Introduction to Data Base Systems

Software House Database

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Submitted to:

Mr. Muhammad Imran Saeed

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Introduction

This introduction provides an overview of the **Database for Organization**. From organization I consider **Tech Company** or **Software House.** The organization has many customer, managers, staff, developers and one CEO. The organization works for many local and international clients(customer). The company generates huge amount of data which need a proper data management system.

Manual System and its Issues

This **Software House** is a startup that has all necessary departments. Also the company has developers, project manager, customer and so on. So they produce huge amount of data which need proper data management. In existing system (file processing system) there is many problems and the staff of company face difficulty in finding records. Some of the problems are

- Slow access time
- Presence of redundant data
- Inconsistent data
- Data integrity problem
- No sharing of data
- Difficult in recovery of corrupt data

Proposed Solution

In this situation the company need a proper data management which is possible with **Data Base**. So in this project I will **Design a Data Base** i.e. diagrams like bubble chart, entity relationship diagram (ERD), Enhanced Entity relationship diagram (EERD) and so on. Also in this projects I

will find **Anomalies** and removing Anomalies from relation (if they exist) with the process of **Normalization**. This will helpful in the implementation of database for Tech Company.

In the end of the designing, I implement this project in **Microsoft Access.** I make tables of different entity classes, implement **static** and **dynamic** queries. Also make attractive **forms** and **generate report**, which is very helpful for any person to understand about data in MS access database.

About Software House

A software house is a company that primarily provides software products. This company may specialize in business or consumer software. Many clients want software for their business, so software house provide them a service in making software that will help client and client can easily do they business work with that software.

Advantages of Database

- Data Integrity
- Data Security
- Data Consistency
- Backup and Recovery
- Reducing Data Redundancy and many more!

Bubble Chart diagram

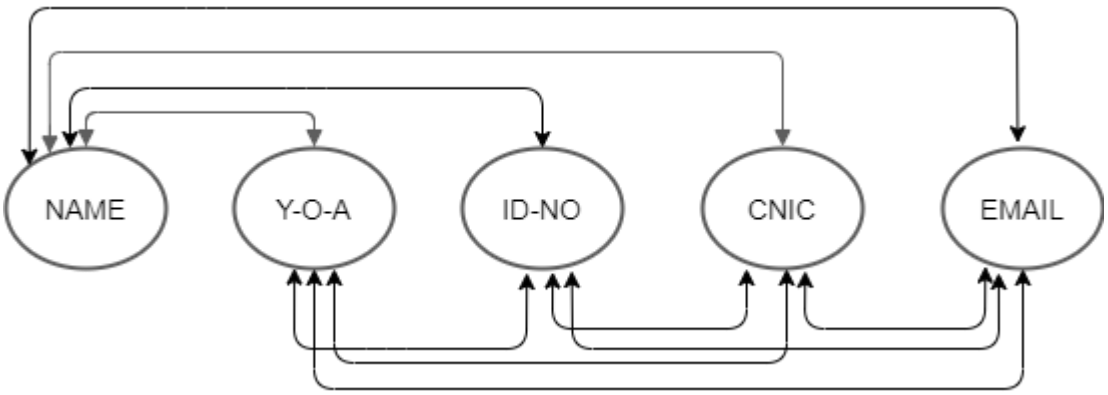
It helps us to represent the association or relationship between attributes of an entity classes.

In projects (Database design for Software House) I find the following **entity classes**.

- Chief Executive Officer (CEO)
- Customer/Client
- Manager (Project lead)
- Staff (Developers team)
- Products
- Departments

Bubble chart for CEO class

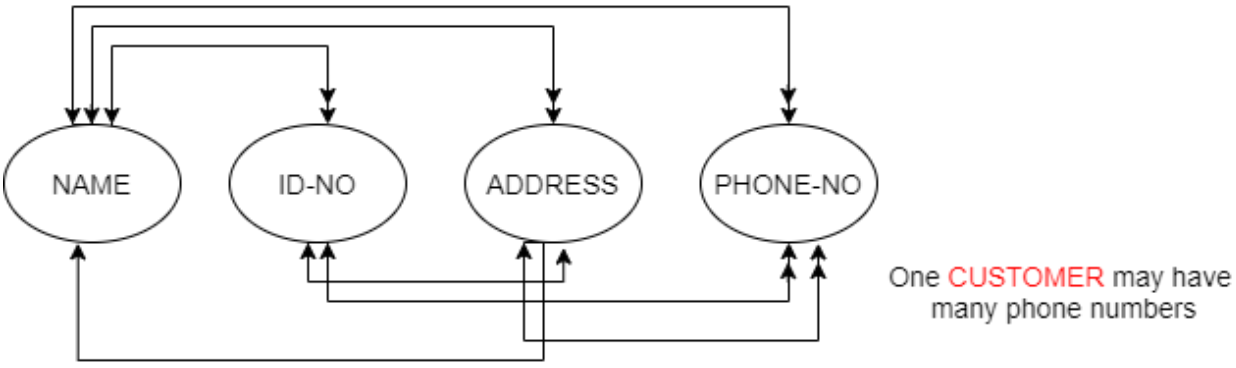
As the CEO of company is signal person so the bubble chart diagram for CEO entity class and its attributes is as below



At one time there is only one CEO of company, so different CEO's tenure are find with help of **Year of Appoipment.**

1. CEO **name** has only one address, ID-No, CNIC and Email
2. **Y-O-A** has one name, one id-no, CNIC and Email
3. **Id-No** has one name, address, CNIC and Email
4. **CNIC** has only one name, address, id-no, and Email
5. **Email** has one name, address, id-no and CNIC along with it.

