UNIVERSITI TEKNOLOGI MARA

COLLEGE OF COMPUTING, INFORMATIC AND MATHEMATICS

UNIVERSITI TEKNOLOGI MARA CAWANGAN SELANGOR

KAMPUS PUNCAK PERDANA

ADVANCED DATABASE MANAGEMENT SYSTEM (IMS 560)

REPORT FOR

PAIR PROJECT ASSIGNMENT

TITLE CHOOSE:

ELDERLY CARE MANAGEMENT SYSTEM

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ACKNOWLEDGEMENT

We want to thank Dr. Mohd Ridwan bin Seman @ Kamarulzaman for helping us start and complete our elderly care management system project. His advice helped us design our research to explore how to protect sensitive elderly care data better.

Our school gave us valuable teaching and tools that helped us study and learn about crucial database management topics. Working with Dr. Mohd Ridwan has taught us valuable lessons and gotten us started well on our educational and work journey.

We value the input from our friends and academic community, as they helped us improve our project with useful suggestions. We thank everyone - those who helped us directly and those who were part of the process, for their effort in making our work come to life.

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1.0 INTRODUCTION

Our Elderly Care Management System does two things: Our care management system both makes it easier to deliver elder care and helps make it better. The growth rate of senior citizens is accelerating as humans live longer. According to the World Health Organization, by 2050 we will have almost twice as many people over 60, and we need advanced solutions to care for these people well (WHO, 2021). The service pulls together several useful tools in one place, enabling health workers and caregivers to manage both daily care routines and medical visits for seniors. Our focus is to improve care by having computers take care of routine tasks and send reminders to caregivers about important meetings, so they can help more seniors during this growing population.

2.0 FINDINGS

We built our system to fix three main problems in elderly care places: Our system fixed three healthcare issues: ensuring proper medication use, booking visits correctly, and providing immediate assistance. Delays and incorrect medical care happen because systems that care for the elderly don't exchange information with each other. Our Elderly Care Management System tackles these issues by bringing all caregivers onto one easy-to-use platform that simplifies communication and info exchange.

3.0 DATABASE OBJECTIVES

The main purpose of the database inside the Elderly Care Management System is to keep and structure all important information needed to care for older people. The database stores individual information, keeps track of their medical records, shows daily routines, and holds family contact numbers and the names of health professionals. The database makes sure all important information added to it is simple to find and change in real time, to help medical staff make quick and fitting choices about care.

4.0 ERD

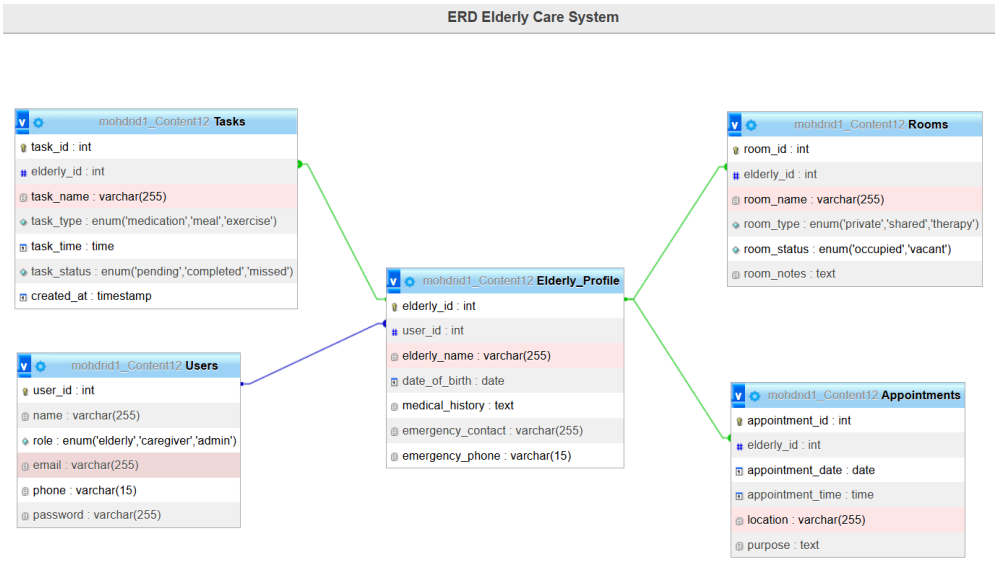

Figure 1: ERD Elderly Care Management System

The ERD visually explains how elderly profiles, users, appointments, tasks, and room data connect within our database. The ERD gives us details about how data stays correct and works more efficiently based on how things inside the database relate to each other. The ERD lets people working on or running the system talk better and work together more easily because it shows how data moves from one place to another.

