DATABASE SYSTEMS

Module Code: AICT005-4-1-DAS

Group Assignment

Student Name and TP Number:

1. Faithlin Hoe Wei Xin (TP055347)
2. Koh Tian Xin (TP055789)
3. Tan Chin Yuon (TP056500)
4. Siah Sung Hanns (TP056553)

Intake Code: UCDF1905ICT(SE)

Lecturer Name: Ms. Lai Chew Ping

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Contents

1.0 Database and Database Management System

1.1 Disadvantage of file-based system

1. Data Redundancy:

It is possible that the same information may be replicated in a specific file and this leads to data redundancy which may result in memory wastage.

2. Data Inconsistency:

Due to data redundancy, it is possible that the data may not be in a consistent state.

3. Difficulty in Accessing Data:

Accessing file-based data is not timely as it requires more time to search a specific data and will not be efficient in the file processing system.

4. Limited Data Sharing:

Different files may have different formats and these files may be stored in different folders, such as folders in different departments. Hence, due to this data isolation, it is difficult to share the data among different applications.

5. Integrity Problems:

The data stored in the database is both correct and consistent. For this purpose the data stored in the database must satisfy certain constraints.

6. Atomicity Problems:

Any operation on the database must be atomic. This means, it must happen in its entirety or not at all. The file system does not guarantee atomicity.

7. Concurrent Access:

Two or more users accessing the same data from the same file are called concurrent access. In the file system, concurrent access leads to incorrect data. For example, a student wants to borrow a book from the library. He searches for the book in the library file and sees that only one copy is available. At the same time another student also wants to borrow the same book

and checks that one copy is available. The first student chooses to borrow and gets the book. But it is still not updated to zero-copy in the file and the second student also opts for borrowing but there are no more books available. This is the problem of concurrent access to the file system.

8. Data isolation:

Imagine we have to generate a single report of a student, who is studying in a particular class, his study report, his library book details, and hostel information. All these pieces of information are stored in different files. The user would not be able to get all these details in one report. Hence, data isolation could happen.

1.2 Advantages of Database and DBMS, functions of DBMS

1.2.1 Advantages of Database

1. The database can store a lot of information

For a large company with a big number of customers and workers, the company must be able to handle the information properly. Databases can help handle the huge amount of information precisely.

2. Information are easily shareable

Data and information that are stored in the database can be accessed by one or more users simultaneously.

3. Information can be accessed quick and easily

Even with a lot of data and information stored in the database, information can be obtained quickly and easily.

4. Duplications can be removed / Reduce data redundancy

By using databases, duplications can be prevented and eliminated. No duplications means that there are no data redundancy. Every table in the database will be normalized and designed properly based on the requirements.

5. Minimize the spaces used for information

Paper-based information uses a lot of spaces. Used space can be reduced by transferring the data into the database. The database was also designed to reduce duplication, so it also saved a lot of storage space in the computer storage.

6. Security of information

The database was secured and only some authorized users can access the database. Therefore, the data in the database will not be shared or leaked to the other non-authorized users.

8. Maintenance is easier

All data and information can be changed and updated on the computer, so that it is easier to perform maintenance.

1.2.2 Advantages of Database Management System (DBMS)

1. Data Redundancy

The file-system storage contains multiple copies of the same files stored in different locations in one or more systems which will cause data redundancy. Data redundancy is reduced or eliminated in DBMS because all data is stored at a centralized location rather than being created by individual users for each application.

2. Data consistency

In traditional file system storage, the changes made by one user in one application do not update the changes in another application, given both have a different set of details (EDUCBA, n.d.). All data appears consistently across the database and the data is the same for all the users viewing the database. Any changes that are made towards the database and all the users get the same changed data. Therefore, data inconsistency does not exist (Kristi, 2018).

3. Data Sharing

Data Sharing is the primary advantage of DBMS, it allows users and applications to share Data with multiple applications and users. One or more network servers are used to store data, to prevent the same data being manipulated by two or more users at the same time, locking mechanism is used (EDUCBA, n.d.). More users can also access the database and share the data at the same time.

4. Data Searching

Searching and retrieving of data is very easy in DBMS systems. The need to write separate programs for each of the search is eliminated as in the case with a traditional file-based approach. In DBMS, we can write small queries to search for multiple information at a time from the data from DB servers (EDUCBA, n.d.).