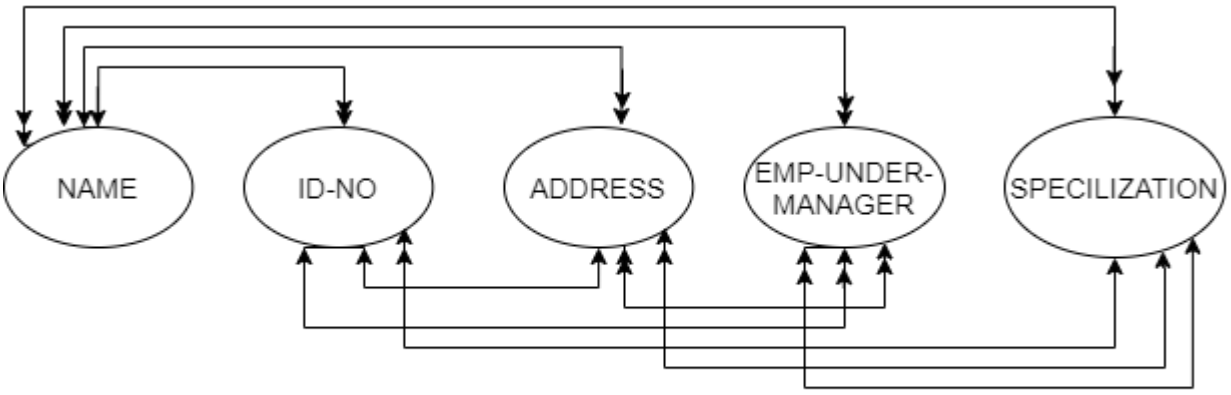
Bubble chart for Customer class



In customer data

1. For one **name** there can be many id-no, address and phone number
2. One **id-no** has only one name, address, and many phone numbers (customer may have many contact numbers)
3. For one **address** there is only one name, id-no and many phone-numbers
4. For one **phone-no** there is only one name, id-number and address.

Bubble chart for Project Manager class

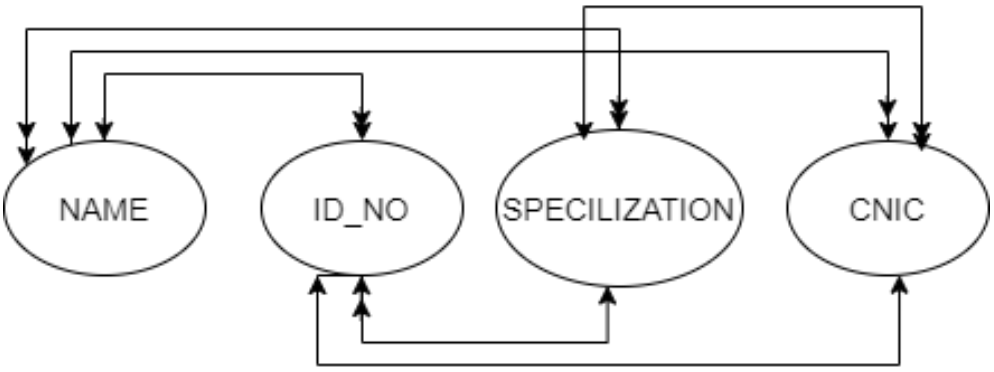


EMP: EMPLOYEES

In project manager table

1. For one **name** there is many id-no, specialization, address and employees.
2. For one **id-no** there is only one name, one specialization and many employees.
3. For one **specialization** in some area there is many names, id-no.
4. For employees under project manager there is one name, address, and many id-no.

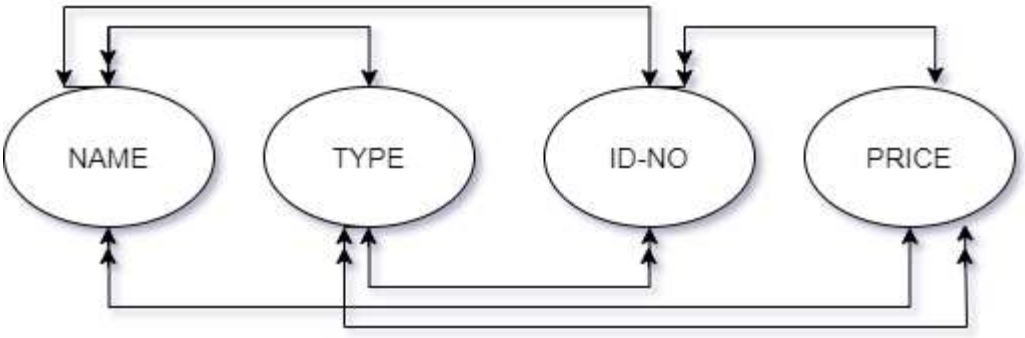
Bubble chart for Developers class



In developers table

1. For one **name** there is many id-no, specialization and CNIC
2. For one **id-no** there is only one name, one specialization and only one CNIC
3. For one **specialization** in some area there is many names, id-no and CNIC
4. For one **CNIC** number there is only one name, one id-no, and specialization associated with it.

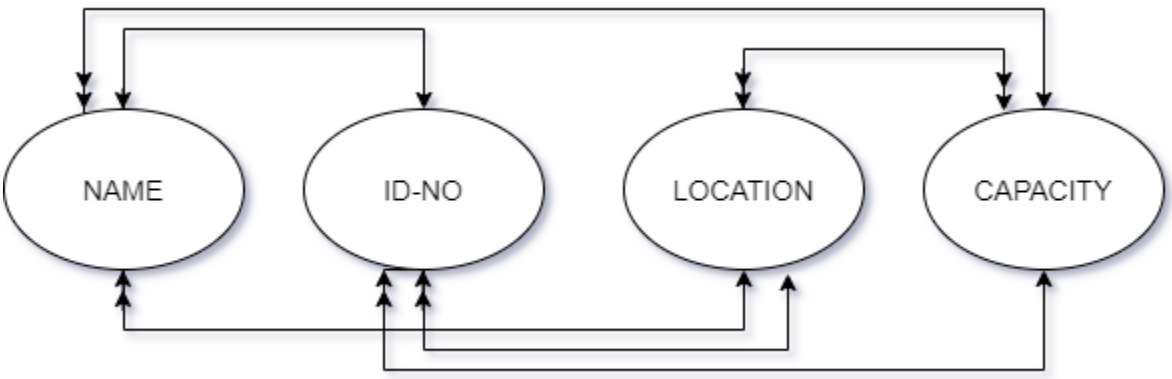
Bubble chart for Product class



In product table

1. For one product **name** there is one type, id-no and one fix price.
2. For **type** there are many names, id-no and price.
3. For **id-no** there is one name product name, type and price.