Overview of each entity:

1. **Users:** This table holds details about each user, including caregivers and administrators, capturing their roles, contact information, and login credentials.
2. **Elderly Profile:** Dedicated to storing detailed information about the elderly individuals, such as their medical conditions, emergency contacts, and date of birth.
3. **Tasks:** Focuses on daily activities and medications, detailing the times and types of each task assigned to an elderly individual.
4. **Appointments:** Manages all medical and non-medical appointments, storing details about the time, date, and purpose of each appointment.
5. **Rooms:** Tracks information about the living arrangements within a care facility, including room status and type.

5.0 DATA DICTIONARIES

The data dictionaries, although nothing else but a type of metadata repository, are used frequently in database management to organize and explain details and rules together with which the database contains the data. These are just hints about the structure, relationships within a system and how data will be represented within a system.

For the Elderly Care Management System, the detailed breakdown of the tables, their attributes, primary keys (PK), foreign keys (FK), and relationships can be organized as follows:

5.1 List of Tables

1. Users
2. Elderly Profile
3. Tasks
4. Appointments
5. Rooms

5.2 List of Attributes

- **Users**
  - user_id
  - name
  - role
  - email
  - phone
  - password

- **Elderly Profile**
  - elderly_id
  - user_id
  - date_of_birth
  - medical_history
  - emergency_contact
  - emergency_phone

➢ **Tasks**

- task_id
- elderly_id
- task_name
- task_type
- task_time
- task_status
- created_at

➢ **Appointments**

- appointment_id
- elderly_id
- appointment_date
- appointment_time
- location
- purpose

➢ **Rooms**

- room_id
- elderly_id
- room_name
- room_type
- room_status
- room_notes

5.3 List of Primary Keys and Foreign Keys

- **Primary Keys (PK)**
  - Users: user_id
  - Elderly Profile: elderly_id
  - Tasks: task_id
  - Appointments: appointment_id
  - Rooms: room_id

- **Foreign Keys (FK)**
  - Elderly Profile: user_id (References Users.user_id)
  - Tasks: elderly_id (References Elderly Profile.elderly_id)

- Appointments: elderly_id (References Elderly Profile.elderly_id)
- Rooms: elderly_id (References Elderly Profile.elderly_id)

5.4 List of Relationships

- **Users ↔ Elderly Profile:**
  One-to-One: *Each user can have one elderly profile.*
- **Elderly Profile ↔ Tasks:**
  One-to-Many: *Each elderly profile can have multiple tasks.*
- **Elderly Profile ↔ Appointments:**
  One-to-Many: *Each elderly profile can have multiple appointments.*
- **Elderly Profile ↔ Rooms:**
  One-to-One or One-to-Many: *Depending on whether the elderly individual has a private room or shares a room.*

These tables and their structured relationships form the backbone of the Elderly Care Management System, facilitating organized data management and efficient access to information critical for elderly care.

6.0 LIST OF SQL QUERIES

1. User Table

```sql
CREATE TABLE Users (
    user_id INT AUTO_INCREMENT PRIMARY KEY,
    name VARCHAR(255) NOT NULL,
    role ENUM('elderly', 'caregiver', 'admin') NOT NULL,
    email VARCHAR(255),
    phone VARCHAR(15),
    password VARCHAR(255) NOT NULL
);
```

Figure 2: SQL script for user table

2. Elderly Profile Table

```sql
CREATE TABLE Elderly_Profile (
    elderly_id INT AUTO_INCREMENT PRIMARY KEY,
    user_id INT NOT NULL,
    date_of_birth DATE NOT NULL,
    medical_history TEXT,
    emergency_contact VARCHAR(255),
    emergency_phone VARCHAR(15),
    FOREIGN KEY (user_id) REFERENCES Users(user_id)
);
```

Figure 3: SQL script for elderly profile table

3. Tasks Table

```sql
CREATE TABLE Tasks (
    task_id INT AUTO_INCREMENT PRIMARY KEY,
    elderly_id INT NOT NULL,
    task_name VARCHAR(255) NOT NULL,
    task_type ENUM('medication', 'meal', 'exercise'),
    task_time TIME NOT NULL,
    task_status ENUM('pending', 'completed', 'missed'),
    created_at TIMESTAMP DEFAULT CURRENT_TIMESTAMP,
    FOREIGN KEY (elderly_id) REFERENCES Elderly_Profile(elderly_id)
);
```

