

SQL Concepts and Database

Introduction:

The Database Life Cycle DBLC has many phases: Database initial study, Database design, Implementation and loading, Testing and evaluation, operation, and maintenance and evolution. The database design is the most necessary level in the DBLC, in which three main stages: Conceptual design, Logical design, and Physical design, then the DBMS selection stage. In this paper, I will make the database design of the finance industry-based organization by making all the data dictionary for all the entities tables. This database will help the organization to take all answers about many important quires. I will implement some queries and explain all the database design steps with details.

The data dictionary for all the tables:

Employee Table					
Attributes	Data type	Format	Range	Description	Key Type
EMP_NUMBER	INTRGER	#####	0-9999	EMPLOYEE NUMBER	PRIMARY KEY
EMP_FIRSTNAME	VARCHAR(15)	Xxxxxxxxxxxxx	NA	EMPLOYEE FIRST NAME	
EMP_LASTNAME	VARCHAR(15)	Xxxxxxxxxxxxx	NA	EMPLOYEE LAST NAME	
COMMISSIONRATE	NUMBER(2,2)	0.##	0.00-0.25	COMMISSION RATE	
YRLYSALARY	NUMBER(8,2)	0.##	0.00-0.99	YEARLY SALARY	
DEPARTMENT_ID	INTEGER	#####	0-999999	DEPARTMENT ID	FOREIGN KEY
JOB_ID	INTEGER	#####	0-9999	JOB ID	FOREIGN KEY

INVOICE TABLE					
Attributes	Data type	Format	Range	Description	Key Type
INV_NUMBER	INTRGER	#####	0-9999	INVOICE NUMBER	PRIMARY KEY
INV_DATE	DATE	YYYY-MM-DD	NA	INVOICE DATE	
EMP_NUMBER	INTEGER	#####	0-9999	EMPLOYEE NUMBER	FOREIGN KEY
INV_AMOUNT	INTEGER	#####	0-999999	INVOICE AMOUNT	
CUSTOMER_ID	INTEGER	#####	0-999999	CUSTOMER ID	FOREIGN KEY

INVOICELINE TABLE					
Attributes	Data type	Format	Range	Description	Key Type
INV_LINE_NUMBER	INTRGER	#####	0-9999	INVOICE LINE NUMBER	PRIMARY KEY
INV_NUMBER	INTEGER	#####	0-9999	INVOICE NUMBER	FOREGN KEY
PRODUCT_NUMBER	INTEGER	#####	0-9999	PRODUCT NUMBER	FOREGN KEY
QUANTITY	INTEGER	#####	0-999999	QUANTITY	

PRODUCT TABLE					
Attributes	Data type	Format	Range	Description	Key Type
PRODUCT_NUMBER	INTRGER	#####	0-9999	PRODUCT NUMBER	PRIMARY KEY
PRODUCT_DESRPTION	VARCHAR(15)	Xxxxxxxxxxxxxxx	NA	PRODUCT DESCRIPTION	
PRODUCT_COST	NUMBER(10,2)	0.##	0.00-0.99	PRODUCT COST	

DEPARTMENT TABLE						
Attributes	Data type	Format	Grid	Range	Description	Key Type
DEPARTMENT_ID	INTRGER	#####		0-999999	DEPARTMENT ID	PRIMARY KEY
DEPARTMENT_DESCRIPTION	VARCHAR(15)	Xxxxxxxxxxxxxxx		NA	DEPARTMENT DESCRIPTION	

JOB TABLE						
Attributes	Data type	Format		Range	Description	Key Type
JOB_ID	INTRGER	####		0-999999	JOB ID	PRIMARY KEY
JOB_DESCRIPTION	VARCHAR(15)	Xxxxxxxxxxxxxxx		NA	JOB DESCRIPTION	