Bubble chart for Departments class



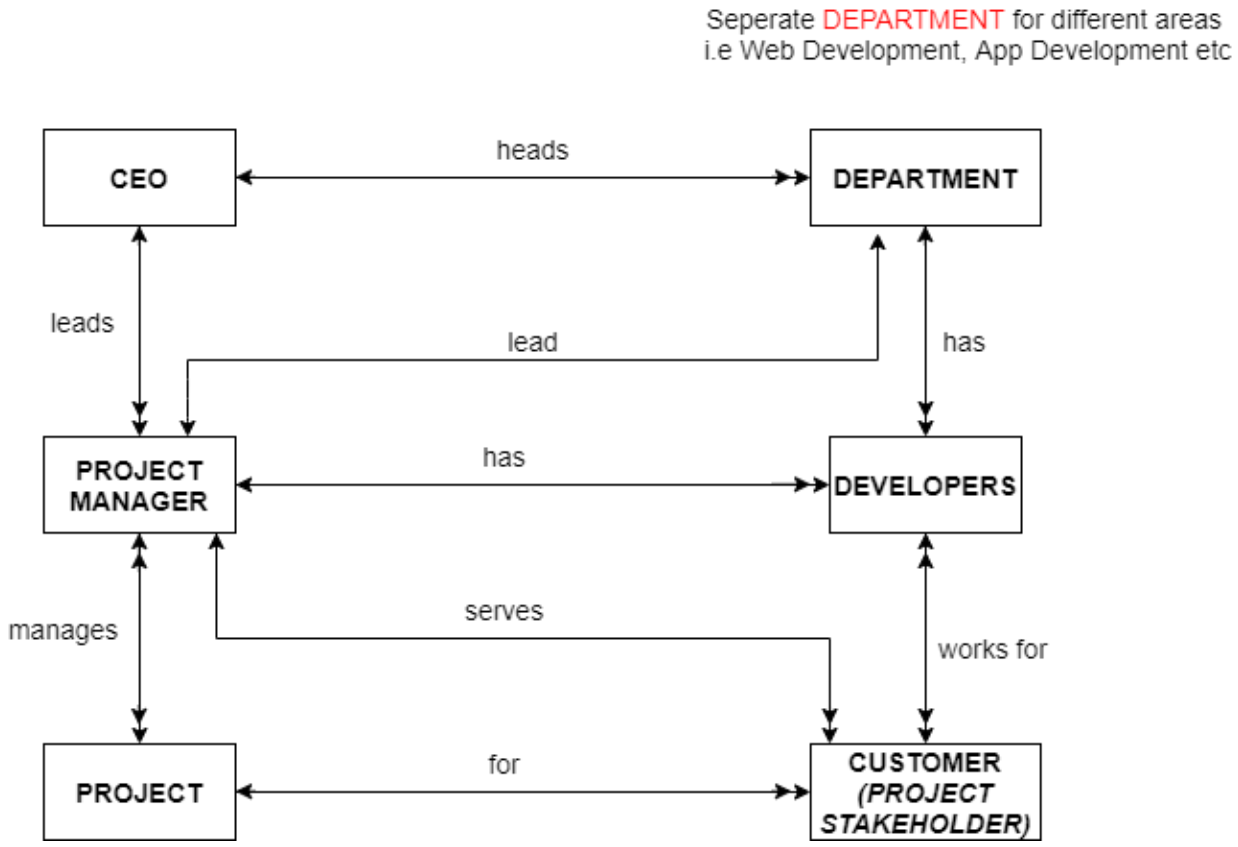
In department table

1. For one department **name** there is one id-no, location, and fix capacity.
2. For department **id-no** there is only one name, location and capacity.
3. At one **location** there are many departments exist, many id-no, and different capacity.
4. For one **capacity** (department with same capacity size) there are many department names, id-no, and location.

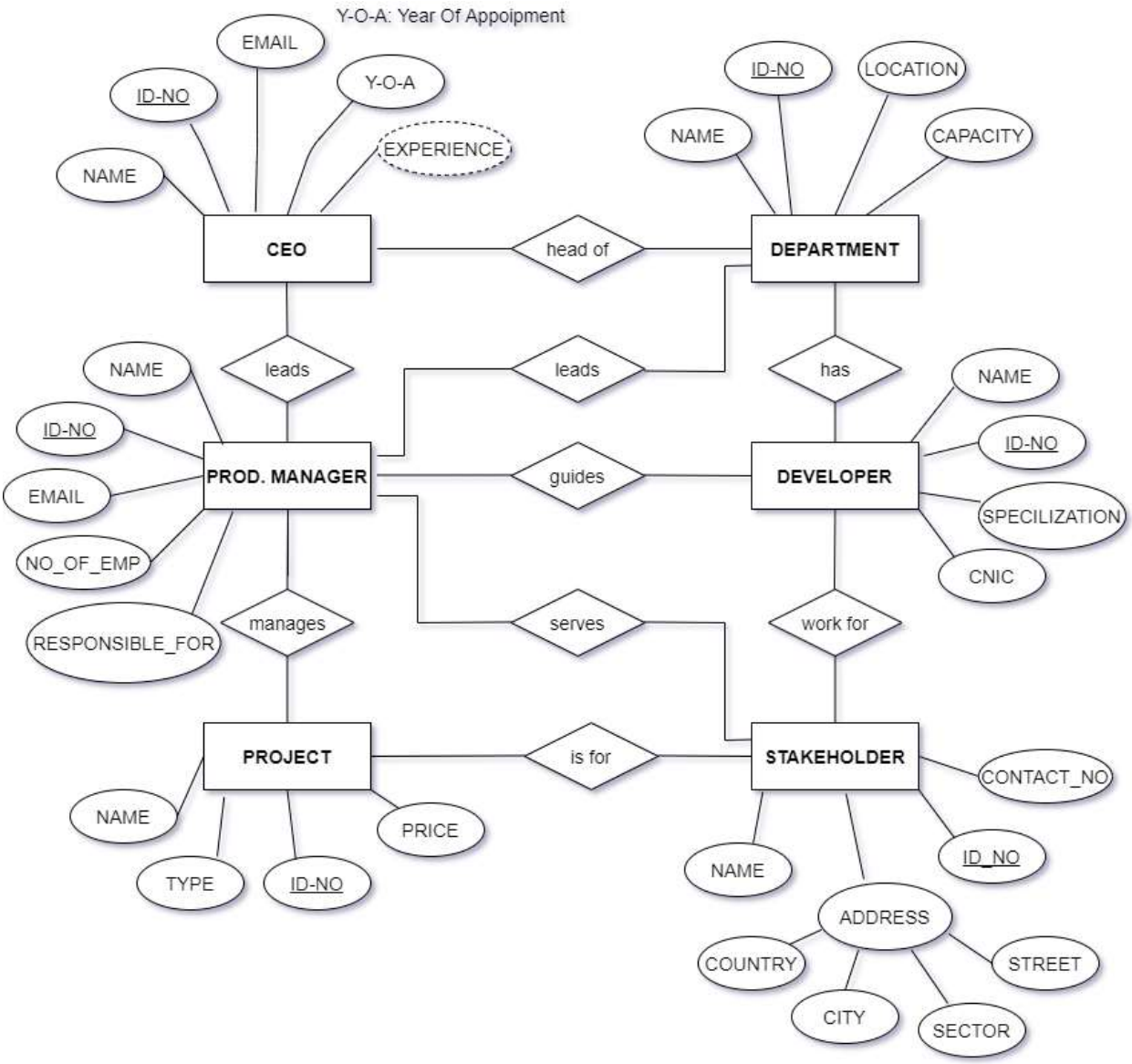
Data Structure Diagram

There are following classes in this project and the relationship between them is also represented with data structure diagram.

