SECD2523 - DATABASE

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DATABASE CONCEPTUAL DESIGN

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1.0 Introduction

In today's era, dental clinics have become a location that is frequented by modern people from time to time. In this fast-paced era, busy people prefer efficient appointment management systems that will help them save more time for other things. Traditional methods of appointment scheduling often lead to inefficiencies, inaccuracies, and extreme challenges in maintaining the optimal balance between the availability of dental professionals and the unique needs of patients.

Effective appointment management is the cornerstone of providing quality patient care and maintaining the operational efficiency of a dental office. The sophistication of the appointment management system will affect the patient's experience. In addition, an efficient appointment system can streamline the daily operations of a dental office and reduce the workload of dentists and nurses. Therefore, the development of a dental appointment rescheduling system is an innovative solution. We hope to improve the scheduling process, minimize wait times and enhance the overall patient experience. Indirectly, this will help dental clinics to reduce the burden on staff and increase the number of customers.

2.0 Data Flow Diagram (DFD)

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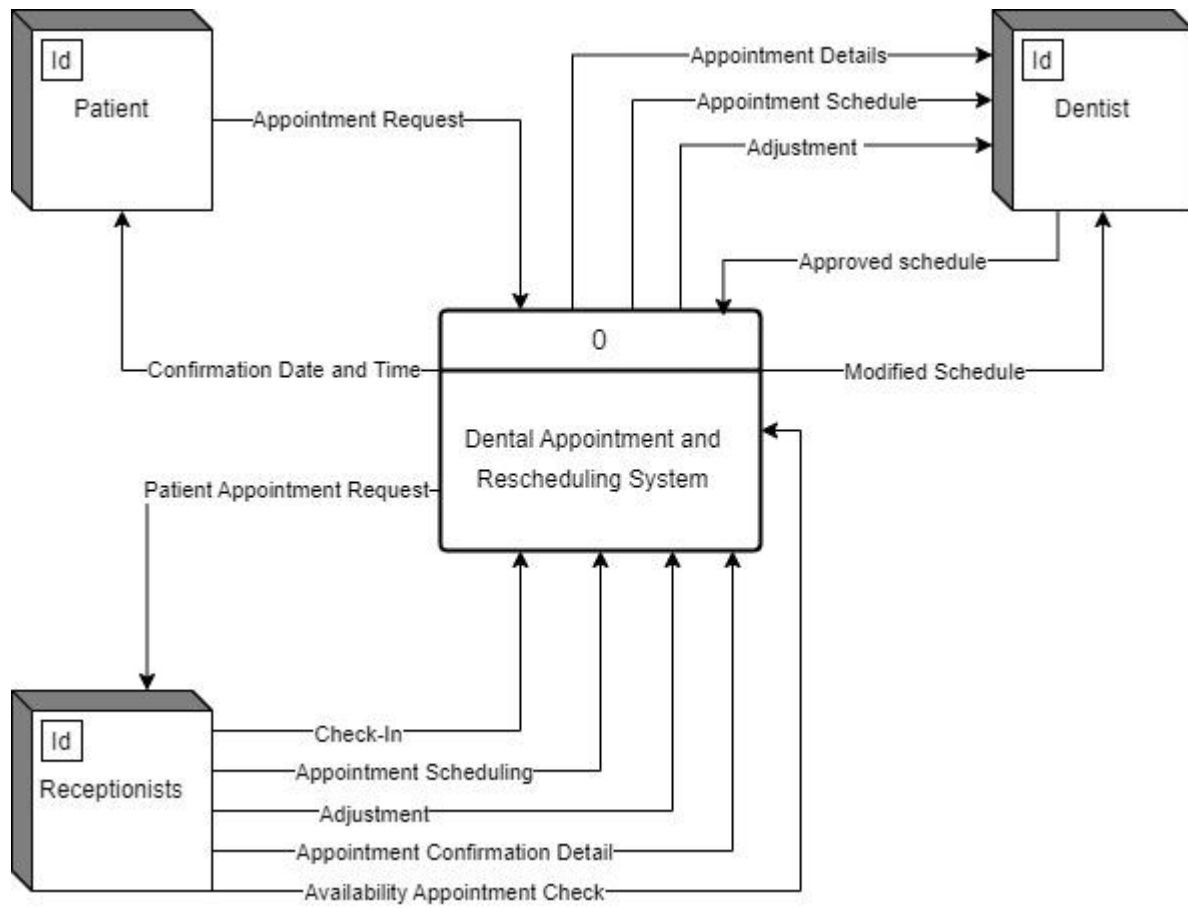
2.2 Parent Diagram (Level 0)
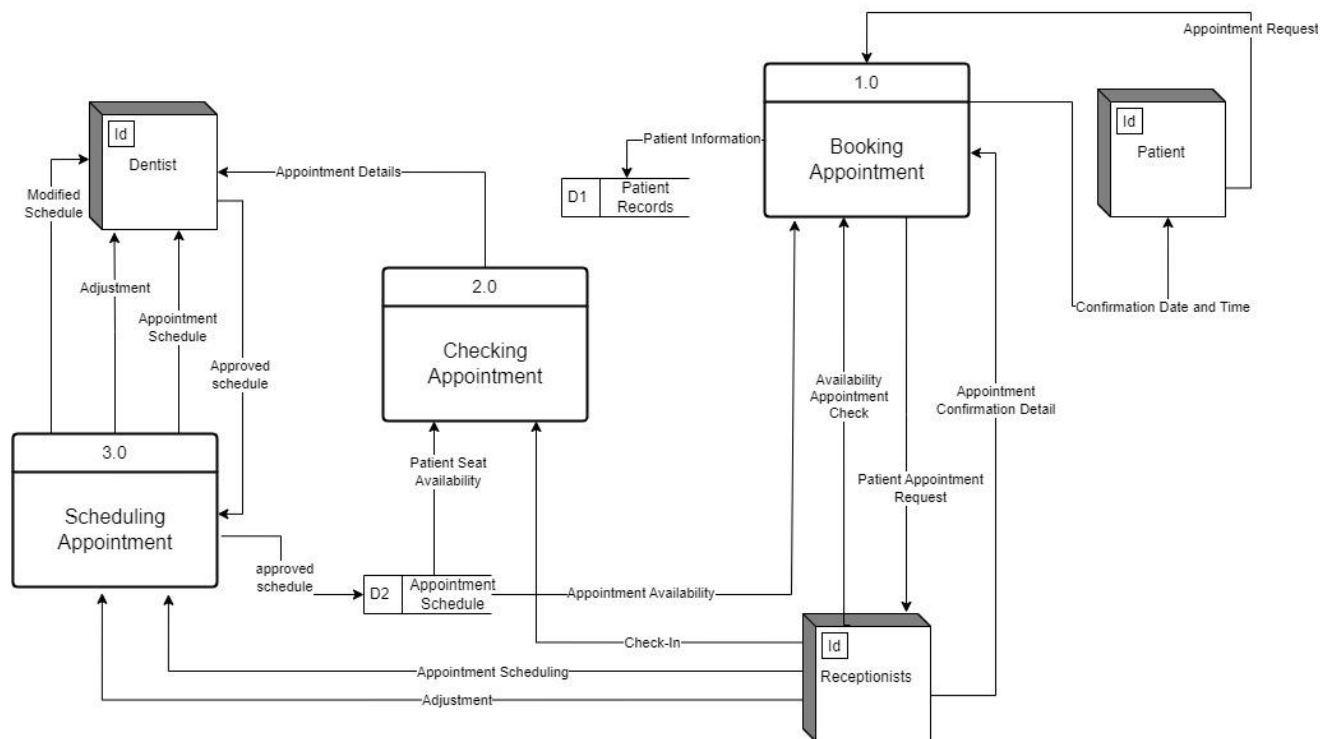
2.3 Child Diagram (Level 1)

