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1.Introduction

This report explains and shows how relational database systems are implemented using Microsoft Access. Database systems are widely used in organisations to manage and store data efficiently, as a result of data systems, errors from manual systems are reduced[2].

This system is built in order to replace manual processes with a digital solution that is able to manage medicines, suppliers, customers, prescriptions and sales transactions more efficiently.

Currently the pharmacy manages it's data manually which can lead to inefficiencies and errors.

This report will show this database improves accuracy and reduce error in order to support better decision making. This report will describe the design process, implementation, and evaluation of the system.

2.Scenario Analysis

The MediLink pharmacy a database to manage key information related to it's operations. The database has been designed to help with managing the pharmacy's daily operations. Currently, information such as medicines, suppliers, customers, prescription and sales is handled manually, which can cause unnecessary error and mistakes. In database designs things such as identifying entities, attributes and relationships are very important in order for the system to reflect real world operations.

A relational database structures ensures that data organisation is improved [1]. The new system is able to store everything in one place. It allows easy organisation, updating and information accessing.

3. Entity-Relationship Diagram (ERD)

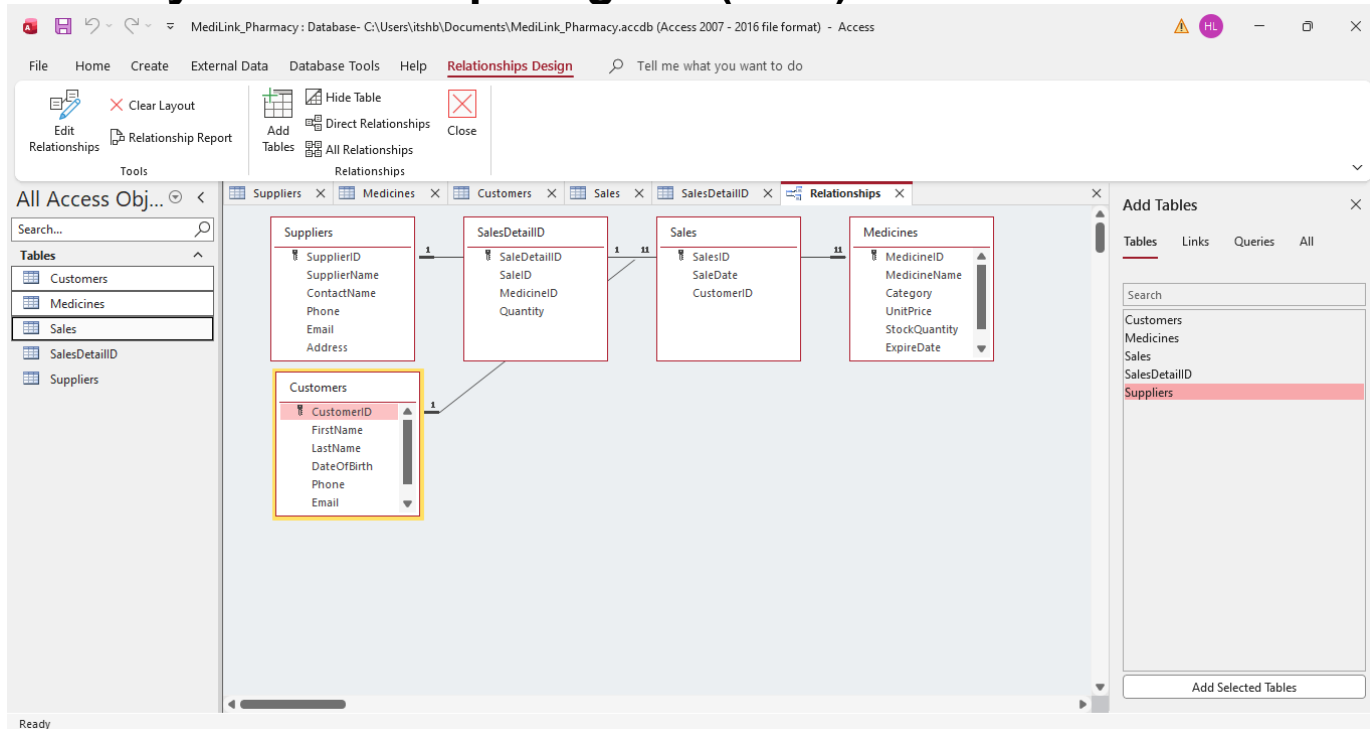


Figure 1: Entity Relationship Diagram showing how the tables are connected

Entity Relationship Diagram – (ERD) are a visual representation of how data is structured and how different entities are related. They assist in planning the database before implementation [5]. The diagram above shows the MediLink Pharmacy database tables and how they are connected and structured. The table includes: Suppliers, Medicines, Customers, Sales and SaleDetails.

Each entity includes a primary key to uniquely identify the records mentioned above. Foreign keys are used to create relationships between tables. For example: Supplier ID in the medicines table.

The relationships between different entity are defined. For example: One customer can make many sales and each sale is able to contain multiple medicines through the sales detail table. Therefore, data integrity is maintained.

4. Data structure Development

The database structure was developed in Microsoft Access based on the ERD. Several tables were created to store different types of data. Each table provides appropriate data. For example: number and currency data types were used for price and quantities where as text data types were used for names and contact details.

Relational databases use tables, primary keys, and foreign keys to not only maintain data consistent but relationships as well. This ensures that data is organised and can be accessed efficiently [1].