5. Data Security

DBMS systems provide a strong framework to protect data privacy and security (EDUCBA, n.d.). DBMS ensures that only authorized users should be allowed to access the database and their identity should be authenticated using a username and password.

6. Data Concurrency

In DBMS, Data is stored in one or more servers in the network and there are some software locking mechanisms that prevent the same set of data from being changed by two people at the same time (EDUCBA, n.d.).

7. Data Integration

Data integrity means the accuracy and consistency of data in the database. All these databases contain data that is visible to multiple users. So, it is necessary to ensure that the data is correct and consistent in all the databases and for all the users (Kristi, 2018).

8. Data Access

While in a traditional file-based approach, it might take hours to look for some very specific information that might be needed in the context of some business emergency, while DBMS reduces this time to a few seconds (EDUCBA, n.d.). DBMS helps to produce quick answers to database queries thus making data accessing faster and more accurate.

9. Decision making

Accurate and consistent data helps generate good quality information, where better decisions can be made. The quality of the information generated depends on the accuracy and consistency of data. DBMS does not guarantee data quality, it provides a framework to make it easy to improve data quality.

10. Data Backup and Recovery

This is another advantage of DBMS as it provides a strong framework for data backup, users are not required to back up their data periodically and manually, it is automatically taken care of by DBMS. Moreover, in case of a server crash, DBMS restores the database to its previous condition (EDUCBA, n.d.).

11. Data Migration

DBMS allows users to export the current database, so that the database can be backed up manually.

12. Low Maintenance Cost

Although DBMS systems might be costly at the time of purchase, their maintenance only involve a very minimal cost (EDUCBA, n.d.).

13. Privacy

Database was set to only let authorized users to access the database by setting the privacy rule. There are levels of database access. For example, in the most basic levels, a user can only view the data that is allowed (Kristi, 2018).

14. Increased end-user productivity

Data can be transformed into useful information quickly and informative information can help to make better decisions which can help improve the business (VK, n.d.).

15. Simple

DBMS is simple, all data can be viewed clearly. Process of create, insert, delete, update can be performed easily.

1.3 Discussion

All in all, DBMS is better than File System as DBMS reduces data redundancy which reduces duplication of data and confusion. DBMS can also share data among other platforms and users unlike File System isolates data. Another reason why DBMS is better then File System is because DBMS has improved data integrity where it can improve the data accuracy and consistency. Security of the database is also important. In DBMS, it allows the administrator to limit their access to the database. For example, there are 2 main characters that will be using the E-Bookstore system that is being implemented, which is the customer and the manager. The customer needs to access the database to check out the products available so the level access of the customer is read-only access whereas the manager can change and update the database and set the level access of the users as the manager is the database administrator.

2.0 Business Rules & Normalization

2.1 Business Rule

1. Students need to register as a member before they proceed to purchase the products through online.
2. Students are required to provide their name, student ID, gender, and contact number to be a member.
3. Members have to put their orders into the website's shopping cart before proceeding to the next step.
4. A customer can order more than 1 item.
5. A customer can only have one order per time.
6. A customer can only make a purchase per order.
7. The payment must be cleared to deliver the order.
8. Digital invoices will be stored in the database as proof.
9. 1 order can only have 1 delivery address.
10. The order must be delivered within 7 days.
11. If the order is not delivered after 7 days, the order will be refunded with full payment.
12. The customers are provided a choice to give ratings.
13. No changes are allowed once the rating is given.
14. Only one feedback per user per book is allowed.

15. Customers can cancel the order within 7 days.

2.2 Normalization

2.2.1 UNF

This is the Un-normalized form of the e-bookstore orderings.

ShoppingCartID	ReviewID (PK)	Rating	Feedback	MemberID	MemberName	MemberAddress	MemberGender	MemberContact
SC1	R1	7	Good	845	Jane	Johor Bahru	Female	101234567
SC6	R6	8	Very Good					
SC4	R4	N/A	N/A	935	Jake	Cheras	Male	1401234567
SC5	R5	N/A	N/A	840	Eve	Johor Bahru	Male	101234567
SC3	R3	N/A	N/A	975	Irene	Klang	Female	131234567
SC7	R7	6	Slow delivery	1140	Windy	Puchong	Female	201234567
SC2	R2	9	Nice!					201234567