2.3.1 Process 1.0 <Booking Appointment>
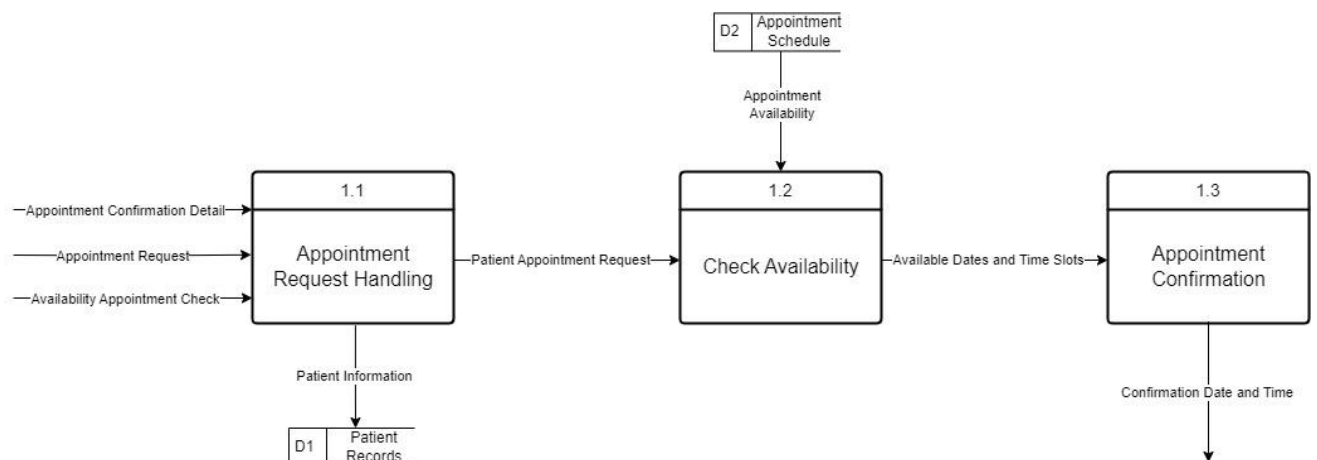
2.3.2 Process 2.0 <Checking Appointment>
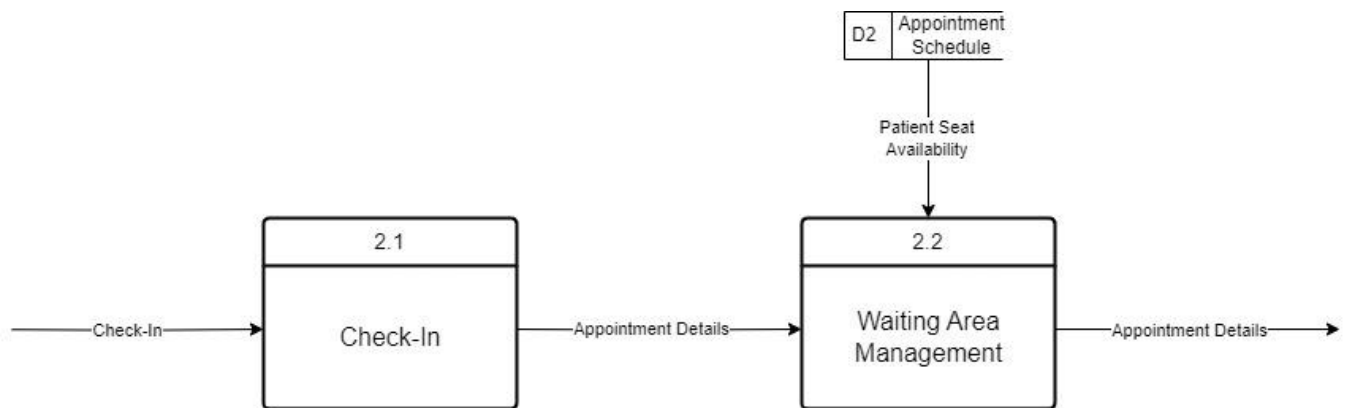
2.3.3 Process 3.0 <Scheduling Appointment>
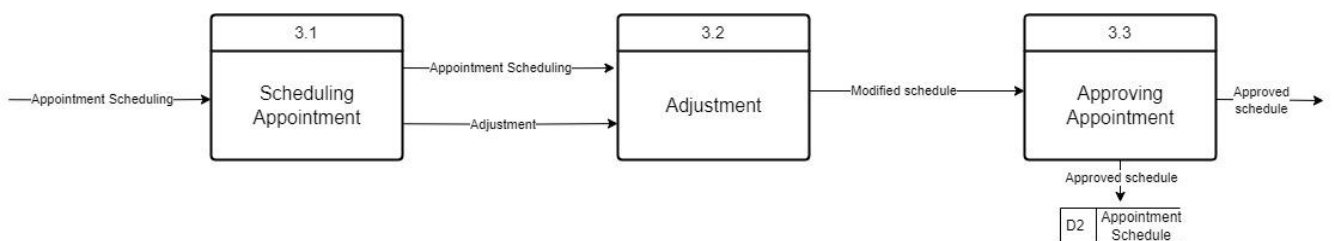
3.0 Data & Transaction Requirement

