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# Acknowledgement

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# Group component

# Introduction

Data is simply the facts that are related to anything. It is a collection of information describing quantity, quality, fact, and statics. It contains various raw facts like address, person, name, age, etc. Data is required everywhere nowadays in various sectors like hospitals and healthcare, shopping, online business, etc.

Data are the facts that give useful information, describing certain things and certain places, etc. Data is very necessary for the present day cause' it gathers information that provides certain guidelines for that particular thing. The data of everything is increasing rapidly on daily basis to order that data the old way of keeping the data in the documentation or the files is not quite effective. Since it might get lost or maybe different casualties will occur like a natural disaster. To protect those data I strongly recommend keeping those data secure in the database.

The database can properly manage the data and also there is less risk of the data to lose also keep the secrecy of the data. So, to store these data of essential information, privacy, etc. Since it keeps the record or track of every data there is no need to worry about losing the data or something like that. Let's take a small example for this: if you buy something from online shopping then after that the distributor keeps your record in the database, hence it helps to prevent the information about your purchase from leaking. It is essential in every place to use a database system to keep the data secure. The database is mainly divided to provide benefits to every individual.

## Database

## Database management system

A database management system (DBMS) is a system software which manages the databases and controls the data. Hence database shares integrated computer structure that stores the end user data and metadata. DBSM manages the database and make end user data to create, delete and protect the data in database. It makes the data management much more efficient and effective and it also possibly share data among multiple applications or even the users. It also manages the administration tasks, security, backup and recovery.

It also allows the user to manipulate the data according to the user point of view. It protects the independent data of the user from leaking and it doesn’t allow the developers to see others personal data. The users can easily get the access of their data even if the data is located at different place.

## Advantages and Disadvantages of DBMS

The database is the collection of various informative data which can be stored and accessed electronically. Thus, databases also have many merits and demerits. so, some of its merits and demerits are explained below:

* **Improved data sharing:**

Database management systems help to share information between the worker in a company easily which can be edited between them easily. The data can be easily accessible thus the work can be responded to quickly which helps in decision-making. (myreadingroom, 2023)

* **Improved data security:**  
   As in a company the data is shared among coworkers so there is a high risk of data security, DBMS provides a better framework for the enforcement of data privacy and security policies.  (myreadingroom, 2023)
* **Minimized data inconsistency:**  
  In a company, various data inconsistencies exist when the same data can occur in different branches of a company thus these problems can be removed with the help of a proper design database. (myreadingroom, 2023)
* **Improved data access:**

Data saved in DBMS is easily accessible by the user as just inserting the query can display the specific information needed so you don’t have to search millions of data stores or find it, you can just insert the query, and the data needed is displayed. Thus the data can be easily accessible. (myreadingroom, 2023)

* **Improved decision making:**

The decision is made with the information provided thus DBMS makes it easier to access data which can help in the decision-making process not only that it saves the data in high quality with less error compared to others. Thus high quality data can help in the decision-making process. (myreadingroom, 2023)

* **Increased end-user productivity:**

Data is stored so that it can be easily accessed in the future thus DBMS transforms the data into usable information and makes it easy for the data to be accessible quickly which can be helped in decision-making. (myreadingroom, 2023)

## Function of DBMS

The functions of DBMS in the TU E-Bookstore is given below in some of the important points:-

1. Data Dictionary Management:

The function of the data dictionary is to store the data elements and their relationships. Also, the data dictionary stores and records every single data which is written in the database. It contains metadata which helps us to manage, implement and understand the data. It understands and functions other data and also manages the database system.

1. Backup and Recovery Management:

The word backup itself says that to store in the cloud or hard disk whereas the recovery means to recover or restore the data stored in the cloud or hard disk. The database management system aids in the backup of data and also recover the data if it is lost in another system. Backup and Recovery management plays an important role in the database management system rather than other. The recovery management restore the database if the data is lost from the disk or something dreadful occurs. It’s quite an essential to protect and preserve the database to secure the user’s data.