Each entity that is identified was created as a separate table so that proper organisation is ensured. Primary keys were assigned for the unique identification of each record in the tables. These include: SupplierID, MedicineID, CustomerID, SaleID, and SaledetailID. Furthermore Foreign keys were used to establish relationships between tables in order to ensure that data is connected correctly and improving data consistency.

5. Normalization Compliance

Normalisation is used to organise data efficiently by removing redundancy and ensuring data integrity. The use of 1NF, 2NF AND 3NF help eliminate duplication and maintain consistency [4]. The database was normalised to the Third Normal Form(3NF). This means that each table only contains related data and there are no duplicates.

In the First Normal Form(1NF), all the tables were structures so that groups were not repeated and each field could contain atomic value. A primary was used to identify each record.

In the Second Normal Form(2NF). Any Partial dependencies were removed so that all non key attributes are dependent on the primary key. This means data organisation is improved and redundancy is reduced. For example: data such as: Suppliers and Medicine was separated into different tables so that duplication is avoided

In the Third Normal Form(3NF), Any transitive dependencies were eliminated. This ensures dependency only on the primary key and not other attributes. This reduces the risk of anomalies.

6. Sample Data Population

MediLink_Pharmacy : Database- C:\Users\itshb\Documents\MediLink_Pharmacy.accdb (Access 2007 - 2016 file format) - Access

File Home Create External Data Database Tools Help Table Fields Table Tell me what you want to do

Views View Paste Copy Cut Copy Paste Format Painter Filter Sort & Filter Filter Ascending Descending Advanced Remove Sort Toggle Filter Selection New Refresh Save All Delete More Find Replace Go To Select Text Formatting

All Access Objects Search... Tables Customers Medicines Sales SalesDetailID Suppliers

SupplierID	SupplierName	ContactName	Phone	Email	Address
1	Supplier A	John Smith	07635836298	SupplierA@gr	UK
2	Supplier B	Mary Sine	07353839289	SupplierB@gr	UK
3	Supplier C	Kenny Costi	07335683311	SupplierC@gr	UK
4	Supplier D	Simmy Sarah	07933567212	SupplierD@gr	UK
5	Supplier E	Daniel Lee	07353938267	SupplierE@gr	UK
(New)					

Records: 14 of 5 No Filter Search

Figure 2: Suppliers Table

MediLink_Pharmacy : Database- C:\Users\itshb\Documents\MediLink_Pharmacy.accdb (Access 2007 - 2016 file format) - Access

File Home Create External Data Database Tools Help Table Fields Table Tell me what you want to do

Views View Paste Copy Cut Copy Paste Format Painter Filter Sort & Filter Filter Ascending Descending Advanced Remove Sort Toggle Filter Selection New Refresh Save All Delete More Find Replace Go To Select Text Formatting