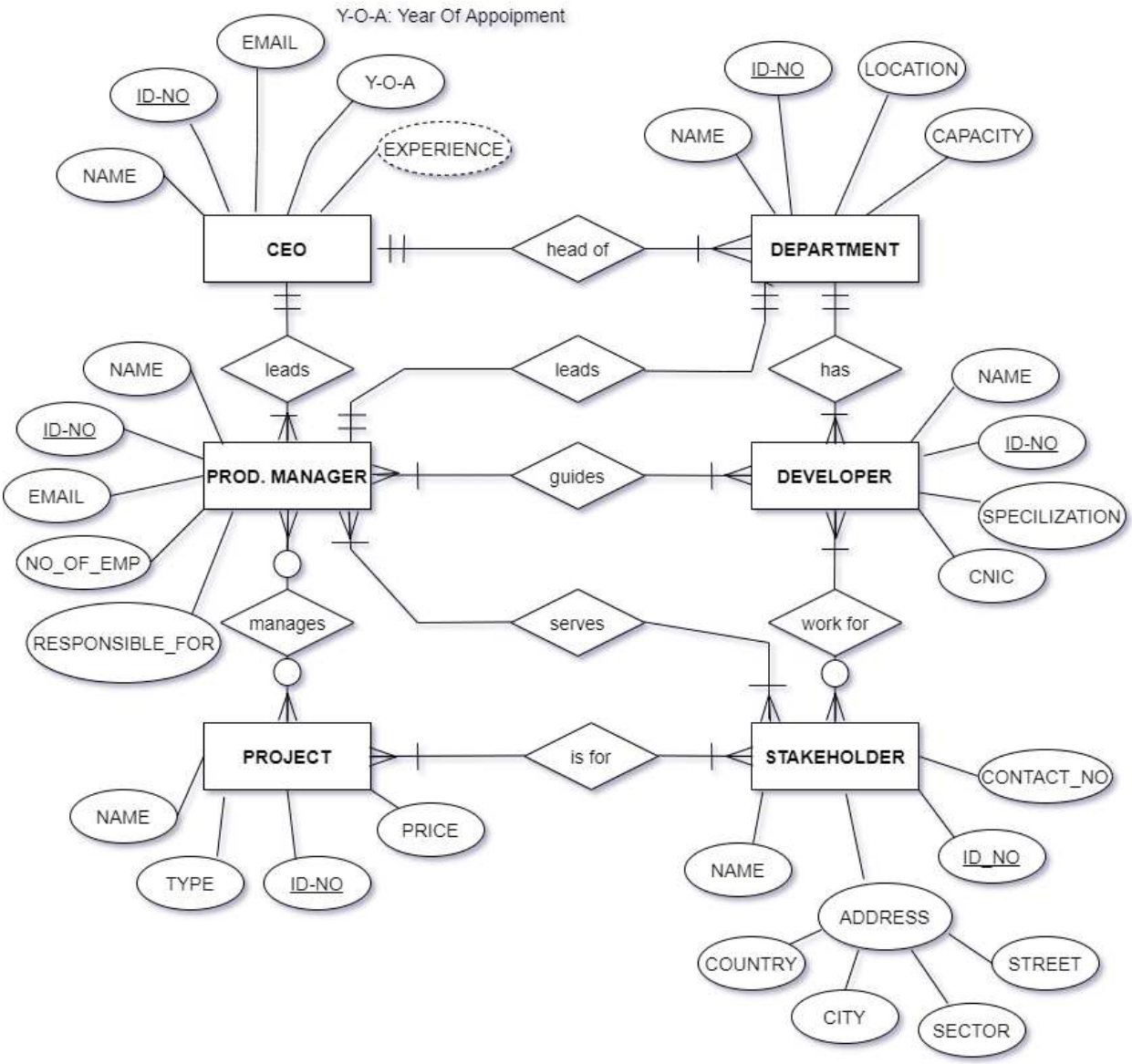
- Chief Executive Officer(CEO)
- Departments
- Project Manager
- Developers
- Projects
- Stakeholder