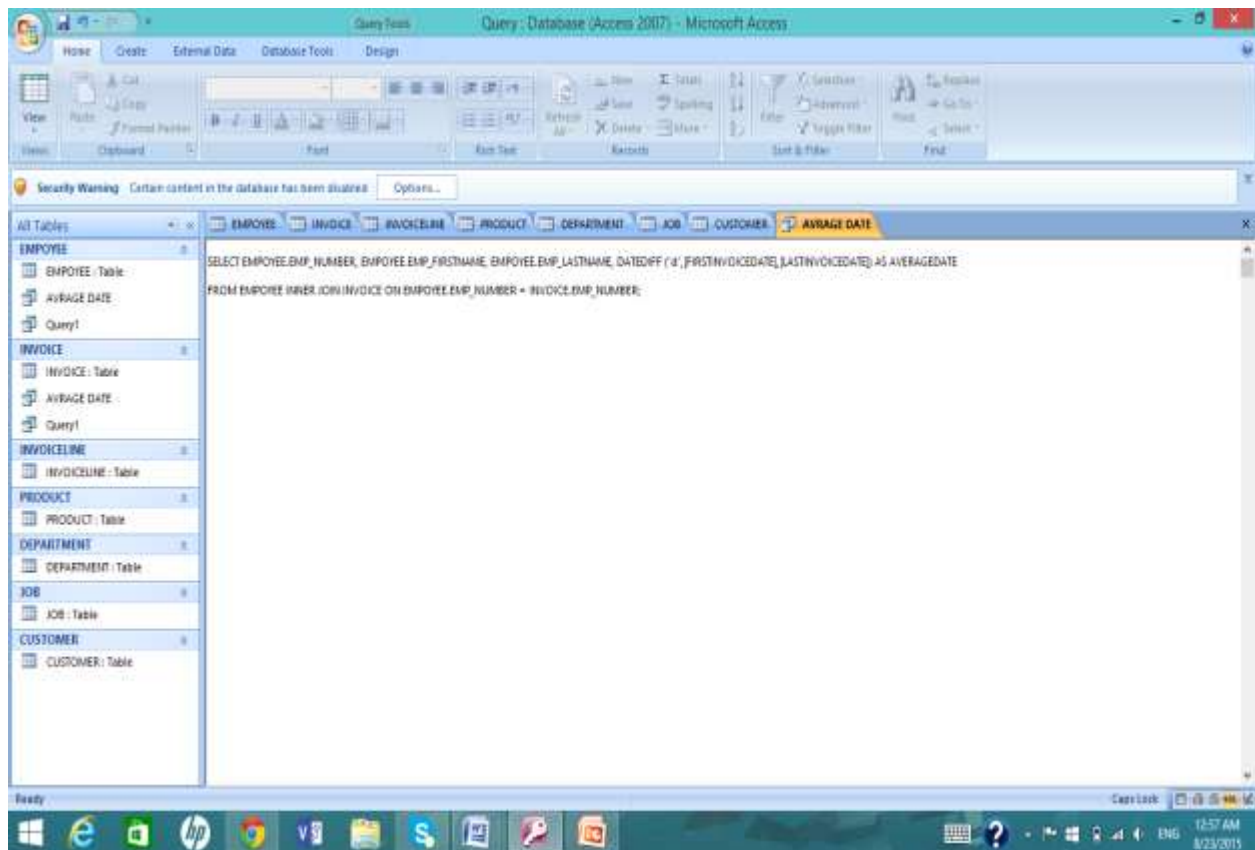
CUSTOMER TABLE						
Attributes	Data type	Format		Range	Description	Key Type
CUSTOMER_ID	INTRGER	#####		0-9999	CUSTOMER ID	PRIMARY KEY
CUSTOMER_NAME	VARCHAR(15)	Xxxxxxxxxxxxxxx		NA	CUSTOMER NAME	
CUSTOMER_ADDRESS	VARCHAR(15)	Xxxxxxxxxxxxxxx		NA	CUSTOMER ADDRESS	
CUSTOMER_PHONE	INTEGER	#####		000000000-999999999	CUSTOMER PHONE	

