Addis Ababa Science and Technology University

College of Electrical and Mechanical Engineering

Department of Software Engineering

Fundamentals of Database Systems

PHARMACEUTICAL SYSTEM

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Introduction

There might be a lot of pharmaceutical systems in the world and ours template might be insignificant but it makes it easy to store records of each data with its Manufacturer's trademark and also helps for the pharmacist to understand whether the drug is harmful or not by seeing the trademark of it's manufacturer. So this database can help a lot of patients retain their health without worrying about the medicine that they're taking and also helps the physician to give proper health care for his patient.

So now since the main concern is identified we can go and start the life cycle of the database development.

Planning

This Pharmaceutical Management system uses sophisticated database technologies to create, handle and maintain the various types of the data that are entered into the system.

So in the planning process we need to specify the type of DBMS(Database Management Software) software that we're going to use and for this project we have chosen MySQL because its really simple but yet sophisticated systems that can really help so much in the data definition and data manipulation methods.

Requirements

Since this system is a database system the major requirement it needs is data itself so for that purpose we're going to insert some typical simple records to show and represent how the system works. It also needs a specific DBMS to do all the functions such as inserting data, deleting data and inserting data.

Contributors

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Database Description

So now for the description we can state some of the entities or structures that are to be implemented into the database and we have to describe the properties(attribute) of each structure.

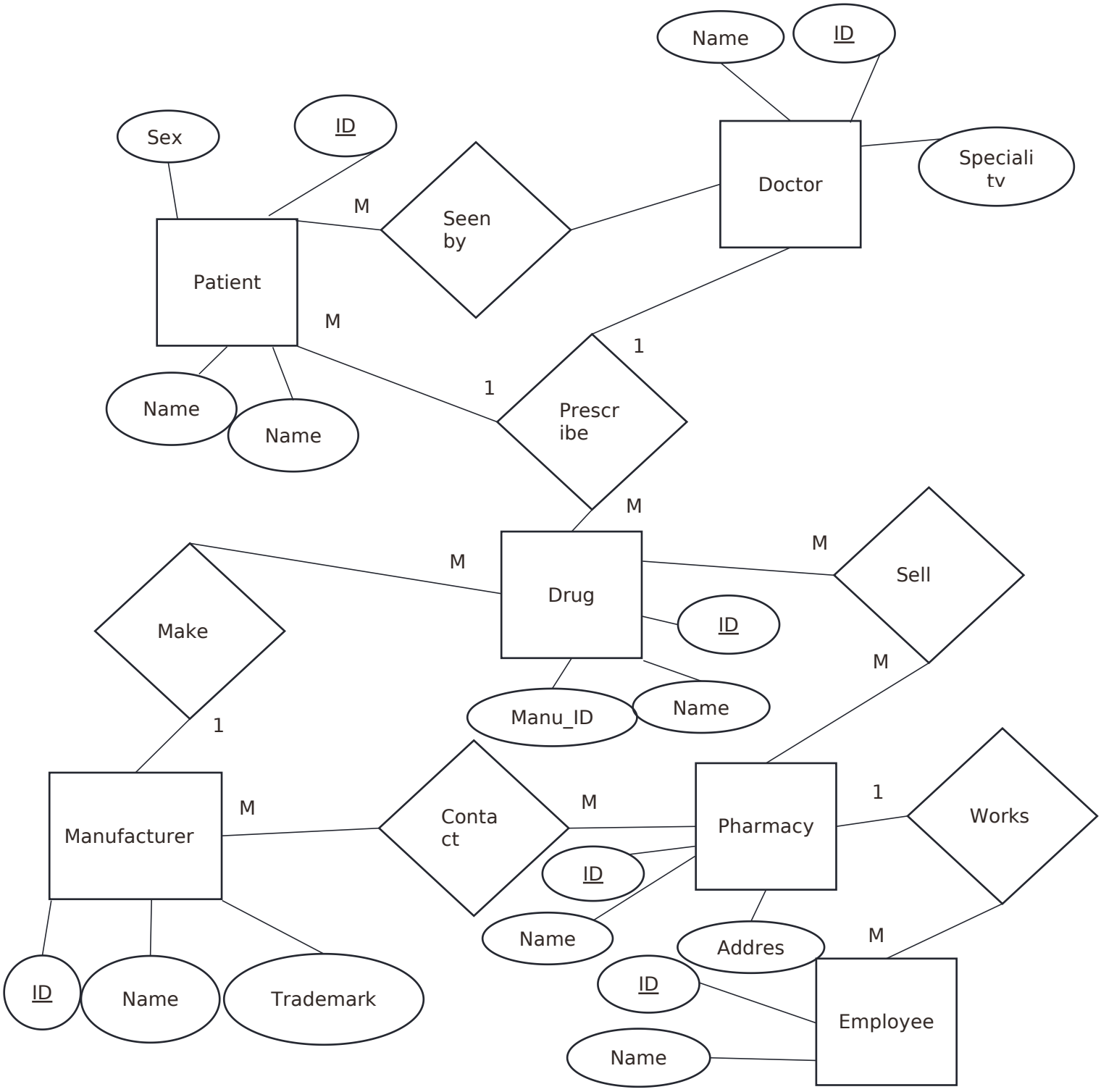
1. Drug
   This structure must have an ID, name, description, Ex. Date and Manufacturer.
2. Pharmacy
   This structure is the connecting structure of different other structures and it must contain an ID, name, Address and Supplier.
3. Manufacturer
   This structure is the core because without this none of them will cease to exist. It contains some of the properties Like the ID, Name and the location
4. Patient
   This structure is not that really significant to the system but it needs to be implemented to understand the whole database system. It contains ID, Name and Address of the Patient
5. Physician
   This structure is needs to be implemented because the physician(doctor) needs to prescribe the drug and that’s linked to the prescription structure.
6. Prescription
   The central structure which is linked to three of the other structures including Drug, Patient and Physician. It helps us to understand how the whole system can function by going through all those processes.