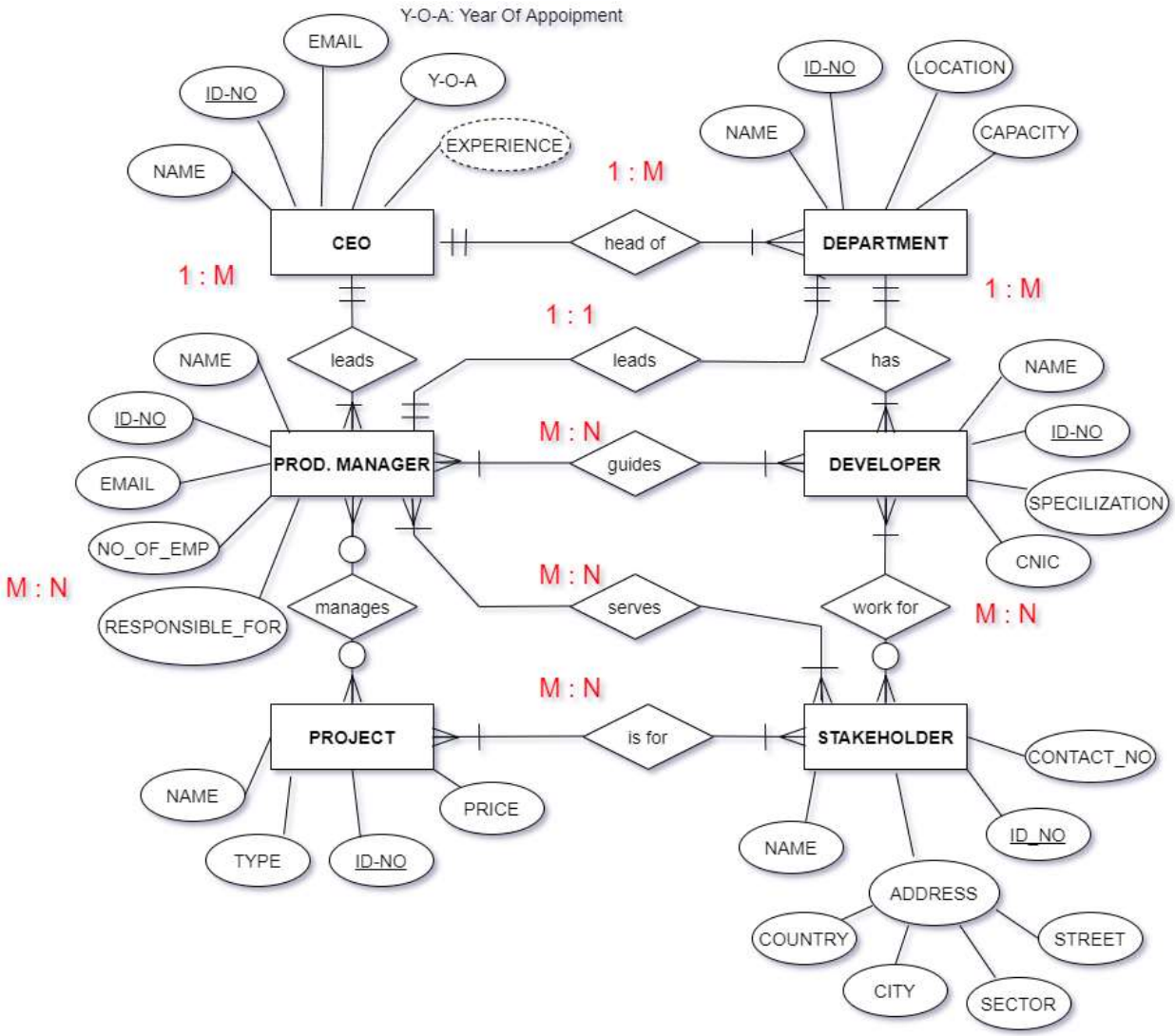
Entity Relationship Diagram (ERD)