The query that will show the number of days that exist between the first invoice and last invoice, for each month, for each employee, by using the DATEDIFF function:

```

SELECT      EMPLOYEE.EMP_NUMBER,      EMPLOYEE.EMP_FIRSTNAME,
EMPLOYEE.EMP_LASTNAME,      DATEDIFF      ("D",      [FIRSTINVICEDATE],
[LASTINVICEDATE]) AS AVERAGEDATE
FROM EMPLOYEE INNER JOIN INVOICE ON EMPLOYEE.EMP_NUMBER =
INVOICE.EMP_NUMBER;

```



Enter Parameter Value ? x

FIRSTINVOICEDATE

7/2/2015

OK Cancel

Enter Parameter Value ? x

LASTINVOICEDATE

7/22/2015

OK Cancel

Query: Database (Access 2007) - Microsoft Access

Security Warning: Certain content in the database has been disabled. Options...

All Tables: EMPLOYEE, INVOICE, INVOICELINE, PRODUCT, DEPARTMENT, JOB, CUSTOMER, AVERAGE DATE

EMPLOYEE: EMPLOYEE - Table

INVOICE: INVOICE - Table

INVOICELINE: INVOICELINE - Table

PRODUCT: PRODUCT - Table

DEPARTMENT: DEPARTMENT - Table

JOB: JOB - Table

CUSTOMER: CUSTOMER - Table

EMP_NUMBR	EMP_FIRSTN	EMP_LASTN	AVERAGE DATE
ALI	MUSSEIN		20
2 ZAINAB	MUSTAFA		30
(New)			

Record: 1 of 2

Ready

100 AM 8/23/2015

The query to show the expected payment date if invoices are due within 30 days of transaction:

```
SELECT INVOICE.INV_DATE, [INV_DATE] + 30 AS [DUEDATE]
```

```
FROM INVOICE;
```

The screenshot shows the SQL Enterprise Manager interface. The left pane displays a tree view of tables including EMPLOYEE, INVOICE, INVOICELINE, PRODUCT, DEPARTMENT, JOB, CUSTOMER, AVRGAGE DATE, and DUE DATE. The right pane shows the following SQL query:

```
SELECT INVOICE.INV_DATE, [INV_DATE] + 30 AS [DUEDATE]
FROM INVOICE;
```