3.1 Proposed business rule

Dentist:

- View and update the patient e-profiles through the system
- Reviews patient x-rays digitally and updates findings in system
- Digitally creates and updates treatment plans for patients
- E-prescribes medications and treatments for patients
- Adjusts digital appointment calendar to accommodate changes

Receptionist:

- Book patient appointments through digital calendar system
- Enters new patient details directly into the system
- System automatically sends appointment reminders to patients
- Reschedule appointments digitally based on requests

Patient:

- Book initial and follow-up appointments through online portal
- Receives automatic appointment reminders
- Do an online payment for dental services
- Access dental records and treatment plans via patient portal

3.2 Proposed data & transactional

3.2.1 Proposed Data Requirement

Patient

The data stored in the Patient entity includes, Patient ID, patient name, gender, date of birth(DOB), contact number, email and address. The patient ID is defined as the primary key. The name and the address are the composite attributes. The name consists of first name and last name, whereas the address consists of street, city, and postcode. A patient can book zero or more than one appointment. A patient has one dental record only. A patient can make one or more than one payment.

Appointment

The data stored in the Appointment includes appointment ID, date, time. dental service type, patient ID, and doctor ID. The appointment ID is defined as the primary key as it is unique. Patient ID and doctor ID will be used as the foreign key, with reference from the Patient entity and the Doctor entity. An appointment is made by one patient only. An appointment is approved by one dentist only.

Dental Record

The data stored in the Dental Record includes record ID, date, symptoms, treatment, history, patient ID, and doctor ID. The record ID is defined as the primary key as it is unique. Patient ID and doctor ID will be used as the foreign key, with reference from the Patient entity and the Doctor entity. A dental record generates one or more than one payment.

Dentist

The data stored in the Dentist entity includes, dentist ID, dentist name, gender, qualification, specialization, contact number, and email. The dentist ID is defined as the primary key. The name and the address are the composite attributes. The name consists of first name and last name, whereas the address consists of street, city, and postcode. A dentist can treat none or more than one patient. A dentist can approve none or more than one appointment schedule. A dentist can write one or more than one appointment schedule.

Receptionist

The data stored in the Receptionist entity includes, receptionist ID, name, gender, date of birth(DOB), qualification, contact number, and email. The receptionist ID is defined as the primary key. The name and the address are the composite attributes. The name consists of first name and last name, whereas the address consists of street, city, and postcode. A receptionist can manage one or more than one payment.

Payment

The data stored in Payment includes invoice No., date, payment fees, and payment status. The invoice No. is defined as the primary key. Each transaction has a unique invoice No.. Since patients need to make payment based on their treatment from dental record, thus record ID will be used as the foreign key, with reference from the Dental Record entity. Receptionist ID will be used as foreign key too, with reference from the receptionist, since the receptionist needs to confirm the payment. A payment is managed by a receptionist. A payment is generated from one dental record only.