BookID	Quantity	TotalMemberBookPrice	DeliveryID	Status	DateOfOrder	BookName	PublisherID	PublisherName
B01	1	65	D1	Delivered	2/4/20	Mirror	P01	John
B03	6	120	D6	Delivered	43870	Planet X	P02	David
B02	4	180	D4	In Progress	2/7/20	Missing Bob	P01	John
B01	5	240	D5	Cancelled	2/8/20	Mirror	P01	David
B03	3	325	D3	In Progress	2/6/20	Planet X	P02	David
B02	7	360	D7	Delivered	2/10/20	Missing Bob	P01	John
B02	2	420	D2	Delivered	2/5/20	Missing Bob	P01	David

PublisherContact	CategoryCode	BookCategory	PublisherBookPrice	MemberBookPrice	SupplierOrderID	ManagerID	ManagerName
567891234	C01	Horror	35	65	S01	M01	Brendan
543219876	C03	Science Fiction	25	60	S06	M01	Brendan
567891234	C02	Adventure	30	60	S04	M02	Cain
543219876	C01	Horror	35	65	S05	M01	Brendan
543219876	C03	Science Fiction	25	60	S03	M02	Cain
567891234	C02	Adventure	30	60	S07	M02	Cain
543219876	C02	Adventure	30	60	S02	M01	Brendan

ManagerContactNumber	OrderQuantity
123456789	100
123456789	225
987654321	175
123456789	125
987654321	200
987654321	250
123456789	150

2.2.2 1NF

In 1NF, every primary key is identified and every cell have its own value. All null are eliminated.

ShoppingCartID (PK)	ReviewID (PK)	Rating	Feedback	MemberID (FK)	MemberName
SC1	R1	7	Good	845	Jane
SC2	R2	9	Nice!	1140	Windy
SC3	R3	N/A	N/A	975	Irene
SC4	R4	N/A	N/A	935	Jake
SC5	R5	N/A	N/A	840	Eve
SC6	R6	8	Very Good	845	Jane
SC7	R7	6	Slow delivery	1140	Windy

MemberAddress	MemberGender	MemberContact	BookID (FK)	Quantity
Johor Bahru	Female	101234567	B01	1
Puchong	Female	201234567	B02	2
Klang	Female	131234567	B03	3
Cheras	Male	1401234567	B02	4
Johor Bahru	Male	101234567	B01	5
Johor Bahru	Female	101234567	B03	6
Puchong	Female	201234567	B02	7

TotalMemberBookPrice	DeliveryID	Status	DateOfOrder	BookName
65	D1	Delivered	2/4/20	Mirror
120	D2	Delivered	2/5/20	Missing Bob
180	D3	In Progress	2/6/20	Planet X
240	D4	In Progress	2/7/20	Missing Bob
325	D5	Cancelled	2/8/20	Mirror
360	D6	Delivered	2/9/20	Planet X
420	D7	Delivered	2/10/20	Missing Bob

PublisherID	PublisherName	PublisherContact	CategoryCode	BookCategory
P01	John	567891234	C01	Horror
P01	David	543219876	C02	Adventure
P02	David	543219876	C03	Science Fiction
P01	John	567891234	C02	Adventure
P01	David	543219876	C01	Horror
P02	David	543219876	C03	Science Fiction
P01	John	567891234	C02	Adventure

PublisherBookPrice	MemberBookPrice	SupplierOrderID (PK)	ManagerID
35	65	S01	M01
30	60	S02	M01
25	60	S03	M02
30	60	S04	M02
35	65	S05	M01
25	60	S06	M01
30	60	S07	M02

ManagerName	ManagerContactNumber	OrderQuantity
Brendan	123456789	100
Brendan	123456789	150
Cain	987654321	200
Cain	987654321	175
Brendan	123456789	125
Brendan	123456789	225
Cain	987654321	250

2.2.3 2NF

All the dependencies are identified and removed from 1NF. Each PK now is separated and don't have partial dependency.