1. Data Transformation and Presentation:

Data transformation is the process through which the data is transferred from logical data format to the physical data format in the DBMS. While the presentation helps

1. Data Integrity Management:

Data integrity is also an important function of DBMS which plays an important role in the proper management of data and reducing the data inconsistency and data redundancy. Those data which are stored at the data dictionary helps in the implementation of the data integrity. It spots the error in the data to protect the data which also helps in the improvement of the DBMS.

1. Security Management:

Security management another important functions of DBMS which aids for the data integrity and privacy of the data by creating a security system. The security management is must necessary part of the DBMS. To protect the data of the user the security management system must aid in the data operations like modifying the data, storing the data and manipulate the data according to the will of the user.

## Disadvantages of File-based system

The file based system is the traditional way of keeping and organizing the data in the file. The file based system is not complicated though it’s easier to use. The files that are kept in this system are not efficient and are at high risk of getting lost. The file based system is usually stores the data in hard disk. Due to this the file based system doesn’t provide backup and recovery if the data or hard disk is lost.

In spite, of having the fact that this system of storing data is easy though it have some of the limitation or the disadvantages of the file-based system which are being described as follows (coursehero, 2023):

1. Data inconsistency and Redundancy:

As we already discussed that data must be kept in a safe place to keep its privacy. As the data is kept again and again then there might be redundancy in data. For example: If a person buys some particular item multiple times then his name will be entered again in the file which causes the data redundancy. If the data is entered in the file more than once then, the data inconsistency may rise until the data is checked properly. (coursehero, 2023)

2. Unanticipated Queries:

The important part of the database is queries. In the organization which is difficult because it requires some changes in the data so it is hard to make changes in file based system. The questions which are not expected to questioned while doing the organizational work could create an awful outcome. Handling those suddenly asked question can be difficult for file based system because the data and the information are written in the file. (coursehero, 2023)

3. Security Problems:

In file based system the data security is kind of insecure because the data may be allocated in multiple file and several location which might get lost. Due to the data is stored in multiple location. (coursehero, 2023)

# Business rule

Business rules describes the business policies that apply to the data stored on a company’s databases. Business rules are quite an essential for every organization for maintaining certain databases. There are some of the limitation for database to preserve the data of certain someone or something.

A business rule represents the certain order of aspects to implement in the database. Thus, business rules provides a data to prevent it from any internal and external factors of problems. To conduct a business we must apply business rules for the organizational code and conducts. Business rules provides a certain guidance for the organization among the customers and also it describes the operation of the organization. It functions as the important aspects of the organization due to various reasons. (Database Business Rules Importance, 2023)

* The user have their own code, number and id which are different from others.
* Any members of the organization are allowed to get the required documents but may have to input their user id for the verification and terms of the organization.
* Employees are allowed to take whatever book they need.
* The book have unique id which are called book id.
* Various book are categorized into various topics which have their own specific code and their own features.
* Creating separate database for the employee and customer.
* Employee have their own organizational id to know in which department they belong.
* Employees may have to sign to those books they’ve lend.
* Applying a customer details and their history.
* The employee can pick or choose whether the book is available or may come in upcoming future by reserving that item.

# Normalization process

Database normalization is a process in a database which help to minimized data dependency and update anomalies. It uses functional dependency that exit in table and primary key or candidate key in analyzing the table. (geeksforgeeks, 2022)

## Unnormalized from

In unnormalized form, a table cell contains multiple values, therefore there are many transitive and partial functional dependencies, as well as the records, are repeated. In the table below, there are multiple values in the book name column. Hence, the given table is an unnormalized form.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Customer Name | Customer  Address | Department | Author Name | Bookname |
| Ram Sharma | Sinamangal | BSC.IT | Philip Ball | The Self-Made Tapestry |
| Hari Rai | Panauti | BBM | Plato | The Republic |
| Sham Adhikari | Gaushala | BCS | Marcus Aurelius | Meditations |
| Pramod Giri | Old Baneshwor | BIT | Tina Fey | Bossypants |
| Pramila Thapa | New Baneshwor | BBM | Steve martin | Born Standing Up |