3.2.2 Proposed Transactional Requirement

Data Entry

1. Enter the details of patients personal information, such as name, identification number, contact number, email and address for new patient records creation.
2. Enter the details of receptionist personal information, such as name, identification number, contact number and address for new records creation.
3. Enter the details of dentist personal information, such as name, identification number, contact number and address for new records creation.
4. Enter the details of dental appointment booking with specifying date and time.
5. Enter the details of the patient's dental condition.
6. Enter the payment details according to the patient's treatment and dates.

Data Update/Delete

1. Update/Delete the details of the patient's information.
2. Update/Delete the details of receptionist's information.
3. Update/Delete the details of dentist's information.
4. Update/Delete the details of the patient's appointment booking schedule.
5. Update/Delete the status of the patient's dental records.
6. Update/Delete the availability of time slots of each dentist or staff.
7. Update/Delete the cosmetic dental services provided in the clinic.
8. Update/Delete the payment status referring to the patient's treatment and date.

Data Queries

1. Display the list of patient's information.
2. Display the list of dentist's or staff's information.
3. Display the patient's past and upcoming appointment booking schedule.
4. Display the patient's dental records history.
5. Display the attendance list of each dentist or staff.
6. Display the availability of time slots for dentist appointments.
7. Display the availability of time slots of each dentist availability's schedule
8. Display the associated fees based on the selected cosmetic dental services.
9. Identify and display the status of total unpaid fees according to the patient's treatment and dates.