Figure 4: SQL script for tasks table

4. Appointments Table

```sql
CREATE TABLE Appointments (
    appointment_id INT AUTO_INCREMENT PRIMARY KEY,
    elderly_id INT NOT NULL,
    appointment_date DATE NOT NULL,
    appointment_time TIME NOT NULL,
    location VARCHAR(255),
    purpose TEXT,
    FOREIGN KEY (elderly_id) REFERENCES Elderly_Profile(elderly_id)
);
```

Figure 5: SQL script for appointments table

5. Rooms Table

```sql
CREATE TABLE Rooms (
    room_id INT AUTO_INCREMENT PRIMARY KEY,
    elderly_id INT NOT NULL,
    room_name VARCHAR(255),
    room_type ENUM('private', 'shared', 'therapy') NOT NULL,
    room_status ENUM('occupied', 'vacant') NOT NULL,
    room_notes TEXT,
    FOREIGN KEY (elderly_id) REFERENCES Elderly_Profile(elderly_id)
);
```

Figure 6: SQL script for rooms table

The key tools for the Elderly Care Management System are the right SQL queries to handle the robust data management and conversation in the database. With these queries flowing smoothly through, the system runs smoothly and efficiently albeit with these queries processing tasks such as creating tables, inserting records, updating, etc. By keeping elderly care neat and precise, they help caregivers and administrators keep every bit of care: organized, to hand, medication schedules, appointments. It is obvious that in the light of this first point we emphasize the proper use of those SQL queries because by this way we are increasing the system reliability and bringing the system to higher performance so it's important for the proper production of high quality care for the elderly patients. It also expresses the overall system objective of providing help to support elderly care usage of advanced databases and operation.

7.0 ACID(ATOMICITY, CONSISTENCY, ISOLATION, & DURABILITY)

On the Elderly Care Management System, this specially Atomicity, Consistency, Isolation and Durability (ACID) are core to the way all transactions with the database are processed safely and securely in the presence of high sensitive and critical information of elderly care.

Atomicity means that transactions are made up of single units — either succeed with everything or not at all. For the Elderly Care Management System, this would mean that any operation that updates a medication schedule, or adds new appointment details, would have to be completed as a total operation to avoid potential care errors through partial updates. As one example, atomicity means that if someone tries (and is able) to update the time and dosage of some medication in the database, they are going to update both. Since the role of medication data is to maintain integrity, if one part fails, the transaction rolls back as a whole.

Data types are predefined and constraints guaranteed all from one valid state to another, every transaction lies out all rules and defined constraints. In this system, consistency checks would need to be any data the user enters (dates and times), and relational constraints (e.g. the task belongs to a valid elderly profile). It stops bad data entry which would lead to scheduling errors, or an incorrect administration of the wrong medication, and protects the well being of the elderly.

The isolation allows concurrent transactions to be isolated, so co transaction do not interfere and the intermediate state of one transaction is not visible to the other transaction. This is critical, in an environment where data can be modified by multiple caregivers and simultaneously read by each subject. Isolation is an example: It allows two caregivers to update different parts of an elderly person's daily schedule at the same time, so they don't clash. Overlapping and contradictory care tasks between different family caregivers wouldn’t overlap.

Durability means that committing a transaction allows you to assume that it’s still committed, even in the event of a system failure (crash or power loss). This is important to consider, particularly in the context of the Elder Care Management System, where in case of the loss of recent transactions (e.g. newly scheduled appointment or updated emergency contact), dependent oversights can be of highly critical nature regarding provision of care. All changes are stored durably in the storage of the system, before the transaction is considered to be complete.

The ACID properties are used to guarantee the data integrity and consistency and used as a framework in which to implement the elderly care management system. The complexity of elderly care hugely depends on accurate and reliable data for taking appropriate decisions at the right time and right place. If these principles are followed the

system will be able to control the complexity of the elderly care. By applying ACID principles to elderly care, high quality services and high levels of trust, that have proven fundamental for health care, can be run.

