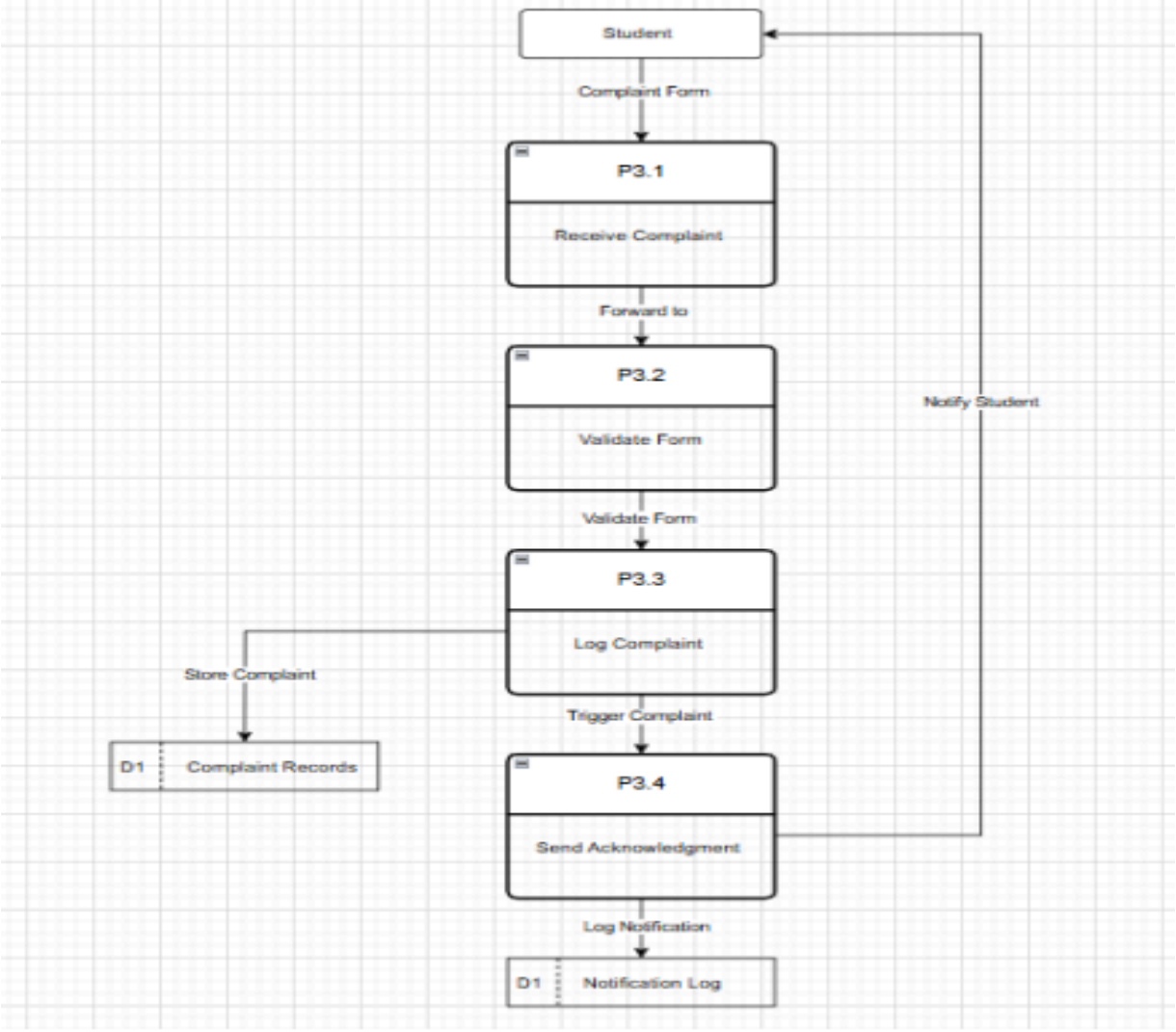

Figure.2.3.3. Child diagram 3

2.3.4. Child diagram 4

P4 Maintenance Task

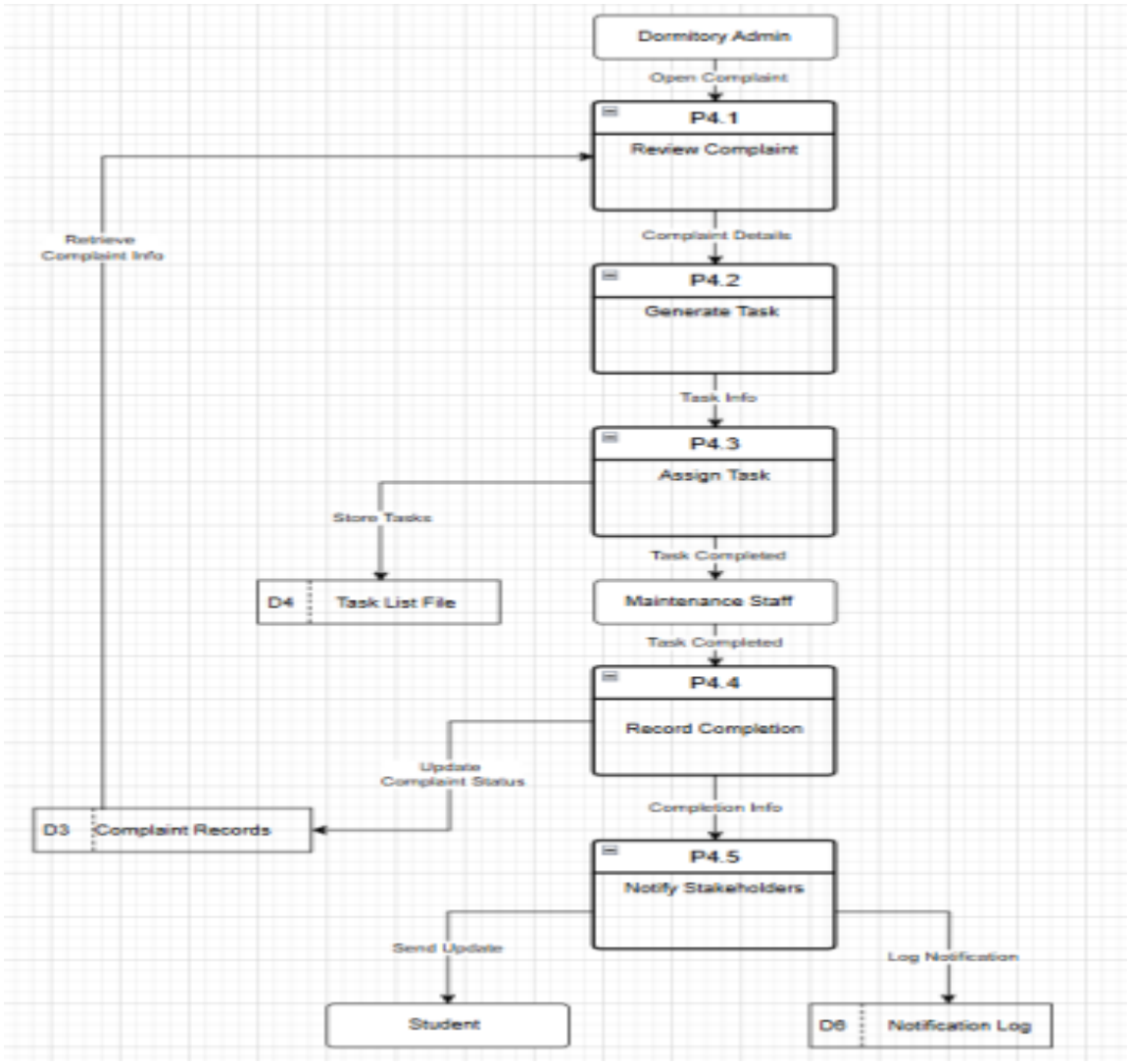

Figure.2.3.4. Child diagram 4

2.3.5. Child diagram 5

P5 Notification Log

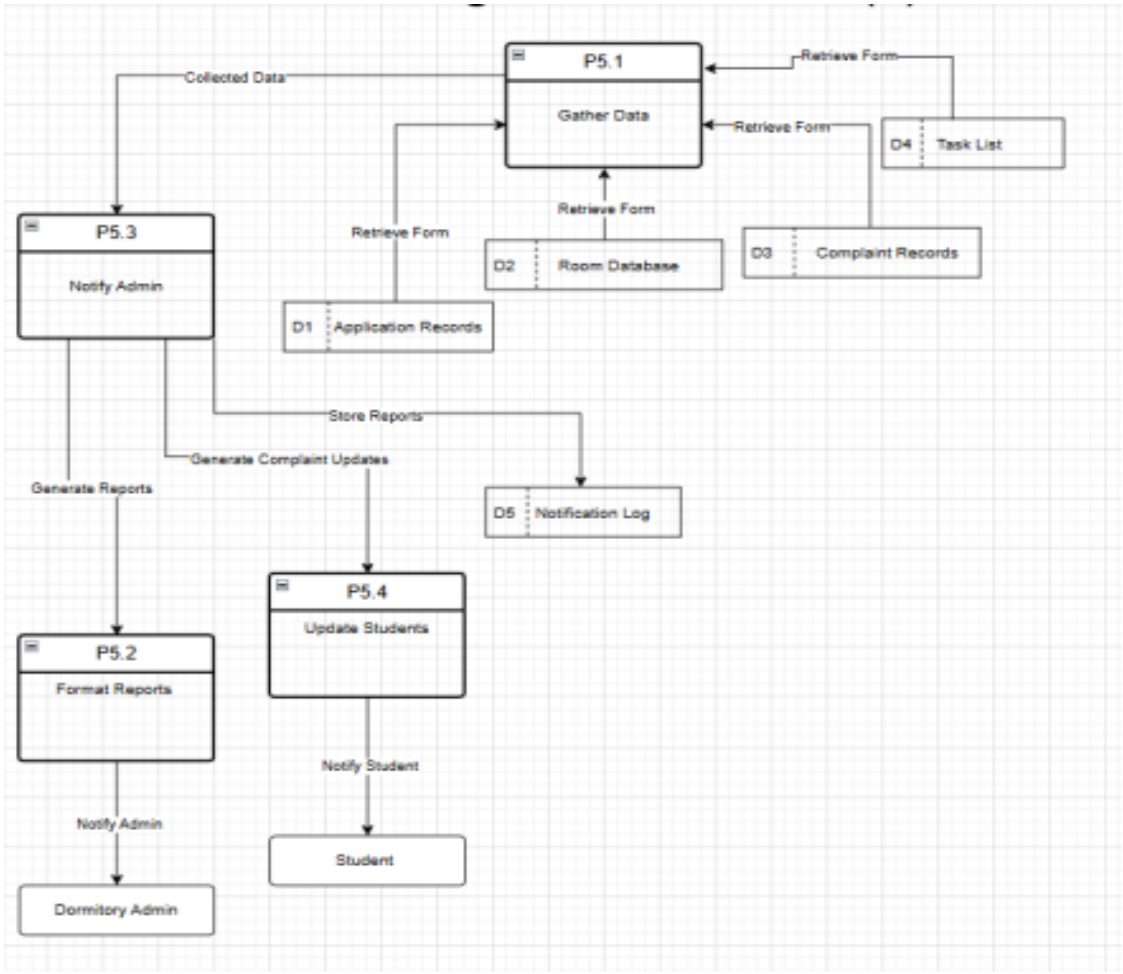

Figure.2.3.5. Child diagram 5

3.0 Data & Transaction Requirements

3.1. Proposed Business Rule

Student Rules:

- A student must submit at least one application to be considered for room allocation
- A student can have multiple applications but only one active application at a time
- A student can occupy only one room during their stay period
- A student can submit multiple maintenance requests for their assigned room
- Students receive notifications for application status, room assignments, and maintenance updates
- A student must have valid enrollment status to apply for dormitory accommodation

Dormitory Administrator Rules:

- Administrators review and approve/reject room applications based on eligibility criteria
- An administrator can allocate multiple rooms to different students
- Administrators can create and post announcements visible to all students
- An administrator assigns maintenance requests to appropriate maintenance staff
- Administrators have access to real-time reports on occupancy, applications, and maintenance status
- Room allocation follows first-come-first-served basis for eligible students

Maintenance Staff Rules:

- Maintenance staff can be assigned multiple maintenance requests
- Each maintenance request is handled by one maintenance staff member
- Staff must update the status of maintenance requests (Pending, In Progress, Completed)
- Maintenance staff can view room details related to their assigned tasks
- Priority is given to urgent requests (e.g., electrical, plumbing issues)

Room and Application Rules:

- Each room has a defined capacity and can accommodate multiple students up to its limit
- Room availability is updated in real-time based on allocations and departures
- An application refers to exactly one room preference
- Applications have statuses: Pending, Approved, Rejected, Waitlisted
- Maintenance requests must be linked to a specific room
- Stay records track check-in and check-out dates for accountability

3.2. Proposed Data & Transactional

Data Entry Requirements:

1. Student Registration: Enter student details including StudentID, Name, Gender, DateOfBirth, ContactNo (multivalued), Email, Program, YearOfStudy (derived), Faculty
2. Room Application: Submit application with ApplicationID, ApplicationDate, Status, Preferences, StudentID, RoomID
3. Room Information: Enter room details including RoomID, RoomNumber, Block, Capacity, CurrentOccupancy, RoomType, Floor
4. Maintenance Request: Log complaint with RequestID, RequestDate, IssueType, Description, Priority, Status, StudentID, RoomID
5. Stay Record: Create stay entry with StayID, CheckInDate, CheckOutDate, StudentID, RoomID
6. Administrator Profile: Enter admin details including AdminID, Name, ContactNo, Email, Role
7. Maintenance Staff Profile: Enter staff details including StaffID, Name, ContactNo, Email, Specialization
8. Announcement: Post announcement with AnnouncementID, Title, Content, DatePosted, AdminID

Data Update/Delete Requirements:

1. Update student personal information (contact number, email, program, year of study)
2. Update application status (Pending → Approved/Rejected/Waitlisted)
3. Update room availability and current occupancy when students check-in/check-out
4. Update maintenance request status (Pending → In Progress → Completed)
5. Update maintenance staff assignments for requests
6. Update stay record check-out dates upon student departure
7. Delete outdated applications after allocation period
8. Delete old announcements based on retention policy
9. Modify room details (capacity, type, availability)
10. Update administrator and maintenance staff profiles

Data Query Requirements:

1. Display list of all students with their current room assignments
2. Display available rooms filtered by block, floor, type, and capacity
3. Display pending applications ordered by submission date
4. Display student's application history and current status
5. Display all maintenance requests for a specific room or building block
6. Display pending and in-progress maintenance tasks assigned to each staff member
7. Display occupancy rate per block/floor/room type
8. Display stay history for a specific student showing check-in and check-out dates
9. Display recent announcements posted by administrators
10. Display maintenance statistics (average resolution time, request types, priority distribution)
11. Display students without room assignments (waitlisted or pending applications)
12. Generate reports on room utilization, application processing time, and maintenance performance
13. Search students by name, StudentID, program, or faculty
14. Display contact information for students in a specific room or block