10. Identify and display the status of total paid fees referring to the patient's treatment and dates.

11. Display the dental treatment bills receipt or invoice.

4.0 Database Conceptual Design

4.1 Conceptual ERD
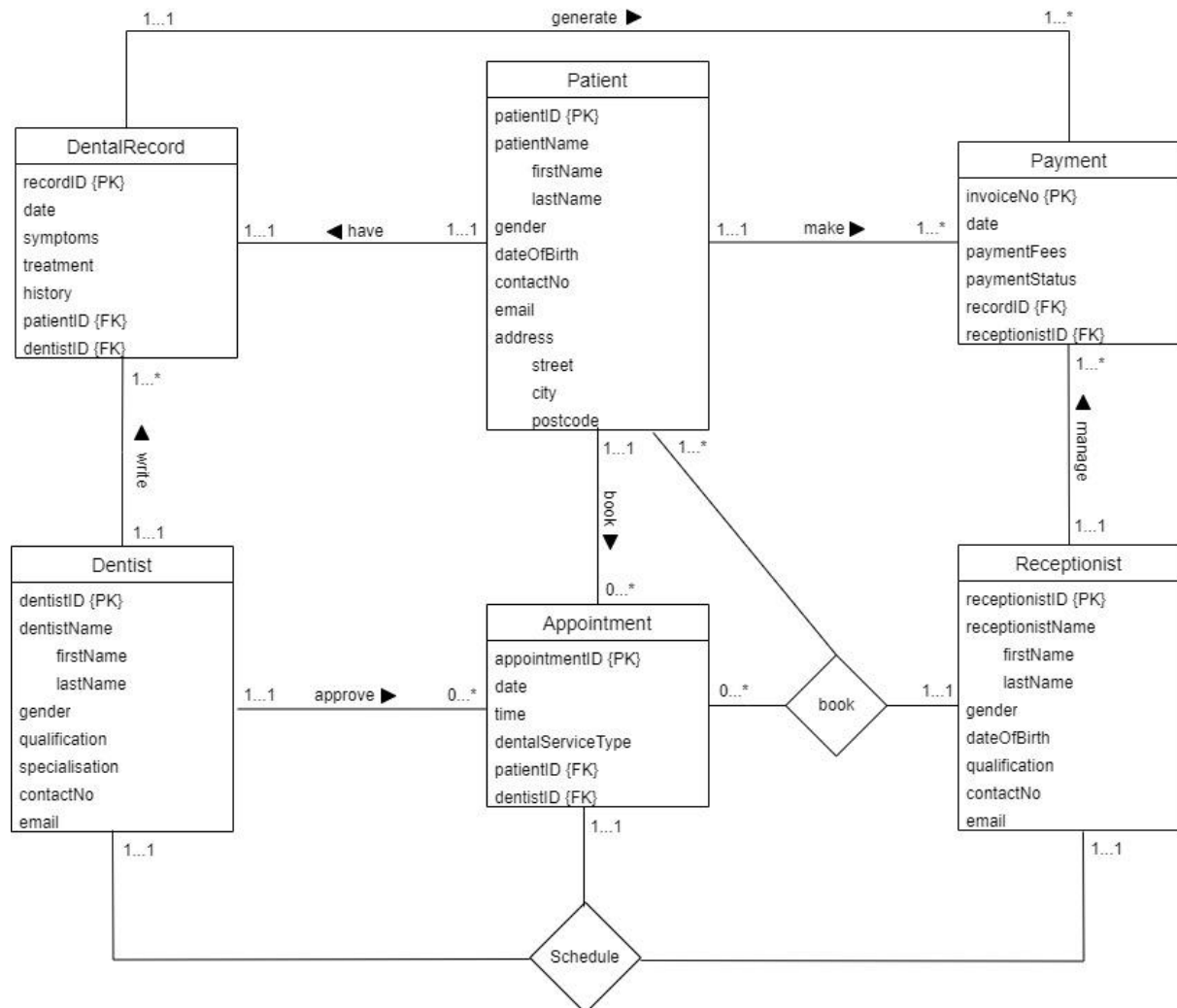
4.2 Enhanced ERD (EERD)
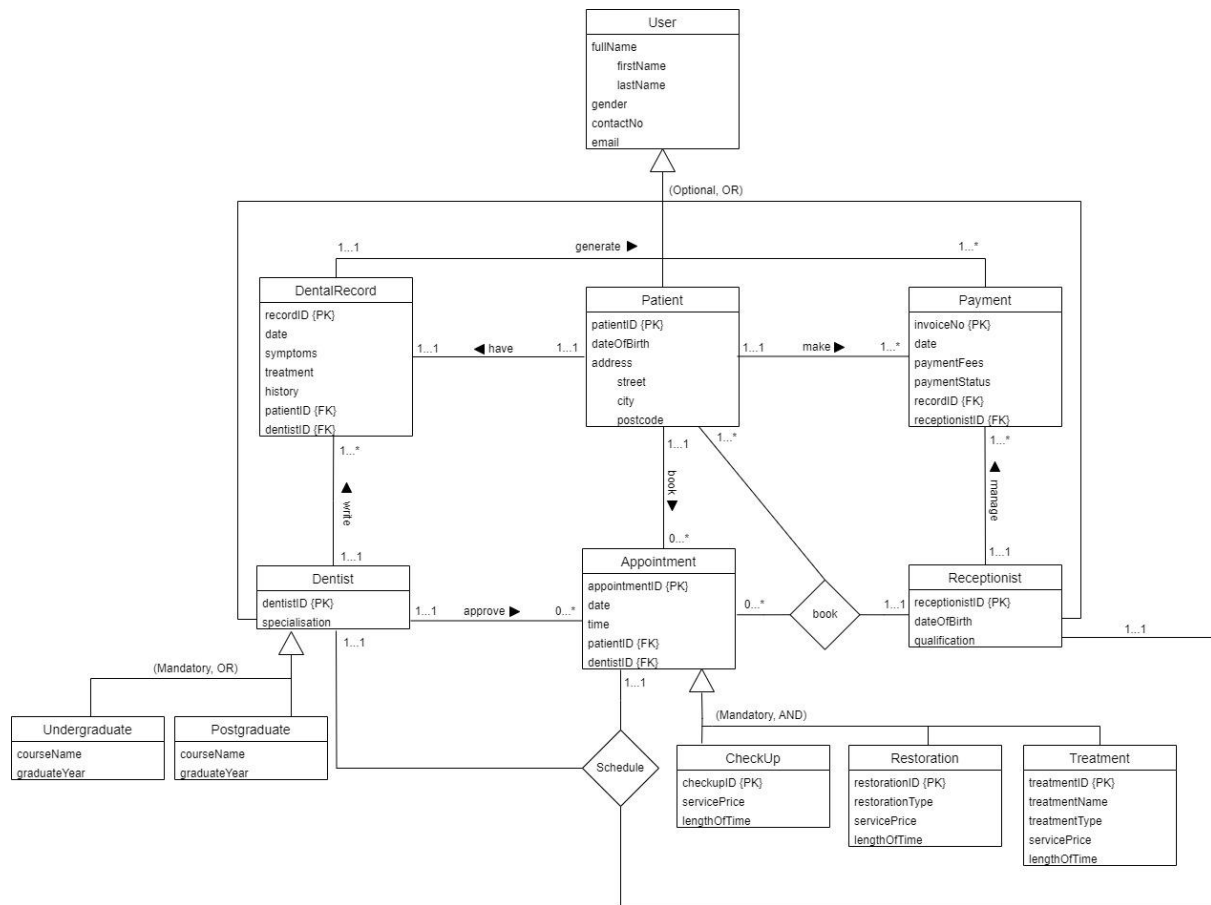
5.0 Data Dictionary