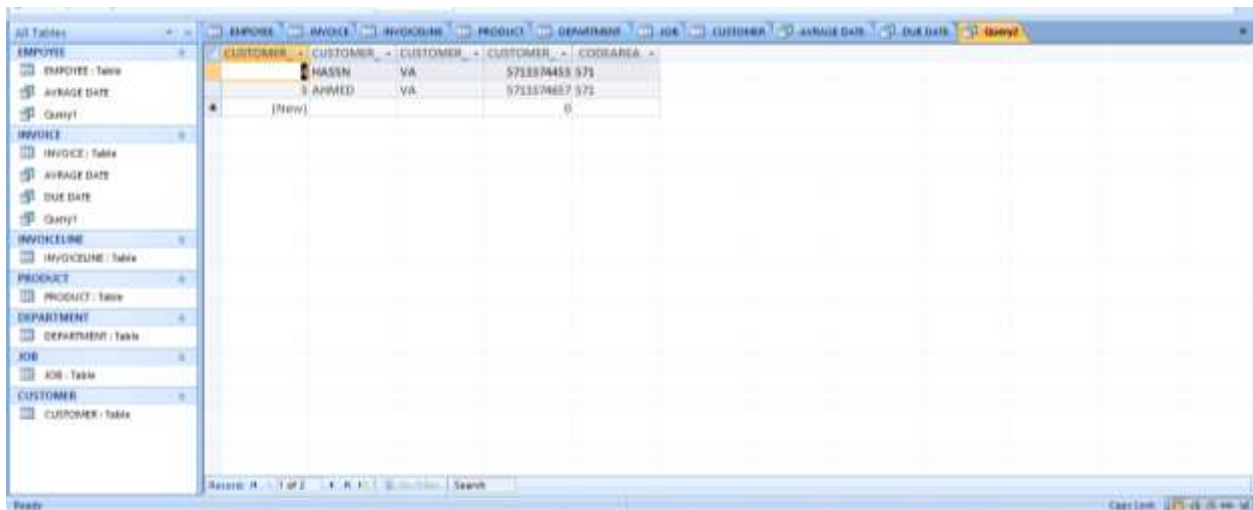
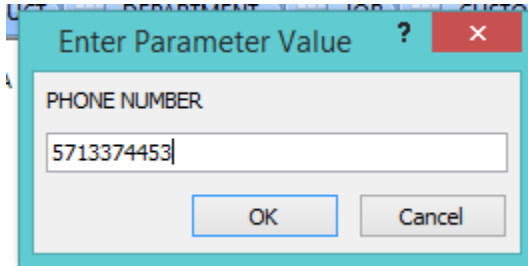
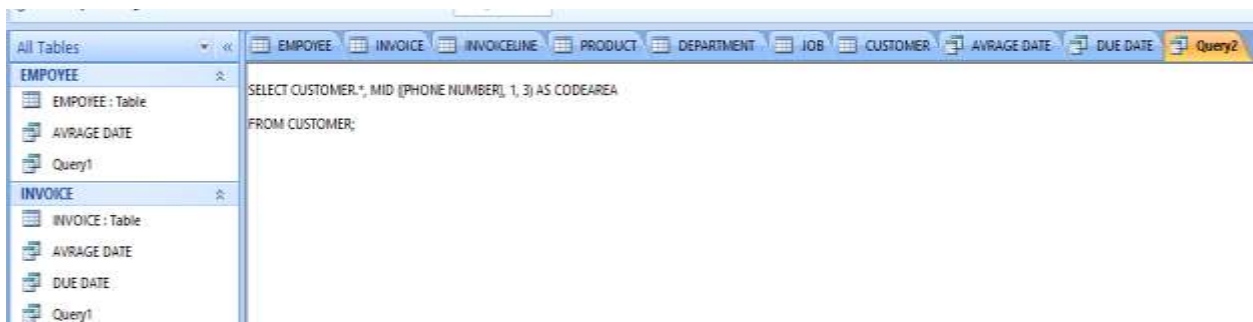
The screenshot shows the same SQL Enterprise Manager interface, but the query results are displayed in a grid view. The results are as follows:

INV_DATE	DUEDATE
7/2/2015	8/1/2015
7/22/2015	8/21/2015

The query that will show distinct area codes of the customers:

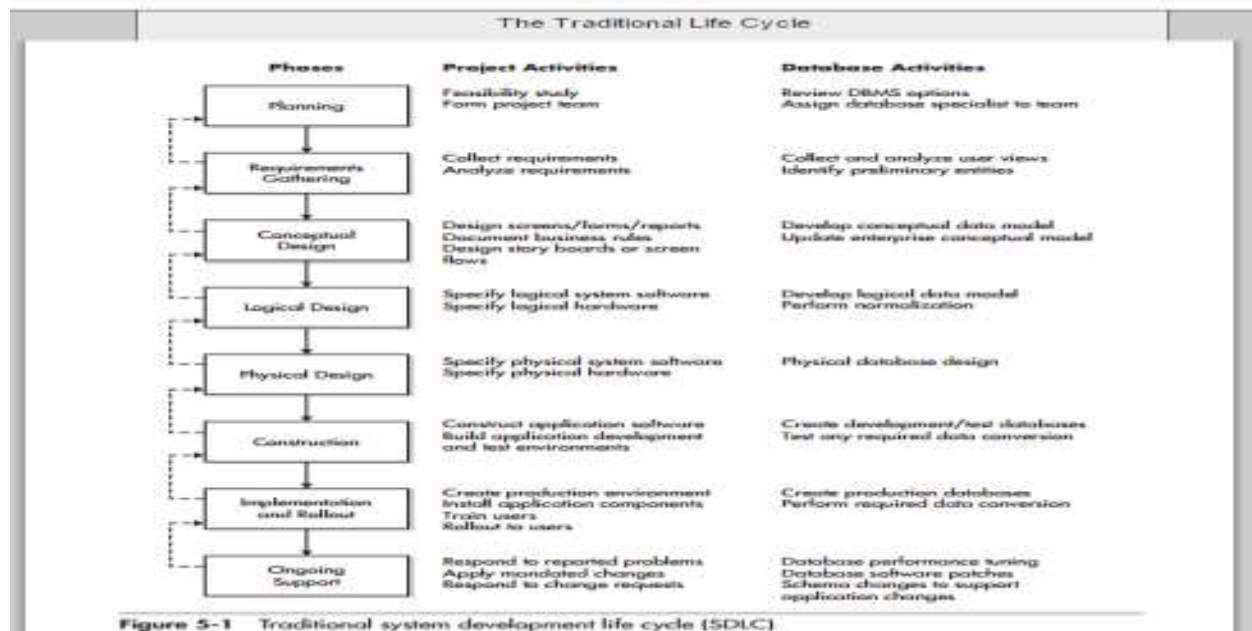
```
SELECT CUSTOMER.*, MID ([PHONE NUMBER], 1, 3) AS CODEAREA
```

```
FROM CUSTOMER;
```