4.0. Database Conceptual Design

4.1. Conceptual ERD

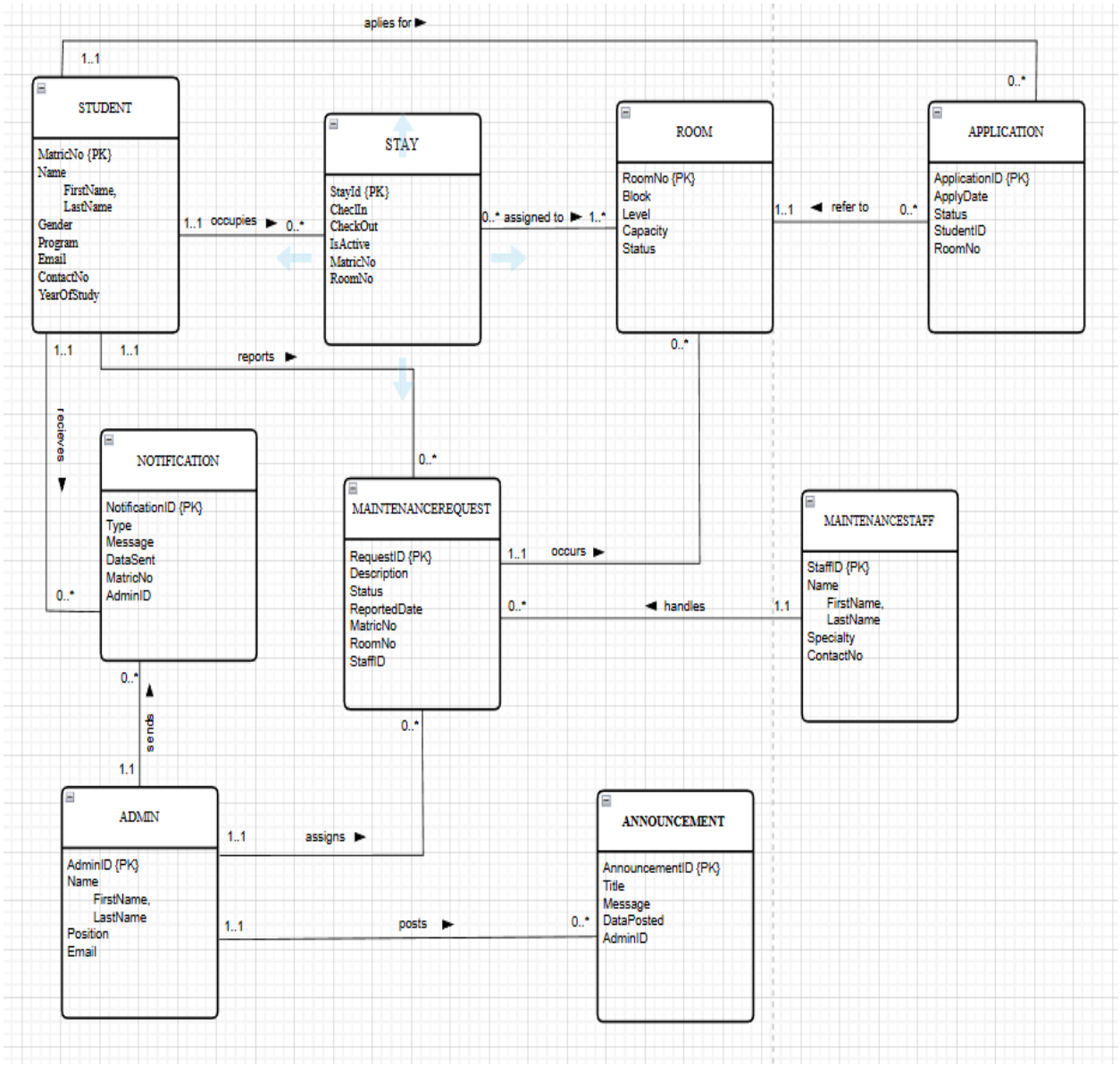

Figure 4.1 Conceptual ERD for Dormitory Management System.