## First Normal form

In 1NF, the data is modified so that each column doesn’t take more than one entry. 1NF is done after unnormalized process. When we need to search any data , the duplicate entries is complex so in order to overcome this problem ,relational database table have to be identified using a unique value key which is also known as index key and this key is used to locate data for retrieval or for other manipulation. (techopedia, 2011)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Customer Name | Customer  Address | Department | Author Name | Bookname |
| Ram Sharma | Sinamangal | BSC.IT | Philip Ball | The Self-Made Tapestry |
| Ram Sharma | Sinamangal | BSC.IT | J.K Rowling | Harry Potter |
| Hari Rai | Panauti | BBM | Plato | The Republic |
| Sham Adhikari | Gaushala | BCS | Marcus Aurelius | Meditations |
| Pramod Giri | Old Baneshwor | BIT | Tina Fey | Bossypants |
| Pramila Thapa | New Baneshwor | BBM | Steve martin | Born Standing Up |
| Pramila Thapa | New Baneshwor | BBM | Stephen Hawking | The Big Bang Theory |
| Pramila Thapa | New Baneshwor | BBM | Benjamin Graham | The Intelligent Investor |

## Second normal

2NF table is made only after 1NF relation is need. In this normalization, every non-key attribute is fully dependent upon unique identification key known as primary key. Second normal form eliminates dependency on primary key. (Diwan, 2020)

|  |  |  |  |
| --- | --- | --- | --- |
| Customer ID | Customer Name | Customer  Address | Department |
| C01 | Ram Sharma | Sinamangal | BSC.IT |
| C02 | Hari Rai | Panauti | BBM |
| C03 | Sham Adhikari | Gaushala | BCS |
| C04 | Pramod Giri | Old Baneshwor | BIT |
| C05 | Pramila Thapa | New Baneshwor | BBM |

|  |  |
| --- | --- |
| Customer ID | Book ID |
| C01 | B01 |
| C01 | B02 |
| C02 | B03 |
| C03 | B04 |
| C04 | B05 |
| C05 | B06 |
| C05 | B07 |
| C05 | B08 |

|  |  |  |
| --- | --- | --- |
| Bookcode | Author Name | Bookname |
| B01 | Philip Ball | The Self-Made Tapestry |
| B02 | J.K Rowling | Harry Potter |
| B03 | Plato | The Republic |
| B04 | Marcus Aurelius | Meditations |
| B05 | Tina Fey | Bossypants |
| B06 | Steve martin | Born Standing Up |
| B07 | Stephen Hawking | The Big Bang Theory |
| B08 | Benjamin Graham | The Intelligent Investor |

## Third normal form

Third step in normalization is 3NF. A table is said to be in 3NF only if the table is in 2NF and it has no transitive Functional Dependency. (Diwan, 2020)

|  |  |  |  |
| --- | --- | --- | --- |
| Customer ID | Customer Name | Customer  Address | DepartmentID |
| C01 | Ram Sharma | Sinamangal | D01 |
| C02 | Hari Rai | Panauti | D02 |
| C03 | Sham Adhikari | Gaushala | D03 |
| C04 | Pramod Giri | Old Baneshwor | D04 |
| C05 | Pramila Thapa | New Baneshwor | D05 |

|  |  |
| --- | --- |
| DepartmentID | Department |
| D01 | BSC.IT |
| D02 | BBM |
| D03 | BCS |
| D04 | BIT |
| D05 | BBM |

|  |  |
| --- | --- |
| Customer ID | Book ID |
| C01 | B01 |
| C01 | B02 |
| C02 | B03 |
| C03 | B04 |
| C04 | B05 |
| C05 | B06 |
| C05 | B07 |
| C05 | B08 |

|  |  |  |
| --- | --- | --- |
| Book ID | Bookname | Author Id |
| B01 | The Self-Made Tapestry | A01 |
| B02 | Harry Potter | A02 |
| B03 | The Republic | A03 |
| B04 | Meditations | A04 |
| B05 | Bossypants | A05 |
| B06 | Born Standing Up | A06 |
| B07 | The Big Bang Theory | A07 |
| B08 | The Intelligent Investor | A08 |

|  |  |
| --- | --- |
| Author Name | Author Id |
| Philip Ball | A01 |
| J.K Rowling | A02 |
| Plato | A03 |
| Marcus Aurelius | A04 |
| Tina Fey | A05 |
| Steve martin | A06 |
| Stephen Hawking | A07 |
| Benjamin Graham | A08 |