Publisher

PublisherID (PK)	PublisherName	PublisherContact
P01	John	567891234
P02	David	543219876

Book

BookID (PK)	BookName	PublisherID (FK)	CategoryCode
B01	Mirror	P01	C01
B02	Missing Bob	P01	C02
B03	Planet X	P02	C03

BookCategory	PublisherBookPrice	MemberBookPrice
Horror	35	65
Adventure	30	60
Science Fiction	25	60

Manager

ManagerID (PK)	ManagerName	ManagerContactNumber
M01	Brendan	123456789
M02	Cain	987654321

Supplier Order

SupplierOrderID (PK)	ManagerID (FK)	PublisherID (FK)	BookID (FK)	OrderQuantity
S01	M01	P01	B01	100
S02	M01	P01	B02	150
S03	M02	P02	B03	200
S04	M02	P01	B02	175
S05	M01	P01	B01	125
S06	M01	P02	B03	225
S07	M02	P01	B02	250

Member

MemberID (PK)	MemberName	MemberAddress	MemberGender	MemberContact
845	Jane	Johor Bahru	Female	101234567
1140	Windy	Puchong	Female	201234567
975	Irene	Klang	Female	131234567
935	Jake	Cheras	Male	1401234567
840	Eve	Johor Bahru	Male	101234567

ShoppingCart

ShoppingCartID (PK)	MemberID (FK)	BookID (FK)	Quantity	TotalMemberBookPrice
SC1	845	B01	1	1
SC2	1140	B02	2	2
SC3	975	B03	3	3
SC4	935	B02	4	4
SC5	840	B01	5	5
SC6	845	B03	6	6
SC7	1140	B02	7	7

DeliveryID	Status	DateOfOrder
D1	Delivered	2/4/20
D2	Delivered	2/5/20
D3	In Progress	2/6/20
D4	In Progress	2/7/20
D5	Cancelled	2/8/20
D6	Delivered	2/9/20
D7	Delivered	2/10/20

2.2.4 3NF

Transitive dependencies are removed from 2NF, there are now no dependencies between non-primary key and non-primary key.

Publisher

PublisherID (PK)	PublisherName	PublisherContact
P01	John	567891234
P02	David	543219876

Book

BookID (PK)	BookName	PublisherID (FK)
B01	Mirror	P01
B02	Missing Bob	P01
B03	Planet X	P02

CategoryCode (FK)	PublisherBookPrice	MemberBookPrice
C01	35	65
C02	30	60
C03	25	60

Category

CategoryCode (PK)	BookCategory
C01	Horror
C02	Adventure
C03	Science Fiction

Manager

ManagerID (PK)	ManagerName	ManagerContactNumber
M01	Brendan	123456789
M02	Cain	987654321

Supplier Order

SupplierOrderID (PK)	ManagerID (FK)	PublisherID (FK)	BookID (FK)	OrderQuantity
S01	M01	P01	B01	100
S02	M01	P01	B02	150
S03	M02	P02	B03	200
S04	M02	P01	B02	175
S05	M01	P01	B01	125
S06	M01	P02	B03	225
S07	M02	P01	B02	250

Member

MemberID (PK)	MemberName	MemberAddress	MemberGender	MemberContact
845	Jane	Johor Bahru	Female	101234567
1140	Windy	Puchong	Female	201234567
975	Irene	Klang	Female	131234567
935	Jake	Cheras	Male	1401234567
840	Eve	Johor Bahru	Male	101234567

ShoppingCart

ShoppingCartID (PK)	MemberID (FK)	BookID (FK)	Quantity	TotalMemberBookPrice
SC1	845	B01	1	65
SC2	1140	B02	2	120
SC3	975	B03	3	180
SC4	935	B02	4	240
SC5	840	B01	5	325
SC6	845	B03	6	360
SC7	1140	B02	7	420

DeliveryID (FK)	DateOfOrder
D1	2/4/20
D2	2/5/20
D3	2/6/20
D4	2/7/20
D5	2/8/20
D6	2/9/20
D7	2/10/20