4.2. Enhanced ERD (EERD)

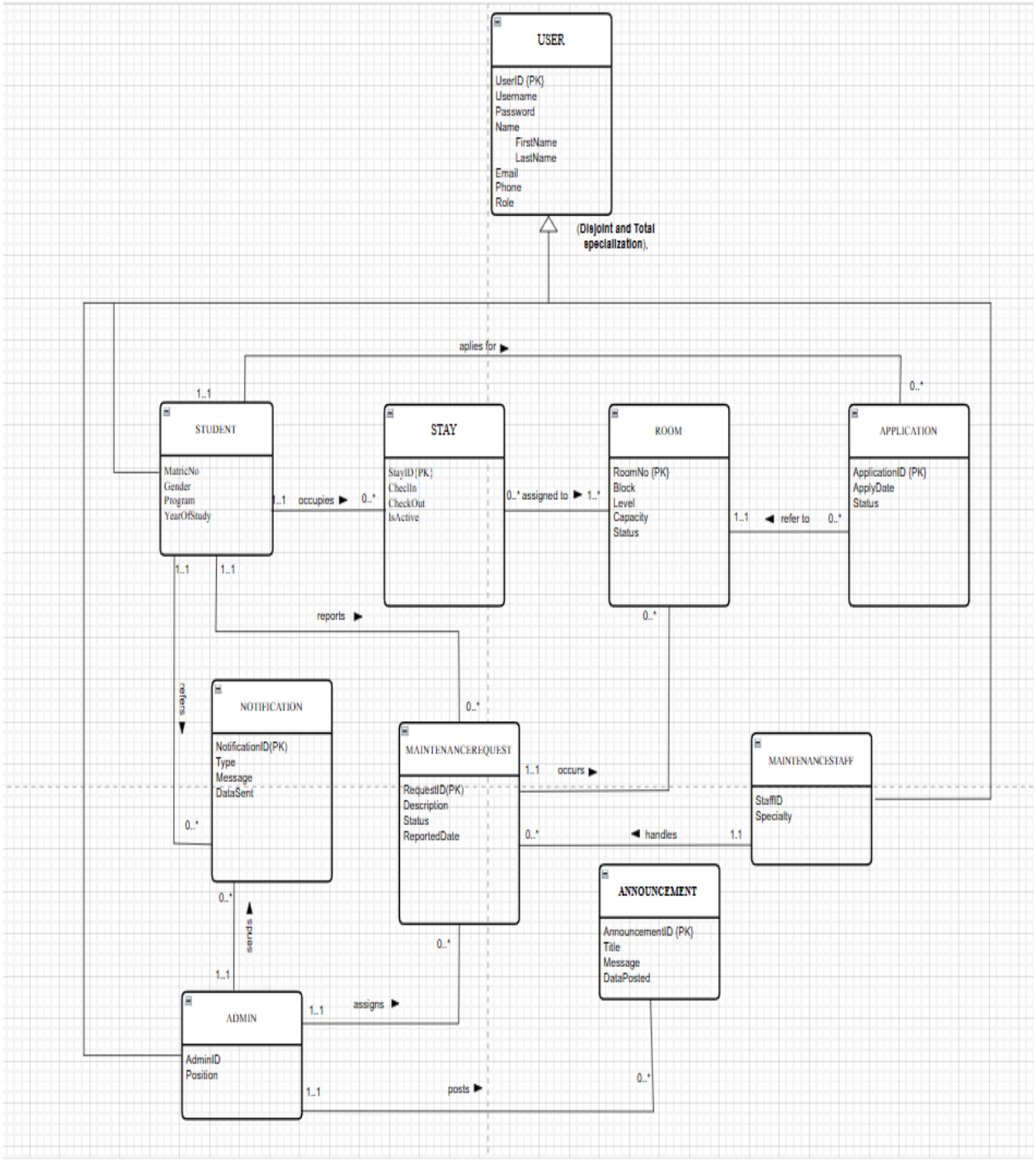

Figure 4.2 Enhanced ERD for Dormitory Management System

5.0. Data Dictionary

5.1. Description of Entity

Entity	Description	Occurrence
STUDENT	Student's personal and application information	Students register in the system, apply for rooms, and submit maintenance requests.
ADMIN	Admin's information	Dormitory admins review student applications, allocate rooms, and assign maintenance tasks.
MAINTENANCESTAFF	Maintenance staff information	Maintenance staff receive assigned maintenance tasks and update completion status.
APPLICATION	Room application details	Application submitted by students and reviewed by dormitory admin.
ROOM	Room's information	Rooms are stored with details such as room number, capacity, and availability status.
STAY	Student staying updates details	including room assignments, duration of stay, and any changes to their accommodation status
MAINTENANCEREQUEST	Maintenance request information	Task created based on complaint, assigned to maintenance staff, and tracked until completed.
NOTIFICATION	Notification details	Notifications are generated automatically by the system for updates and alerts.
ANNOUNCEMENT	Announcement information shared by the admin.	Each announcement is created and posted by an admin.

5.2. DESCRIPTION OF RELATIONSHIP

Entity	Multiplicity	Relationship	Multiplicity	Entity
STUDENT	1..1	Occupies	0..*	Stay
STAY	0..*	Assigned to	1..1	Room
STUDENT	1..1	Applies for	0..*	Application
APPLICATION	0..*	Refers to	1..1	Room
STUDENT	1..1	Reports	0..*	MaintenanceRequest
MAINTENANCEREQUEST	1..1	Occurs in	0..*	Room
MAINTENANCEREQUEST	0..*	Handled by	1..1	MaintenanceStaff
ADMIN	1..1	Assigns	0..*	MaintenanceRequest
ADMIN	1..1	Sends	0..*	Notification
STUDENT	1..1	Receives	0..*	Notification
ADMIN	1..1	Posts	0..*	Announcement

5.3. Description of Attributes

Entity	Attributes	Description	Data Type	Null	Multi-Valued
Student	MatricNo (PK)	Unique matric number for each student.	VARCHAR(15)	No	No
	FirstName	Student's first name.	VARCHAR(50)	No	No
	LastName	Student's last name.	VARCHAR(50)	No	No
	Gender	Student gender (M/F).	CHAR(1)	No	No
	Program	Academic program name.	VARCHAR(100)	No	No
	Email	Student's email address.	VARCHAR(100)	No	No
	ContactNo	Student's phone number(s).	VARCHAR(20)	No	Yes
	YearOfStudy	Derived from current year – admission year.	INT	Yes	No
Room	RoomNo (PK)	Unique ID for each room.	INT	No	No
	Block	Dormitory block name (e.g., K9, K10).	VARCHAR(10)	No	No
	Level	Floor number of the room.	INT	No	No
	Capacity	Maximum number of occupants.	INT	No	No

Entity	Attributes	Description	Data Type	Null	Multi-Valued
Student	MatricNo (PK)	Unique matric number for each student.	VARCHAR(15)	No	No
	FirstName	Student's first name.	VARCHAR(50)	No	No
	LastName	Student's last name.	VARCHAR(50)	No	No
	Gender	Student gender (M/F).	CHAR(1)	No	No
	Program	Academic program name.	VARCHAR(100)	No	No
	Email	Student's email address.	VARCHAR(100)	No	No
	ContactNo	Student's phone number(s).	VARCHAR(20)	No	Yes
	YearOfStudy	Derived from current year – admission year.	INT	Yes	No
	Status	Availability status ('Available', 'Occupied', etc.).	VARCHAR(20)	No	No
Application	ApplicationID (PK)	Unique ID for each room application.	INT	No	No
	ApplyDate	Date the student submitted the application.	DATE	No	No
	Status	Application status ('Pending',	VARCHAR(20)	No	No