Design

The design processes in the development of database are classified into three: Conceptual Design, Logical Design and Physical Design which we will explain and construct each of these designs in the following chapters.

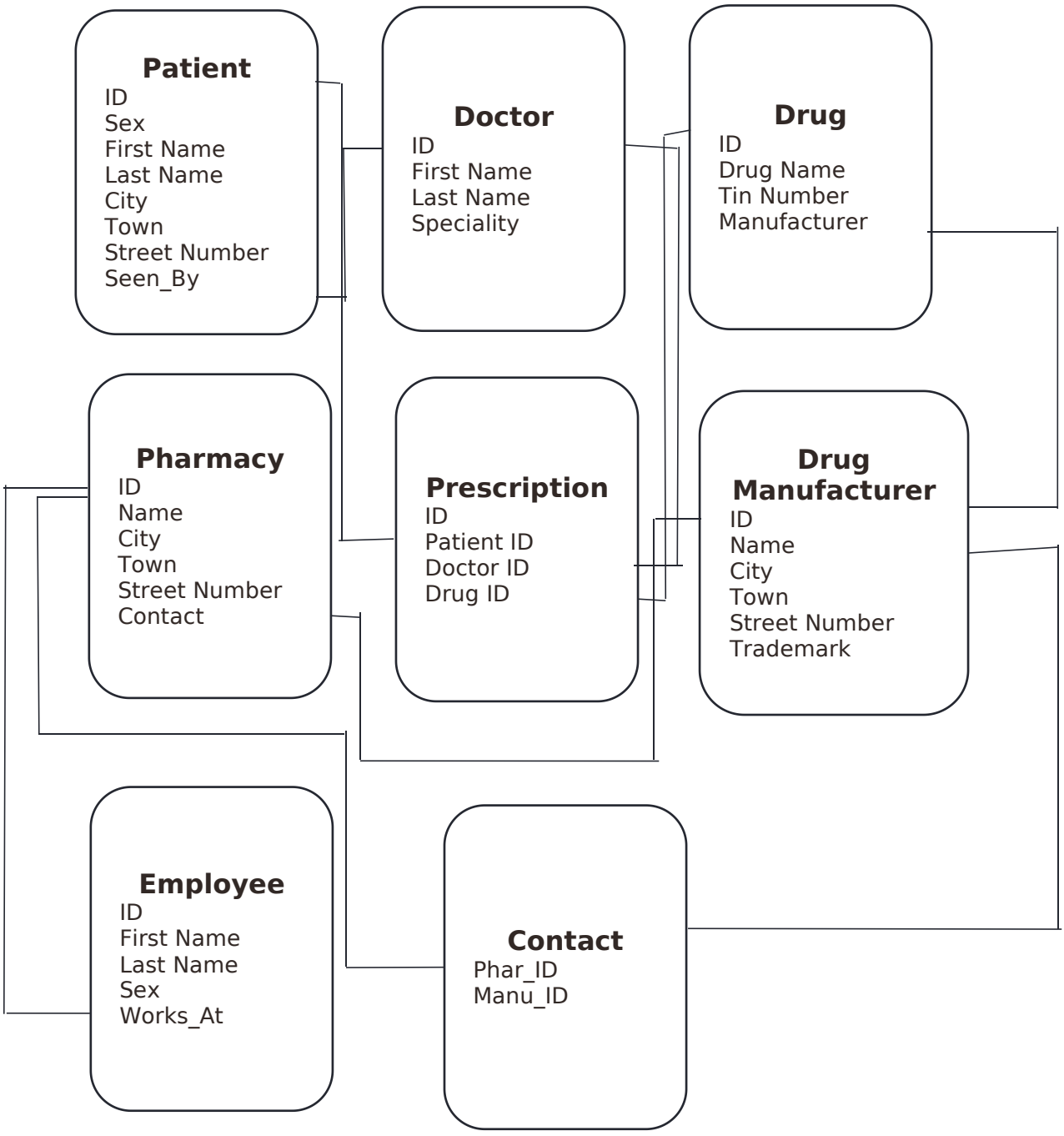
Conceptual Design

Conceptual Design is an important part of design process in any kind of project. It helps the developer to visualize his work before putting all the work. So in a database in order to do that one must follow certain rules. There are several components in the conceptual design and each of them are represented by using their own shape. Like for an entity we use a rectangle, for an attribute we use circle, and for a relationship we use a rhombus. Therefore we have designed our conceptual design of the project down below.



Logical Design

Now logical design in a database is a more realistic view of the conceptual design. It shows how the tables(entities) of the database are represented on the database with their attributes independent of the DBMS. It still shows the relationships with the tables, not with a rhombus but just by connecting the relating columns.



Normalization

Normalization is a technique used in database development and its used to eliminate data redundancy and unwanted behaviors like insertion anomalies, modification anomalies and update anomalies. Since our tables(entities) are so much related there we only presented the fully normalized forms by converting the composite attributes into atomic attributes.