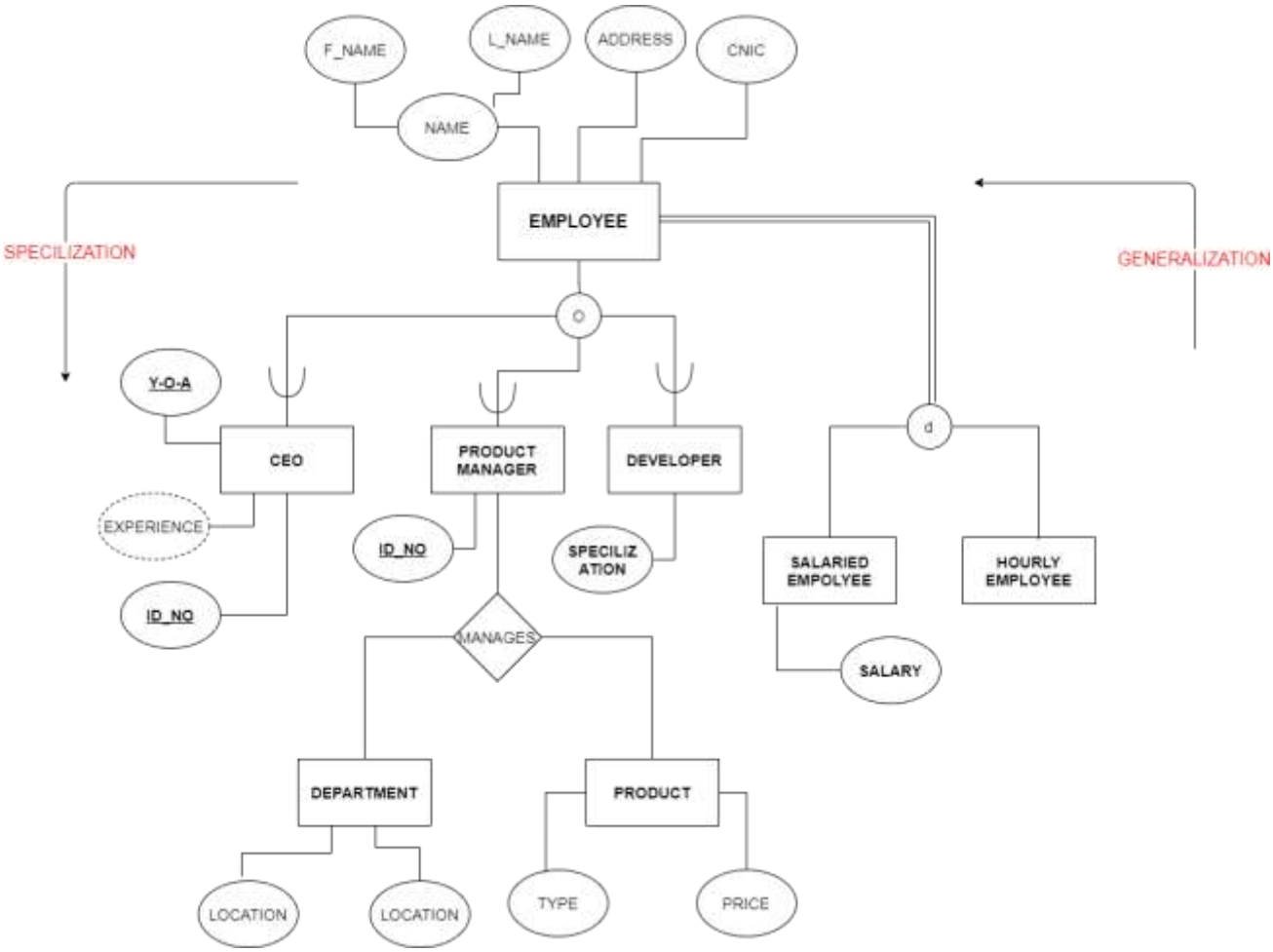
Finding Cardinalities



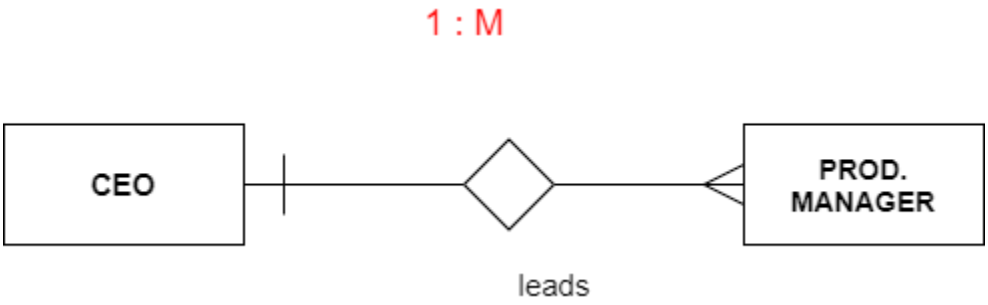
Finding Relationship

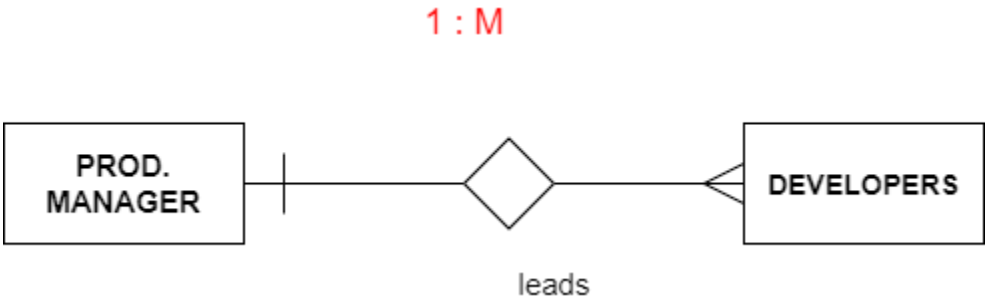


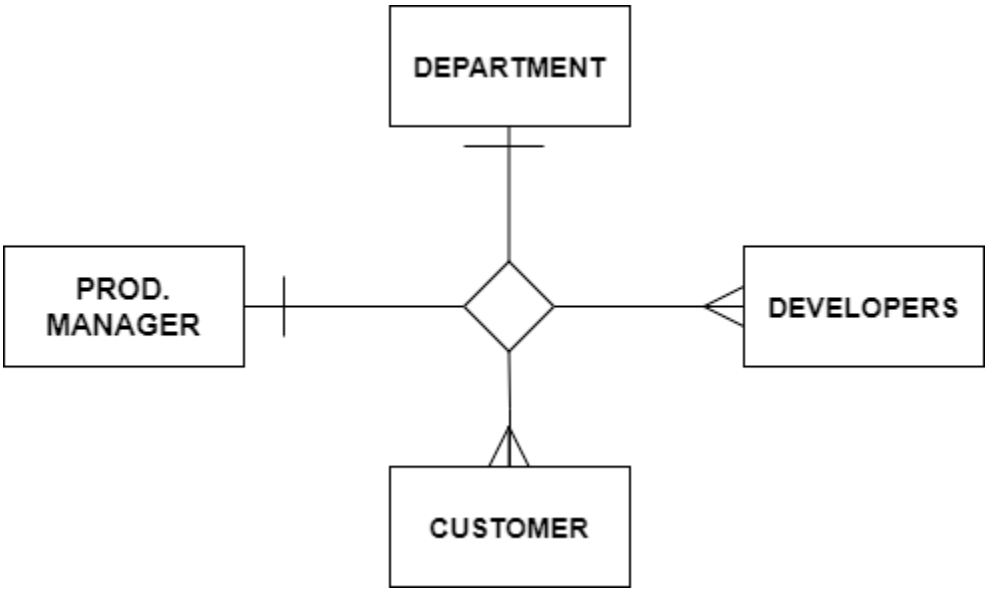
Enhanced Entity Relationship Diagram (EERD)