The plan of the necessary activities that would be required to implement a valid database design process:

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1. The Conceptual design stage:

The conceptual design is the first stage of the DB design, in which the abstraction of all the DB's entities, attributes, relationships, and constraints, with detail (textual detail). The conceptual design has many steps:

- Data analysis and requirements: It is the first step of the conceptual design. The designer at this stage:
- Searching everything about the data: How it is produced to useful information, what is the information needs, what is the information user, what is the information source and constitution. When the designer study all the previous points, he/she can improve the database information.
- Determine the entities and the attributes of every entity with the relationships and constraints among these entities.
- Normalize the entities
- Implement the ER model.

2. DBMS selection stage:

The DBMS selection stage steps:

- Determine the high requirements.
- Identify the managers, stakeholders, and decision makers.
- Communicate with the vendors and users to take the useful advice.

- Determine the hardware and software requirements and recording it.
- Using the Internet and other multimedia to search the products.

And many other steps.

3. The Logical design stage:

The Logical design stage is the second step of database design in which the many steps must be performed:

- Convert the conceptual design detail to logical design components (design the internal database). Convert the ER model to set of tables with all the binary relations.
- Validate the logical design by the normalization: In this step the model must have only the normalized tables (until 3NF); therefore, maybe there are new attributes or changing in tables.
- Validate the logical design by integrity constraints: in this step the designer must be sure from the relationship constraints.
- Validate the logical model against the user requirements: in this step the designer must sure that all the user needs are achieved.

4. The physical design stage:

The physical design stages is the third phase of the database design, in it must achieve the integrity, performance and security of the database. In this design level is implemented the following steps:

- Define the database storage: Before define this step, it must determine the many things such as the volume of the data, how to store and retrieve the data, defining the physical storage for all the entities, and identify the indexes.
- Define the integrity and security by identifying the security roles and the security access control.
- Define the performance measurements to achieve the user requirements. (**Coronel, C., 2010**), (**Oppel & Andrew J, 2009**).

Conclusion:

This paper had many important trends such as the data dictionary for all the entities tables of the finance industry-based organization. Then, it had some queries that the organization needed it, with the screen shot for all these queries by the SQL language. Also, I talked about the Database Life Cycle DBLC, and I explained all the database design stages with more details.

References:

Oppel & Andrew J, (2009), The article of (Chapter 5 The Data Base Life Cycle), Databases: A Beginner's Guide. (eBook).

Coronel, C., (2010), Article of (Chapter 9 Data Base Design), Database Systems: Implementation, and Management, 10e 10th Edition.

Professional Visio 2013.

Microsoft Access 2013.

Microsoft Powerpoint 2013.