All Access Objects Search... Tables Customers Medicines Sales SalesDetailID Suppliers

MedicineID	MedicineName	Category	UnitPrice	StockQuantity	ExpireDate	SupplierID
1	Paracetamol	Painkiller	£2.50	100	01/12/2026	1
2	Ibuprofen	Anti-Inflamma	£3.00	80	01/11/2026	2
3	Amoxicillin	Antibiotic	£5.50	60	01/11/2026	3
4	Cough Syrup	Cold & Flu	£4.00	50	01/12/2026	4
5	Vitamin D	Supplement	£6.00	120	01/08/2026	5
(New)			£0.00	0		0

Records: 14 of 5 No Filter Search

Figure 3: Medicines Table

MediLink_Pharmacy : Database- C:\Users\itsb\Documents\MediLink_Pharmacy.accdb (Access 2007 - 2016 file format) - Access

File Home Create External Data Database Tools Help Table Fields Table Tell me what you want to do

Views View Paste Copy Cut Format Painter Filter Sort & Filter Advanced Selection Refresh Save New Totals Find Replace Aptos (Detail) 11 B I U Text Formatting

All Access Obj... < Customers x Relationships x Suppliers x SalesDetailID x Sales x Medicines x

Search... Tables Customers Medicines Sales SalesDetailID Suppliers

CustomerID	FirstName	LastName	DateOfBirth	Phone	Email	Address
1	Emilia	Johnzy	14/03/2000	07365227272	Emilia@gmail UK	
2	Stephanie	Siwa	16/01/1998	07721184529	Stephy@gma UK	
3	David	Lunia	01/01/2002	07862173892	David@gmail UK	
4	Kyra	Klar	01/11/1999	07988211929	Kyra@gmail c UK	
5	James	Adebayo	18/09/2001	07388292924	James@gma UK	
6	(New)					

Datasheet View Record: 14 of 5 1 of 5 No Filter Search

Figure 4: Customers Table

MediLink_Pharmacy : Database- C:\Users\itsb\Documents\MediLink_Pharmacy.accdb (Access 2007 - 2016 file format) - Access

File Home Create External Data Database Tools Help Table Fields Table Tell me what you want to do

Views View Paste Copy Cut Format Painter Filter Sort & Filter Advanced Selection Refresh Save New Totals Find Replace Aptos (Detail) 11 B I U Text Formatting

All Access Obj... < Customers x Relationships x Suppliers x SalesDetailID x Sales x Medicines x

Search... Tables Customers Medicines Sales SalesDetailID Suppliers

SalesID	SaleDate	CustomerID
1	01/04/2026	1
2	01/03/2026	2
3	01/02/2026	3
4	01/02/2026	4
5	02/03/2026	5
6	(New)	0

Datasheet View Record: 14 of 5 1 of 5 No Filter Search

Figure 5: Sales Table

MediLink_Pharmacy : Database- C:\Users\itshb\Documents\MediLink_Pharmacy.accdb (Access 2007 - 2016 file format) - Access

File Home Create External Data Database Tools Help Table Fields Table Tell me what you want to do

Views View Paste Copy Cut Format Painter Clipboard Filter Sort & Filter Selection Advanced Refresh Save New Totals Find Replace Go To Select Text Formatting

All Access Obj... Search...

Tables Customers Medicines Sales SalesDetailID Suppliers

SaleID	MedicineID	Quantity
1	1	2
2	2	1
3	3	3
4	4	1
5	5	2
(New)	0	0

Record: 1 of 5 No Filter Search

Figure 6: SalesDetail Table

To test how the system works, sample data was added to each table within the database. At least five records are contained in each table. This includes suppliers, medicines, customers and sales. For example the Customers table stores customer information.

The data used is an example of how a pharmacy would operate on a day to day basis. This assures and ensures that the database functionalities are correct and that the relationships between table work correctly.