Entity	Attributes	Description	Data Type	Null	Multi-Valued
Student	MatricNo (PK)	Unique matric number for each student.	VARCHAR(15)	No	No
	FirstName	Student's first name.	VARCHAR(50)	No	No
	LastName	Student's last name.	VARCHAR(50)	No	No
	Gender	Student gender (M/F).	CHAR(1)	No	No
	Program	Academic program name.	VARCHAR(100)	No	No
	Email	Student's email address.	VARCHAR(100)	No	No
	ContactNo	Student's phone number(s).	VARCHAR(20)	No	Yes
	YearOfStudy	Derived from current year – admission year.	INT	Yes	No
		'Approved', 'Rejected').			
	MatricNo (FK)	References student who submitted the application.	VARCHAR(15)	No	No
	RoomNo(FK)	References the room applied for.	INT	No	No
Stay	StayID (PK)	Unique stay record ID.	INT	No	No

Entity	Attributes	Description	Data Type	Null	Multi-Valued
Student	MatricNo (PK)	Unique matric number for each student.	VARCHAR(15)	No	No
	FirstName	Student's first name.	VARCHAR(50)	No	No
	LastName	Student's last name.	VARCHAR(50)	No	No
	Gender	Student gender (M/F).	CHAR(1)	No	No
	Program	Academic program name.	VARCHAR(100)	No	No
	Email	Student's email address.	VARCHAR(100)	No	No
	ContactNo	Student's phone number(s).	VARCHAR(20)	No	Yes
	YearOfStudy	Derived from current year – admission year.	INT	Yes	No
	CheckIn	Date and time student checked in.	DATETIME	No	No
	CheckOut	Date and time student checked out.	DATETIME	Yes	No
	IsActive	Indicates if the stay is current.	BOOLEAN	No	No
	MatricNo (FK)	References the student.	VARCHAR(15)	No	No

Entity	Attributes	Description	Data Type	Null	Multi-Valued
Student	MatricNo (PK)	Unique matric number for each student.	VARCHAR(15)	No	No
	FirstName	Student's first name.	VARCHAR(50)	No	No
	LastName	Student's last name.	VARCHAR(50)	No	No
	Gender	Student gender (M/F).	CHAR(1)	No	No
	Program	Academic program name.	VARCHAR(100)	No	No
	Email	Student's email address.	VARCHAR(100)	No	No
	ContactNo	Student's phone number(s).	VARCHAR(20)	No	Yes
	YearOfStudy	Derived from current year – admission year.	INT	Yes	No
	RoomNo (FK)	References the room occupied.	INT	No	No
MaintenanceRequest	RequestID (PK)	Unique ID for maintenance request.	INT	No	No
	Description	Details of the problem reported.	TEXT	No	No
	Status	Status of request ('Pending', 'In Progress', 'Completed').	VARCHAR(20)	No	No

Entity	Attributes	Description	Data Type	Null	Multi-Valued
Student	MatricNo (PK)	Unique matric number for each student.	VARCHAR(15)	No	No
	FirstName	Student's first name.	VARCHAR(50)	No	No
	LastName	Student's last name.	VARCHAR(50)	No	No
	Gender	Student gender (M/F).	CHAR(1)	No	No
	Program	Academic program name.	VARCHAR(100)	No	No
	Email	Student's email address.	VARCHAR(100)	No	No
	ContactNo	Student's phone number(s).	VARCHAR(20)	No	Yes
	YearOfStudy	Derived from current year – admission year.	INT	Yes	No
	ReportedDate	Date and time request was submitted.	DATETIME	No	No
	MatricNo (FK)	Student who reported the issue.	VARCHAR(15)	No	No
	RoomNo(FK)	Room where issue occurred.	INT	No	No
	StaffID (FK)	Staff assigned to handle the issue.	INT	Yes	No
Admin	AdminID (PK)	Unique admin ID.	INT	No	No

Entity	Attributes	Description	Data Type	Null	Multi-Valued
Student	MatricNo (PK)	Unique matric number for each student.	VARCHAR(15)	No	No
	FirstName	Student's first name.	VARCHAR(50)	No	No
	LastName	Student's last name.	VARCHAR(50)	No	No
	Gender	Student gender (M/F).	CHAR(1)	No	No
	Program	Academic program name.	VARCHAR(100)	No	No
	Email	Student's email address.	VARCHAR(100)	No	No
	ContactNo	Student's phone number(s).	VARCHAR(20)	No	Yes
	YearOfStudy	Derived from current year – admission year.	INT	Yes	No
	FirstName	Admin's first name.	VARCHAR(50)	No	No
	LastName	Admin's last name.	VARCHAR(50)	No	No
	Position	Admin's position in dorm management.	VARCHAR(50)	No	No
	Email	Admin's email address.	VARCHAR(100)	No	No
MaintenanceStaff	StaffID (PK)	Unique maintenance staff ID.	INT	No	No