5.1 Description of Entity

Entity	Description	Occurrence
Patient	Patient's information	Patients make appointments then record in dental records and make payment based on the dental record.
Appointment	Appointment's information	Appointment booked by receptionist and approved by dentist.
DentalRecord	Dental record's information	Dental records written by dentists which include patient information and generate payment.
Dentist	Dentist's information	Dentists approve appointments and write dental records.
Receptionist	Receptionist's information	Receptionists book appointments and manage payment.
Payment	Payment's information	Payment generated by dental record and made by patient.

5.2 Description of Relationship

Entity	Multiplicity	Relationship	Multiplicity	Entity
Patient	1…1	Book	0…*	Appointment
	1…1	Have	1…1	DentalRecord
	1…1	Make	1…*	Payment
DentalRecord	1…1	Generate	1…*	Payment
Dentist	1…1	Approve	0…*	Appointment
	1…1	Write	1…*	DentalRecord
Receptionist	1…1	Book	1…*	Appointment
	1…1	Manage	1…*	Payment

5.3 Description Attributes

Entity	Attributes	Description	Data Type	Null	Multi-Valued
Patient	patientID	Uniquely identify a patient (PK)	VARCHAR2(10)	No	No
	patientName	Name of patient	VARCHAR2(50)	No	No
	firstName	First name of patient	VARCHAR2(30)	No	No
	lastName	Last name of patient	VARCHAR2(30)	No	No
	gender	Gender of patient	VARCHAR2(6)	No	No
	dateOfBirth	Date of birth of patient	DATE	No	No
	contactNo	Contact number of patient	VARCHAR2(13)	No	Yes
	email	Email address of patient	VARCHAR	Yes	No
	address	Address of patient	VARCHAR2(45)	Yes	No
	street	Street address of patient	VARCHAR2(15)	Yes	No
	city	City address of patient	VARCHAR2(15)	Yes	No
	postcode	Postcode address of patient	VARCHAR2(5)	Yes	No
Appointment	appointmentID	Uniquely identify an appointment (PK)	VARCHAR2(10)	No	No
	date	Date of appointment	DATE	No	No
	time	Time of appointment	TIMESTAMP	No	No
	dentalServiceType	Type of dental service	VARCHAR2(20)	No	No
	patientID	Foreign key of Patient which uniquely identify a patient (FK)	VARCHAR2(10)	No	No
	dentistID	Foreign key of Dentist which uniquely identify a dentist (FK)	VARCHAR2(10)	No	No
DentalRecord	recordID	Uniquely identify a dental record (PK)	VARCHAR2(10)	No	No
	date	Date of dental record	TIMESTAMP	No	No
	symptoms	symptoms of patient	VARCHAR2(20)	Yes	Yes
	treatment	treatment of patient	VARCHAR2(20)	Yes	Yes