7. Queries

MediLink_Pharmacy : Database- C:\Users\itshb\Documents\MediLink_Pharmacy.accdb (Access 2007 - 2016 file format) - Access

File Home Create External Data Database Tools Help Tell me what you want to do

Views View Paste Copy Cut Format Painter Clipboard Filter Sort & Filter Selection Advanced Refresh Save New Totals Find Replace Go To Select Text Formatting

All Access Obj... Search...

Tables Customers Medicines Sales SalesDetailID Suppliers

MedicineName	SupplierName
Amoxicillin	Supplier C
Cough Syrup	Supplier D
Ibuprofen	Supplier B
Paracetamol	Supplier A
Vitamin D	Supplier E

Record: 1 of 5 No Filter Search

Figure 7: Query – Medicine by Supplier

SalesID	CustomerID	SaleDate
1	1	01/04/2026
2	2	01/03/2026
3	3	01/02/2026
4	4	01/02/2026
5	5	02/03/2026

Figure 8: Query – Sales by Customer

SaleID	MedicineName	Quantity
1	Paracetamol	2
2	Ibuprofen	1
3	Amoxicillin	3
4	Cough Syrup	1
5	Vitamin D	2

Figure 9: Query – Sales Details

Several queries were created to show and demonstrate how the pharmacy database can be used. These queries allow users to access and retrieve their need information.

Queries allow users to be able to retrieve and filter specific data from the database. This is essential for the analysis of information and supporting business decisions [3].

For example, queries can show all the medicine supplier by a specific supplier, all the sales that were made by a particular customer and a list of medicine. Another example is: when a customer makes specific sales, all of those sales can be displayed to show detail of the sales transactions from the sales detail table. This allows for better decision making and efficiency of the system.

8. Forms and Reports

The screenshot displays the Microsoft Access application window for a database named 'MediLink_Pharmacy'. The 'Customers' table is selected in the 'All Access Objects' pane on the left. The main window shows the 'Customers' form in 'Form View'. The form has the following fields and values:

Field	Value
CustomerID	
FirstName	Emilia
LastName	Johnzy
DateOfBirth	14/03/2000
Phone	07365227272
Email	Emilia@gmail.com
Address	UK

The status bar at the bottom indicates 'Record: 14 of 5' and 'No Filter'.

Figure 10: Customer Form

SalesID	SaleDate	CustomerID
1	01/04/2026	1
2	01/03/2026	2
3	01/02/2026	3
4	01/02/2026	4
5	02/03/2026	5

Figure 11: Sales Report

Forms provide not only just a user-friendly interface for entering but also viewing data, while reports present information in a way more structured format that supports analysis and decision-making [6].

In order to improve user interaction and how data were to be presented, forms and reports were created in Microsoft Access. For the system to become more user-friendly, forms were designed for easy input and view of data.

Reports were generated based on different queries to display important information such as medicine details in a structured format. These reports provide useful insights into the system.

9.Validation and Testing

The database was made to make sure that it meets not only user requirements but also correct functionality of the MediLink Pharmacy. Various tests were taken such as checking whether data can be entered correctly, if relationships between tables work properly and whether queries return accurate results.

Appropriate data types and required fields were applied to ensure that the correct data is entered. Testing confirmed that the database works as needed and expected and support the expectations and needs of the pharmacy.

Validation ensures only appropriate and curate information is entered into the database, while tests confirm that the system is in correct functionality and meets user requirements [5]

Any minor issues: such as duplication, were identified during testing and corrected for better performance and reliability of the system.

10.Reflection

During the development of this database, I faced several challenges including understanding relationships between tables and ensuring correct normalisation.

However, through practice and applying database design principles these challenges were overcome. If improvements are to be made in the future, improved user interfaces and additional queries could be included.

Overall, this project allowed me to develop an understanding of database systems and their practicality.

11.Conclusion

In Conclusion, Microsoft Access was used to create and implement a relational database for the Medilink Pharmacy. A system was created in order to manage medicines, customers, suppliers and sales. The database was structured using tables, relationships and queries. This helped not only with organisation but with data accuracy.

One challenge I faced was ensuring that all the tables were properly linked. In the future, I believe adding more advanced queries, forms and reports will be an improvement for enhanced usability. Overall, the database improves how the pharmacy manages its data.

12.References

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