# ER modeling

## ER-Diagram

Er-Diagram stands for Entity Relationship Diagram. Er-diagram is a graphical representation of the database and helps in the logical structure of the database. Er-diagram can be represented into three basic concepts: (Peterson, 2021)

1. Entities:  
    The Entities can be defined as any concept of data that can have to be managed in a database. The Rectangle symbol is used to define the entities in Er-diagram.
2. Attributes

Attributes can be defined as objects that can be identified. Attributes that are used in the er diagram are represented by the Ellipses Symbol.

1. Relationship

The relation can be defined as the Connection between two or more entities in the database. The relationship symbol is Diamonds used in the SQL.

Some other components that can be used in Database and their symbol are shown below:

Weak Entity Weak Relationship Multivalued Attributes

**Advantages of ER Diagram:**

1. It is used to define the term related to entity relationship modeling.
2. It defined the entity, attributes, and relationship used in the database.
3. Show the relationship between the components of the table.
4. It is the GUI representation of data which means easy to communicate.
5. Easy to understand the data.

## Crow’s foot notation

# Finalized Diagram

Here is the finalized diagram of database diagram and Chen’s foot notation.

## Crow’s foot notation

Diagram

Description automatically generated

# Data dictionary

A data dictionary is a Meta Data Repository (MDR) which manages the metadata and metadata is defined as the data about a data. In the data dictionary section, it contains all the information about the table names with their details and the unique identification number of required attributes. The data stored in it can be automatically updated by the database management system (DBMS). (tutorialspoint, 2020)

These are details of each of the tables used in the system with their detail:

1. **Customer**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attributes** | **Datatype** | **Length** | **Description** | **Key** |
| CustomerID | varchar | 500 | Unique identification number for customer | Primary key |
| Firstname | varchar | 50 | First name of customer | - |
| Lastname | varchar | 50 | Last number of customer | - |
| Dateofbirth | date | - | Date of birth of customer | - |
| Address | varchar | 50 | Address of customer | - |
| Department | varchar | 20 | Course the customer has taken | - |
| Email | varchar | 50 | Email of customer | - |

1. **Supplier**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attributes** | **Datatype** | **Length** | **Description** | **Key** |
| SupplierID | varchar | 500 | Unique identification number for supplier | Primary key |
| SupplierName | varchar | 50 | Name of supplier | - |
| Email | varchar | 50 | Email of book supplier | - |

1. **Staff**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attributes** | **Datatype** | **Length** | **Description** | **Key** |
| StaffID | varchar | 500 | Unique identification number for staff | Primary key |
| Name | varchar | 50 | Staff name | - |
| Address | varchar | 500 | Staff address | - |
| MobileNo | varchar | 10 | Staff mobile number | - |
| Email | varchar | 50 | Staff email address | - |
| Memertype | varchar | 50 | Staff who are permanent or temporary | - |
| Status | varchar | 50 | Position in the library department | - |
| Department | varchar | 50 | In which field the staff work | - |

1. **Bookdetails**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attributes** | **Datatype** | **Length** | **Description** | **Key** |
| Bookcode | varchar | 500 | Unique identification number for Book | Primary key |
| Bookname | varchar | 500 | Book name | - |
| writer | varchar | 500 | Writer who wrote the book | - |
| Title | varchar | 500 | Short description or another name of the book | - |
| ISBN | varchar | 500 | 13-digit unique identification number for the book name | - |
| Publisher | varchar | 500 | Publisher who published that book | - |
| Tag | varchar | 500 | Detail about the book | - |
| Publisherdate | date | - | In which year the book was published | - |
| Catagories | varchar | 500 | In which genes the book lies in | - |
| Qty | Int | - | Total number of books currently available or in stocked | - |
| Price | Money | - | per book price or money needed to buy the book | - |
| StaffID | varchar | 500 | Staff who provide or give the book to the customer | Foreign key |