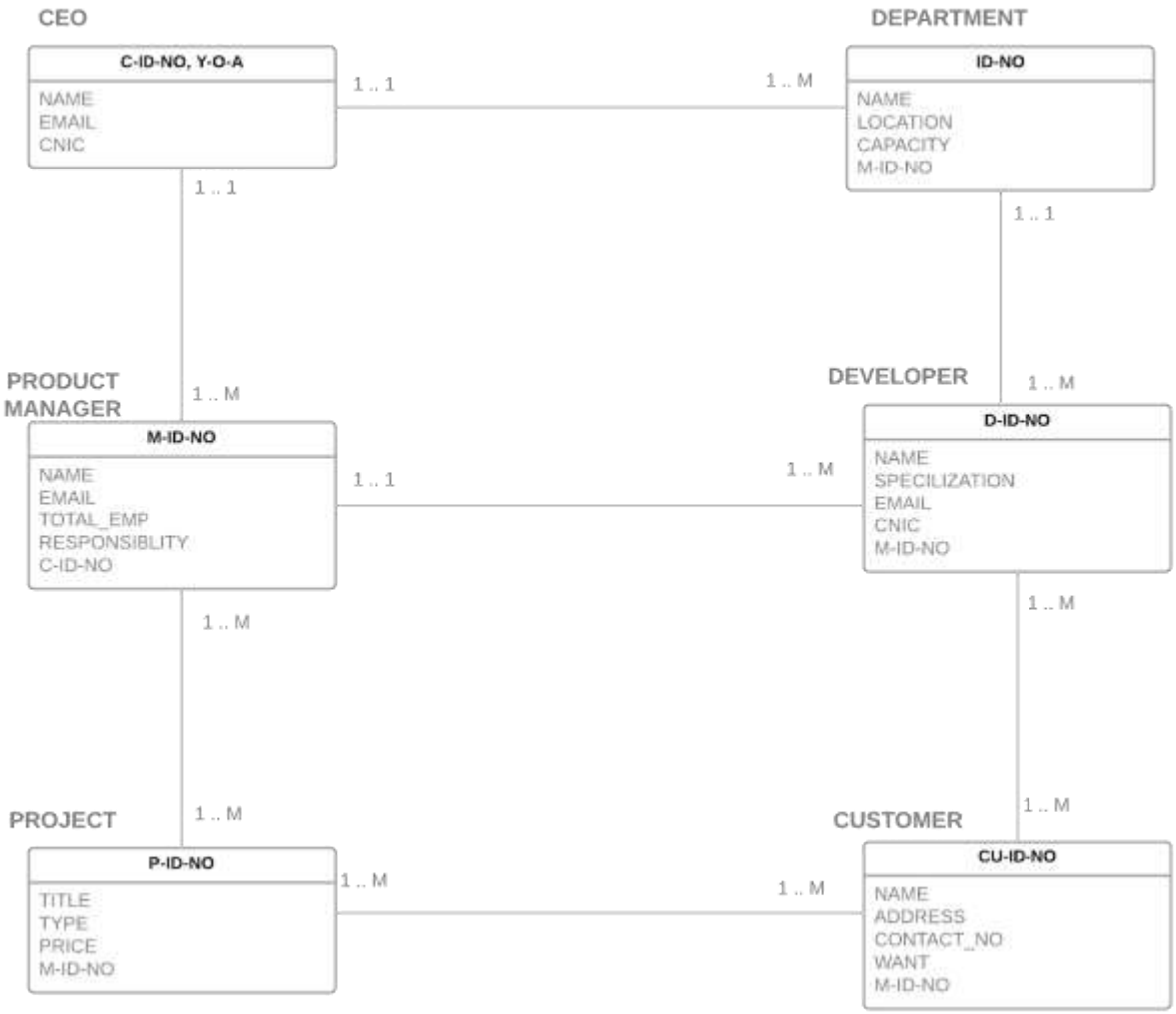
Identifying Degree







Modern Entity Relationship Diagram



Logical Data Model

This is a data model that appears from conceptual data model (ERD/EERD).

There are 4 steps for logical data model

1. Representing entity classes
2. Represent Relationship
3. Normalization
4. Integration of Relations

1. Representing Entity Classes

In this step we make table for each entity class.

Chief Executive Officer table

CHIEF EXECUTIVE OFFICER (CEO)				
ID-NO	**Y-O-A**	**NAME**	**EMAIL**	**CNIC**
1	2012	M. ALI	ali@example.com	37431-323223-2
2	2015	HAMZA	hamza@example.com	37431-363003-3
3	2016	M.ALI	ali1@example.com	39933-32883-5
4	2018	M. FAHAD	fahad@example.com	3901-323123-2
5	2019	M. SAAD	saad@example.com	37431-32001-9

Product Manager table

PRODUCT MANAGER				
ID-NO	NAME	EMAIL	TOTAL-EMPLOYEES	RESPONSIBILITY
2	DAIM	daim@example.com	10	Web Apps Dev
1	SHAHMEER	shahmeer@example.com	7	Android App Dev
3	SARMAD	sarmad@example.com	9	DataBase Dev
4	KASHIF	kashif@example.com	6	AI Apps Dev
5	NABEEL	nabeel@example.com	7	DevOps team Management

Department table

DEPARTMENT				
ID-NO	NAME	LOCATION	CAPACITY	HEAD
100	WEB APPS DEP	Block A	50	DAIM
105	MOBILE APPS DEP	Block A	70	SHAHMEER
103	DATABASE DEP	Block B	30	SARMAD
102	AI APPS DEP	Block A	35	KASHIF
104	DEVOPS	BLOCK B	40	NABEEL

Developer table

DEVELOPER				
ID-NO	**NAME**	**SPECILIZATION**	**EMAIL**	**CNIC**
2	Naeem	Web developer	naeem@example.com	34568-4534892-5
1	Hamza	AI Engineer	hamza@example.com	32598-4044800-2
3	Aslam	Android developer	aslam@example.com	34001-3454800-8
4	Saad	Full Stack Developer	saad@example.com	32352-4034241-0
5	Hassan	DevOps engineer	hassan@example.com	33508-4414902-1