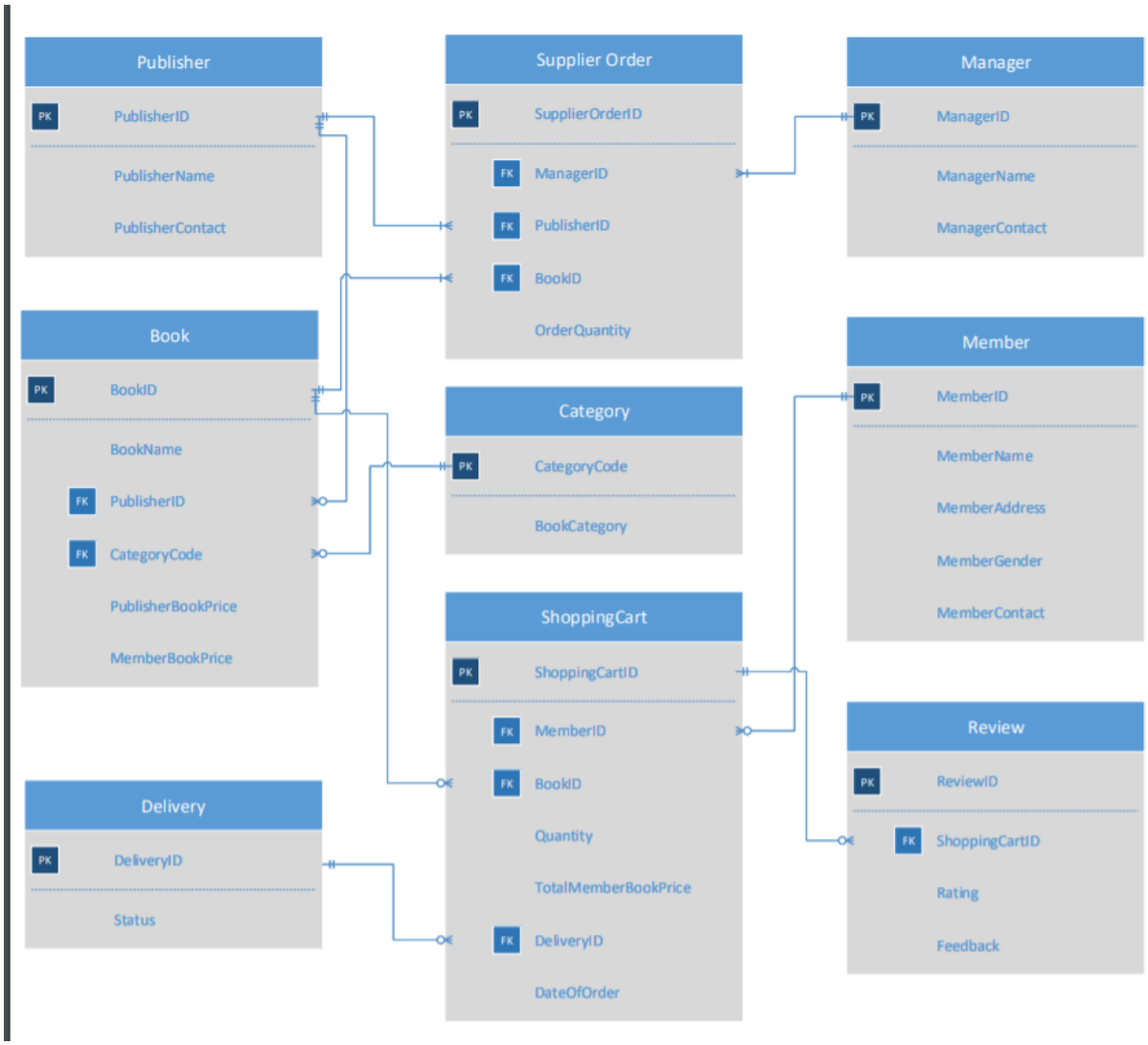
Delivery

DeliveryID (PK)	Status
D1	Delivered
D2	Delivered
D3	In Progress
D4	In Progress
D5	Cancelled
D6	Delivered
D7	Delivered

Review

ReviewID (PK)	ShoppingCartID (FK)	Rating	Feedback
R1	SC1	7	Good
R2	SC2	9	Nice!
R3	SC3	N/A	N/A
R4	SC4	N/A	N/A
R5	SC5	N/A	N/A
R6	SC6	8	Very Good
R7	SC7	6	Slow delivery

3.0 ERD


Publisher
PK PublisherID
PublisherName
PublisherContact
Supplier Order
PK SupplierOrderID
FK ManagerID
FK PublisherID
FK BookID
OrderQuantity
Manager
PK ManagerID
ManagerName
ManagerContact
Book
PK BookID
BookName
FK PublisherID
FK CategoryCode
PublisherBookPrice
MemberBookPrice
Category
PK CategoryCode
BookCategory
Member
PK MemberID
MemberName
MemberAddress
MemberGender
MemberContact
ShoppingCart
PK ShoppingCartID
FK MemberID
FK BookID
Quantity
TotalMemberBookPrice
FK DeliveryID
DateOfOrder
Review
PK ReviewID
FK ShoppingCartID
Rating
Feedback
Delivery
PK DeliveryID
Status

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