8.0 DATA SECURITY & PRIMARY

Now in the digital era, protection of sensitive data is more necessary than ever, especially in the sector handling user data, personal health information. However, the Elderly Care Management System, that takes care of a lot of personal data of elderly people, such as personal coordinates, medical records, and care hours. This system has no less of a technical obligation and fundamental ethical obligation to ensure robust data security and privacy.

8.1 Importance of Data Security and Privacy

This is Elderly Care Management System that stores and processes elderly people's personal and medical data. It's really sensitive information, if the wrong person got in their hands they would have a lot of that information that they can misuse. This means that the security and privacy of this data has to be so stringent so that we have no one unauthorized, no one who breached nor no one that misused this data. Enough cannot be so badly that the data is not kept secure as what would happen to the wrong things happening identity theft, privacy violation and everything or nothing according to wrong decisions made from the corrupted data until the integrity.

8.2 Core Security Measures

- **Encryption:** Encryption is one of the first data breach defense lines. Data that has been encrypted is changed into a format that is safe for delivery, and from which you can only read or process the data again when you have the key to decrypt it. In Elderly Care Management System we encrypt both the data at rest and data in transit making the data less vulnerable.
- **Access Control:** It offers also the extra protection that the strong access control mechanisms offer for sensitive information. We just have to define the requirement of who should be allowed to read or change a given data inside the system and enforce it. Role based access protocols are almost always used to control access and determine a user's rights due to the role and necessity. For instance, this also leaves it up so caregivers get their access only to medical schedules and their telephone numbers while the system

administrators may get their access to other things also.broader access that includes configuring system settings.

- **Monitoring and Audits:** Unauthorized access, or abnormal behaviour, must be continuously monitored. Regularly, security auditing and monitoring protocols throughout the system are being done in order to monitor and respond quickly when there are probable security threats. That helps the environment by pinpointing and fixing a security breach on the spot.
- **Authentication:** The strong authentication verifies the user identity before granting it access into the system. It keeps unauthorized access away. For securing the Embedded Elderly Care Management System and to only allow the current users to view the protected data, multiple ways of authentication such as passwords, biometrics or two factor authentication is used.

8.3 Privacy Practices

- **Data Minimization:** The principle of data minimization is adhered to strictly within the system. By collecting only the data necessary for the purposes of providing care, the system reduces the risk of exposure in the event of a data breach.
- **Transparency:** Transparency is maintained with users about how their data is collected, used, and shared. Privacy policies and user agreements clearly outline these practices, ensuring users are informed and their data is handled in compliance with legal standards.
- **User Access and Correction:** The system provides mechanisms for users or their authorized representatives to access their data and correct any inaccuracies. This not only helps in maintaining data accuracy but also fosters trust between the users and the system.

But the function of Elderly Care Management System heavily depends on the successful implementation of a comprehensive system of data security and privacy. These are not just not technically, these are the very measures that dictate how the care is done ethically. Regarding using elderly people's data, it respects dignity and privacy sealing and preservation as well as making use of advanced security protocols and privacy practices that fight off threats to their data. The Elderly Care Management System needs to be secured with data, this means Elderly Care Management System should be committed to elderly care with safe and respectful elderly care.

9.0 CONCLUSION

The application of technology to elder care is a big step, since the Elderly Care Management System does just that. However, in this project under the guidance of Dr. Mohd Ridwan bin Seman @ Kamarulzaman, we are able to apply our theoretical knowledge of advanced database systems in the study of data security and privacy in healthcare settings.

Building this database system we have put in a lot of time and work to make it resilient and keep precious information safe and private. Additionally, this system is made to ACID principles although it utilizes settings with encryption, controlled access and strong authentication methods which demonstrate a proactive data protection. We also follow best practices and regulatory standards as we do alongside referring best practices when it comes to managing privacy practices like limiting data collection, acting transparently and guaranteeing users' rights of accessing and correcting information.

The Elderly Care Management System also is well conceived and it will greatly assist in managing and providing care for elderly patients in a vastly richer and comprehensive manner. The core of essential healthcare process has been automated and it is tackling medicine management and schedule of appointment to monitor it 24 hours a day, to minimize human error and maintain operation in the best efficient way. This also means that the system is accessible for any user from any technical background, thanks to the portable interface tool.

This project wrapped up by achieving academic goals and established a framework for future healthcare technology development. The results presented here are an important contribution towards extending further discussions and further advances in healthcare database systems. We thank Dr. Mohd Ridwan when we had gained incredible mentorship, as well as any people that helped us brought this project to life.

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