	history	history dental record	VARCHAR2(50)	Yes	Yes
	patientID	Foreign key of Patient which uniquely identify a patient (FK)	VARCHAR2(10)	No	No
	dentistID	Foreign key of Dentist which uniquely identify a dentist (FK)	VARCHAR2(10)	No	No
Dentist	dentistID	Uniquely identify a dentist (PK)	VARCHAR2(10)	No	No
	dentistName	Name of dentist	VARCHAR2(50)	No	No
	firstName	First name of dentist	VARCHAR2(30)	No	No
	lastName	Last name of dentist	VARCHAR2(30)	No	No
	gender	Gender of dentist	VARCHAR2(6)	No	No
	qualification	Qualification of dentist	VARCHAR2(10)	No	No
	specialisation	Specialization of dentist	VARCHAR2(10)	No	No
	contactNo	Contact number of dentist	VARCHAR2(13)	No	Yes
	email	Email of dentist	VARCHAR	No	No
Receptionist	receptionistID	Uniquely identify a receptionist (PK)	VARCHAR2(10)	No	No
	receptionistName	Name of receptionist	VARCHAR2(50)	No	No
	firstName	First name of receptionist	VARCHAR2(30)	No	No
	lastName	Last name of receptionist	VARCHAR2(30)	No	No
	gender	Gender of receptionist	VARCHAR2(6)	No	No
	dateOfBirth	Date of birth of receptionist	DATE	No	No
	qualification	Qualification of receptionist	VARCHAR2(10)	Yes	No
	contactNo	Contact number of receptionist	VARCHAR2(13)	No	No
	email	Email of receptionist	VARCHAR	No	Yes
Payment	invoiceNo	Uniquely identify once payment (PK)	VARCHAR2(10)	No	No
	date	Date of payment done	TIMESTAMP	No	No
	paymentFees	Total fee of payment	FLOAT(8)	No	No

	paymentStatus	Status of payment	VARCHAR2(20)	No	No
	recordID	Foreign key of DentalRecord which uniquely identify a dental record (FK)	VARCHAR2(10)	No	No
	receptionistID	Foreign key of Receptionist which uniquely identify a receptionist (FK)	VARCHAR2(10)	No	No

6.0 Summary

In this phase, our group has gained a deeper understanding of the foundation for dental appointment and rescheduling systems and know how it works by completing the database conceptual design. In this phase, we updated our business rules that will be proposed and the proposed data and transactional of this system. We also created the data flow diagram with context diagram, parent diagram and child diagram. A conceptual entity-relationship diagram, an enhanced ERD, and a data dictionary also created by us.

By creating the data flow diagrams, we clearly understand the intricate interactions between entities and processes, and the architecture of the system. We illustrate our design in detail in the parent diagram (level 0) and child diagrams (level 1), meticulously mapping out the processes of booking an appointment, checking an appointment, and scheduling an appointment.

Through the Data and Transaction Requirements, we have reinforced the complexity of our data management strategy, emphasizing the need for a robust system capable of dealing with patient absenteeism, operational inefficiencies, and inconvenient appointment management.

Conceptual ERD and Enhanced ERD presentations of key databases are the cornerstone of our program. By completing the ERD diagram, we refined the relationships between entities, which provided a blueprint for our database structure. The data dictionary served as a reference guide, ensuring clarity and consistency of terminology. In summary, this phase marked significant progress in transforming our project from conceptualization to an actual database structure, laid the foundation for subsequent development phases, and contributed to the overall success of our innovative dental appointment and rescheduling system.