Entity	Attributes	Description	Data Type	Null	Multi-Valued
Student	MatricNo (PK)	Unique matric number for each student.	VARCHAR(15)	No	No
	FirstName	Student's first name.	VARCHAR(50)	No	No
	LastName	Student's last name.	VARCHAR(50)	No	No
	Gender	Student gender (M/F).	CHAR(1)	No	No
	Program	Academic program name.	VARCHAR(100)	No	No
	Email	Student's email address.	VARCHAR(100)	No	No
	ContactNo	Student's phone number(s).	VARCHAR(20)	No	Yes
	YearOfStudy	Derived from current year – admission year.	INT	Yes	No
	Name	Staff member's name.	VARCHAR(100)	No	No
	Speciality	Area of specialization (Electrical, Plumbing, etc.).	VARCHAR(50)	No	No
	ContactNo	Staff contact number.	VARCHAR(20)	No	No
Announcement	AnnouncementID (PK)	Unique ID for announcement.	INT	No	No

Entity	Attributes	Description	Data Type	Null	Multi-Valued
Student	MatricNo (PK)	Unique matric number for each student.	VARCHAR(15)	No	No
	FirstName	Student's first name.	VARCHAR(50)	No	No
	LastName	Student's last name.	VARCHAR(50)	No	No
	Gender	Student gender (M/F).	CHAR(1)	No	No
	Program	Academic program name.	VARCHAR(100)	No	No
	Email	Student's email address.	VARCHAR(100)	No	No
	ContactNo	Student's phone number(s).	VARCHAR(20)	No	Yes
	YearOfStudy	Derived from current year – admission year.	INT	Yes	No
	Title	Announcement title.	VARCHAR(100)	No	No
	Message	Full content of announcement.	TEXT	No	No
	DatePosted	Date and time announcement was created.	DATETIME	No	No
	AdminID (FK)	References the admin who posted it.	INT	No	No

Entity	Attributes	Description	Data Type	Null	Multi-Valued
Student	MatricNo (PK)	Unique matric number for each student.	VARCHAR(15)	No	No
	FirstName	Student's first name.	VARCHAR(50)	No	No
	LastName	Student's last name.	VARCHAR(50)	No	No
	Gender	Student gender (M/F).	CHAR(1)	No	No
	Program	Academic program name.	VARCHAR(100)	No	No
	Email	Student's email address.	VARCHAR(100)	No	No
	ContactNo	Student's phone number(s).	VARCHAR(20)	No	Yes
	YearOfStudy	Derived from current year – admission year.	INT	Yes	No
Notification	NotificationID (PK)	Unique ID for each notification.	INT	No	No
	Type	Type of notification ('Application', 'Maintenance', etc.).	VARCHAR(50)	No	No
	Message	Content of the notification.	VARCHAR(255)	No	No
	DateSent	Date and time notification was sent.	DATETIME	No	No

Entity	Attributes	Description	Data Type	Null	Multi-Valued
Student	MatricNo (PK)	Unique matric number for each student.	VARCHAR(15)	No	No
	FirstName	Student's first name.	VARCHAR(50)	No	No
	LastName	Student's last name.	VARCHAR(50)	No	No
	Gender	Student gender (M/F).	CHAR(1)	No	No
	Program	Academic program name.	VARCHAR(100)	No	No
	Email	Student's email address.	VARCHAR(100)	No	No
	ContactNo	Student's phone number(s).	VARCHAR(20)	No	Yes
	YearOfStudy	Derived from current year – admission year.	INT	Yes	No
	MatricNo (FK)	Student who received the notification.	VARCHAR(15)	No	No
	AdminID (FK)	Admin who sent the notification.	INT	No	No

6.0. Summary

The database conceptual design for the Dormitory Management System lays a solid foundation for data organization and integrity. The To-Be DFD, business rules, and ER models together ensure that each of the system processes is supported by a reliable and normalized data structure. A Data Dictionary defines all data elements and relationships, which in turn gives a clear reference to database developers. This conceptual design will form the basis for the Logical Database Design and SQL implementation in Phase 3.