Data Dependency: two data items A and B are said to be in a determinant or dependent relationship if certain values of data item B always appears with certain values of data item A

So in the process in normalization we have three different forms:

1. First Normal Form(1NF)
   Making sure that all column values are atomic.

So we have our table to normalize down below:

P_ID	P_Name	P_Sex	P_Address	D_ID	D_Name	Speciality	P_Seen_By
78	Abebe Tebebu	M	AA, Bole, 3345	90	Abera Mola	Surgeon, Pediatric	90

1NF:

P_ID	P_First	P_Last	P_Sex	City	Town	Street_Number	D_ID	D_First_Name	D_Last_Name	Speciality	P_Seen_By
78	Abebe	Tebebu	M	AA	Bole	3345	90	Abera	Mola	Surgeon	90
78	Abebe	Tebebu	M	AA	Bole	3345	90	Abera	Mola	Pediatric	90

2. Second Normal Form(2NF)
   So in this normal form no partial dependency of a non-key attribute on part of the primary key.

2NF:

P_ID	P_First	P_Last	P_Sex	City	Town	Street_Number
78	Abebe	Tebebu	M	AA	Bole	3345

D_ID	D_First	D_Last	Speciality	Seen_By
90	Abera	Mola	Surgeon	90
90	Abera	Mola	Pediatric	90

3. Third Normal Form(3NF)

So at last in the fully normalized form(third form) we eliminate columns dependant on another non-primary key.

P_ID	P_First	P_Last	P_Sex	City	Town	Street_Number	Seen_By(FK)
78	Abebe	Tebebu	M	AA	Bole	3345	90

D_ID	D_First	D_Last	Speciality
90	Abera	Mola	Surgeon
90	Abera	Mola	Pediatric

As you can see this relation has no transitional dependency and all column reference in referenced data that are not dependent on the primary key are removed.