1. **Orderbook**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attributes** | **Datatype** | **Length** | **Description** | **Key** |
| OrderID | varchar | 500 | Unique identification number given to the book which is given order | Primary key |
| Bookcode | varchar | 500 | Unique identification number for book | Foreign key |
| CustomerID | varchar | 500 | Unique identification number for customer | Foreign key |
| orderdate | Date | - | Date in which the customer has been ordered the book | - |

1. **Orderbookpublist**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attributes** | **Datatype** | **Length** | **Description** | **Key** |
| StaffId | varchar | 500 | Unique identification number for the staff | Foreign key |
| Bookcode | varchar | 500 | Unique identification number for book | Foreign key |
| SupplierID | varchar | 500 | Unique identification number for Supplier who provide book | Foreign key |
| Order\_date | date | - | The date in which the book has been ordered | - |

1. **Sales**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attributes** | **Datatype** | **Length** | **Description** | **Key** |
| TranID | varchar | 500 | Unique identification number for transaction for book | Primary key |
| TranDate | date | - | Date in which the book has been transaction | - |
| Bookcode | varchar | 500 | Unique identification number for book in the library | Foreign key |
| CustomerID | varchar | 500 | Unique identification number for customer who are member of library | Foreign key |
| Paid\_Amount | money | - | The money paid by customer to buy book | - |
| StaffID | varchar | 500 | Unique identification number for staff who sold the book to customer | Foreign key |
| Quantity | int | - | Total number of book the customer have brought | - |

1. **Purchase**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attributes** | **Datatype** | **Length** | **Description** | **Key** |
| TranID | varchar | 500 | Unique identification number for transaction for book | Foreign key |
| TranDate | date | - | Date in which the book has been transaction | - |
| Bookcode | varchar | 500 | Unique identification number for book in the library | Foreign key |
| SupplierID | varchar | 500 | Unique identification number for Supplier who provide book | Foreign key |
| Paid\_Amount | money | - | The total money paid | - |
| StaffID | varchar | 500 | Unique identification number for staff who purchase the book | Foreign key |

1. **Feedback**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attributes** | **Datatype** | **Length** | **Description** | **Key** |
| Bookcode | varchar | 500 | Unique identification number for book in the library | Foreign key |
| CustomerID | varchar | 500 | Unique identification number for customer who are member of library | Foreign key |
| Feedback | varchar | - | Short information about the book or how was it | - |

1. **Rating**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attributes** | **Datatype** | **Length** | **Description** | **Key** |
| Bookcode | varchar | 500 | Unique identification number for book in the library | Foreign key |
| CustomerID | varchar | 500 | Unique identification number for customer who are member of library | Foreign key |
| Rating\_star | int | - | The number given by the customer whose thought after reading the context of the book | - |

# Database Diagram

Database diagram is graphical representation of data present in the database. Database diagram shows the relation between foreign key and primary key. We can create database diagram using the database option in the database we have created. (jetbrains, 2020)

Diagram, schematic

Description automatically generated

# Database Schema

Database schema is the logical view of the entire database. Schema Diagram should contain the database scheme and the primary key. Scheme diagram contain relation name and attribute name. in the scheme diagram primary key is represented by Underlined and Foreign key is represented by the arrow key in the schema Diagram. Other constraints are not explicitly shown in schema diagrams.

Table

Description automatically generated

Table

Description automatically generatedTable

Description automatically generatedTable

Description automatically generatedGraphical user interface, table

Description automatically generatedTable

Description automatically generatedTable

Description automatically generatedTable

Description automatically generatedTable

Description automatically generated

Table

Description automatically generatedTable

Description automatically generated

# Conclusion

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