Physical Design

So a physical design is just an upgrade of the logical design rather it is the most realistic design of the database life cycle. It is specific on the particular DBMS. So based on the above logical design here is the SQL code implementation of the tables shown above.

```
CREATE TABLE IF NOT EXISTS DOCTOR (
    ID int(11) not null AUTO_INCREMENT PRIMARY KEY,
    First_name text(256) not null,
    last_name text(256) not null,
    Speciality varchar(256) not null
);

CREATE TABLE IF NOT EXISTS MANUFACTURER (
    ID int(11) not null AUTO_INCREMENT PRIMARY KEY,
    Name varchar(256) not null,
    City text(256) not null,
    Town text(256) not null,
    Street_number int(11) not null,
    Trademark varchar(256) not null
);

CREATE TABLE IF NOT EXISTS PATIENT (
    ID int(11) not null AUTO_INCREMENT PRIMARY KEY,
    First_name text(256) not null,
    Last_name text(256) not null,
    City text(256) not null,
    Town text(256) not null,
    Street_number int(11) not null,
    Seen_by int(11),
```

```
    FOREIGN KEY(Seen_by) REFERENCES DOCTOR(ID)
);

CREATE TABLE IF NOT EXISTS DRUG (
    ID int(11) not null AUTO_INCREMENT PRIMARY KEY,
    Name varchar(256) not null,
    Tin_number varchar(256) not null,
    Man_ID int(11),
    FOREIGN KEY (Man_ID) REFERENCES MANUFACTURER(ID)
);

CREATE TABLE IF NOT EXISTS PHARMACY (
    ID int(11) not null AUTO_INCREMENT PRIMARY KEY,
    Name varchar(256) not null,
    City text(256) not null,
    Town text(256) not null,
    Street_number int(11) not null,
    Contact int(11),
    FOREIGN KEY (Contact) REFERENCES MANUFACTURER(ID)
);

CREATE TABLE IF NOT EXISTS PRESCRIPTION (
    ID int(11) not null AUTO_INCREMENT PRIMARY KEY,
    Drug_ID int(11),
    Doctor_ID int(11),
    Patient_ID int(11),
    FOREIGN KEY (Drug_ID) REFERENCES DRUG(ID),
    FOREIGN KEY (Doctor_ID) REFERENCES DOCTOR(ID),
    FOREIGN KEY (Patient_ID) REFERENCES PATIENT(ID)
);


CREATE TABLE IF NOT EXISTS EMPLOYEE (
    ID int(11) not null AUTO_INCREMENT PRIMARY KEY,
    First_name text(256) not null,
    Last_name text(256) not null,
    Sex char not null,
    Works_at int(11),
    FOREIGN KEY (Works_at) REFERENCES PHARMACY(ID)
);

CREATE TABLE IF NOT EXISTS CONTACT (
    ID int(11) not null AUTO_INCREMENT PRIMARY KEY,
    Phar_ID int(11) not null,
    Manu_ID int(11),
    FOREIGN KEY (Phar_ID) REFERENCES PHARMACY(ID),
    FOREIGN KEY (Manu_ID) REFERENCES MANUFACTURER(ID)
);

INSERT INTO DOCTOR (First_name, last_name, Speciality) VALUES ("Samuel",
"Amsalu", "Neourosurgeon");

INSERT INTO MANUFACTURER (Name, City, Town, Street_number, Trademark)
VALUES ("Edge Medicine", "AA", "Bole", 4456, "EM");
```

INSERT INTO PATIENT (First_name, Last_name, City, Town, Street_number, Seen_by) VALUES ("Omer", "Abdu", "Harar", "Oromiya", 1384, 1);

INSERT INTO PHARMACY (Name, City, Town, Street_number, Contact) VALUES ("Aksum", "AA", "Kolfe", 1445, 1);

INSERT INTO DRUG (name, Tin_number, Man_ID) VALUES ("Diclopheniac", "1223", 1);

INSERT INTO EMPLOYEE (First_name, Last_name, Sex, Works_at) VALUES ("Robanus", "Tadele", "M", 1);

INSERT INTO PRESCRITPTION (Drug_ID, Doctor_ID, Patient_ID) VALUES (1, 1, 1);

Summary

This project is done to show how to implement databases and how the organization of data is made on a specific environment, in which in our case we used the Pharmacy. This project is a template for other environment.

In this project we tried to show the different methods of implementations of the database and also tried to show the basic life cycle of database development. We also have intentions to maximize our project into a more interactive level.

In the description on the project its mentioned its done as a prototype of pharmaceutical industry maintenance including from Drugs up to patients. Even if its such a small portion of the medical system it can bring in a significant difference in the medical community.

Reference

In this project we have used several resources like articles, videos and PDFs. But we have mentioned some of them who were useful for us:

- Robert K. Flagalen Pharmaceutical Organization in the modern world
- Elvis Richie: Medicine for Everyone 2nd Edition
- 2013 Outlined US Medical View