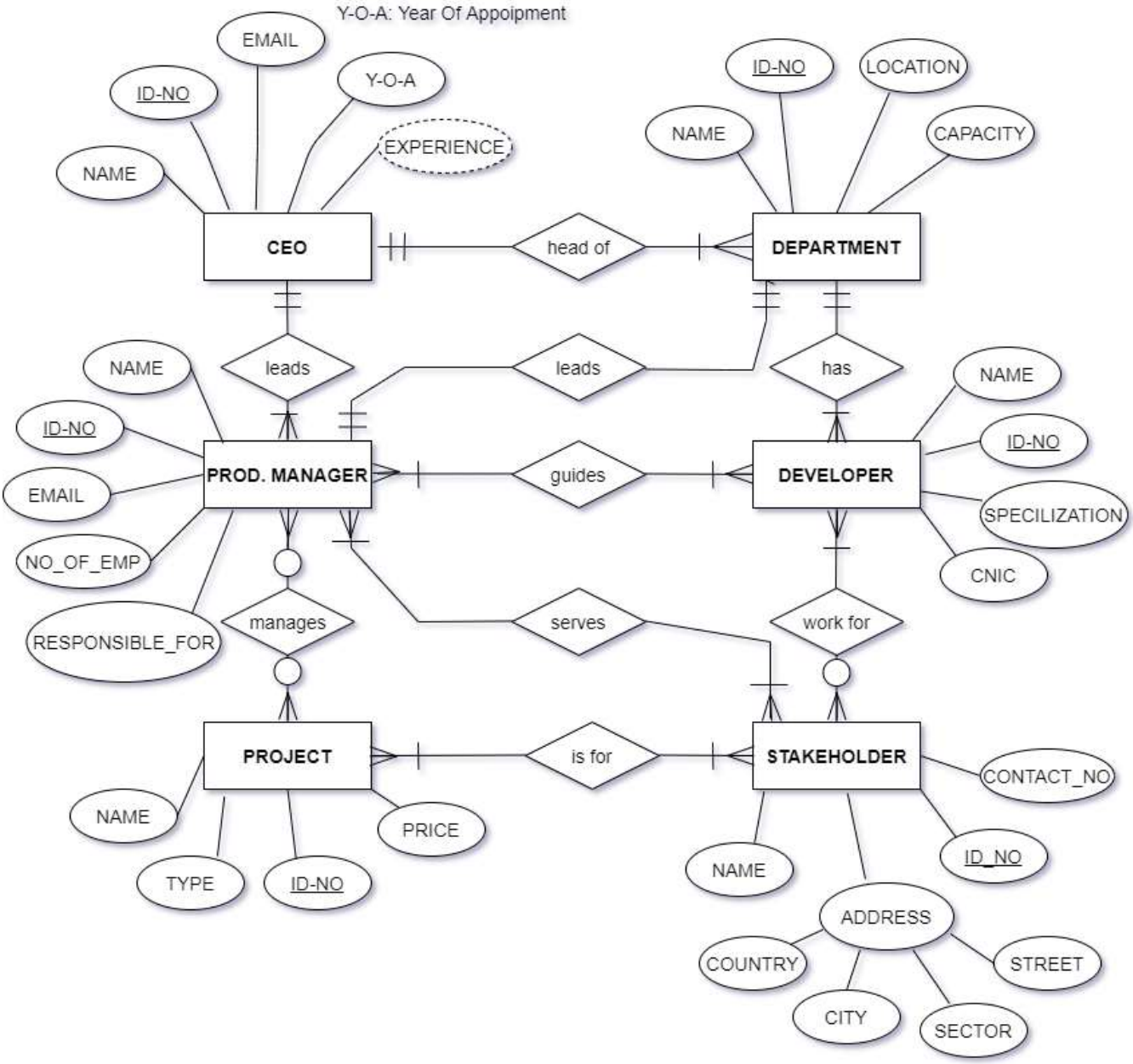
Project table

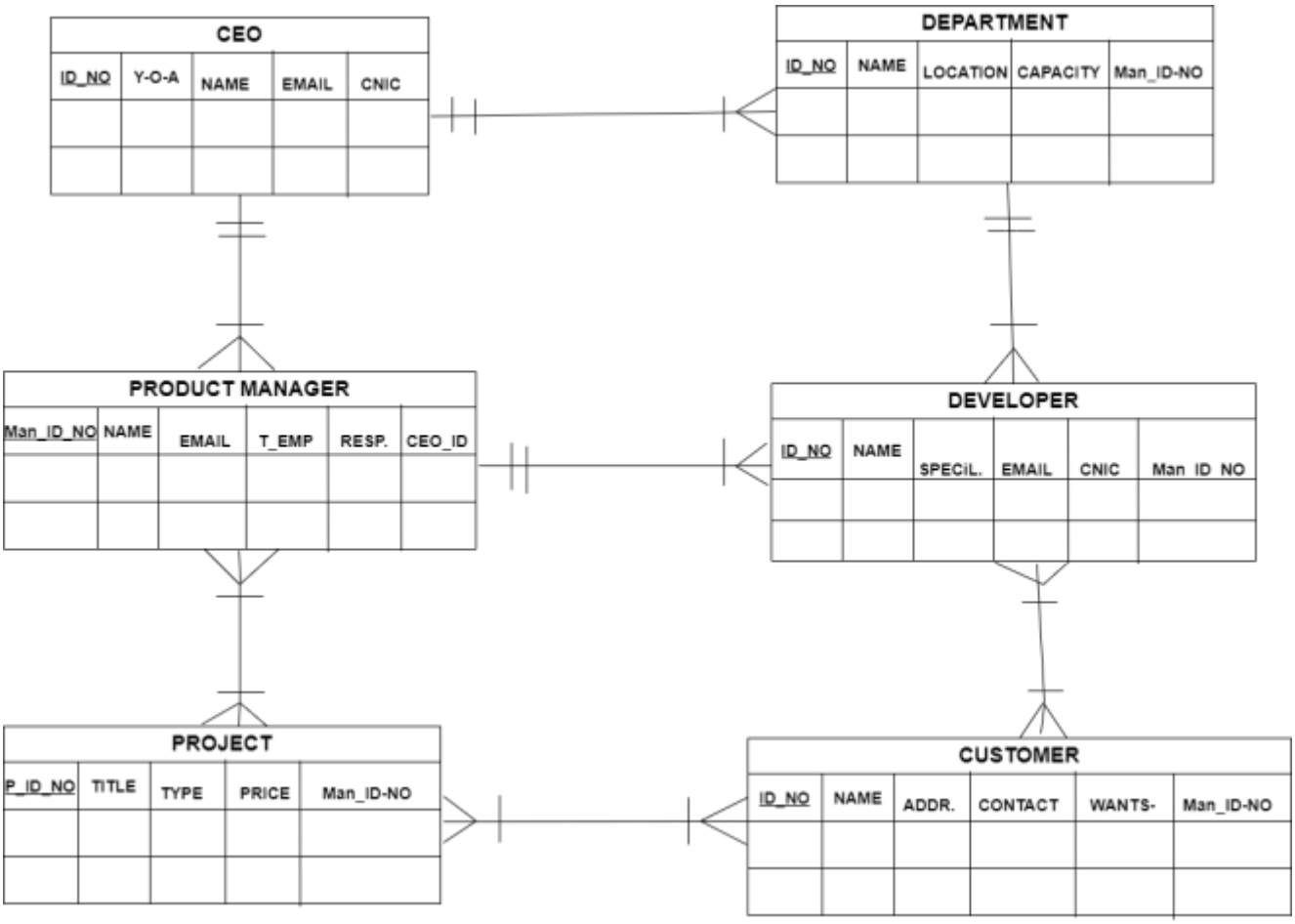
PROJECT				
ID-NO	**TITLE**	**TYPE**	**PRICE**	**LEAD BY**
1	Web App for Sales store	WEB APP	50000	DAIM
2	Mobile App for Daraz	ANDROID APP	30000	SHAHMEER
3	Design DataBase for Retail Sector	DATABASE DEV	60000	SARMAD
4	Face Detection System for Security Agency	AI BASED APP	100000	KASHIF
5	Manage Company Project	DevOps	90000	NABEEL

Stockholder/Customer table

STACKHOLDER				
ID-NO	**NAME**	**ADDRESS**	**CONTACT NO**	**WANTS**
1	Jhanzaib	USA	1232323224	WEB APP
2	Aslam	Pakistan, Lahore	9243434232	ANDROID APP
3	ALI	Afghanistan	9374783478	AI APP
4	BILAL	Pakistan, ISB	9243548935	DATABASE SYSTEM
5	FAHAD	Canada	1783473847	PROJECT MANAGEMENT

2. Representing Relationship




CEO
ID_NO
Y-O-A
NAME
EMAIL
CNIC
DEPARTMENT
ID_NO
NAME
LOCATION
CAPACITY
Man_ID-NO
PRODUCT MANAGER
Man_ID_NO
NAME
EMAIL
T_EMP
RESP.
CEO_ID
DEVELOPER
ID_NO
NAME
SPECiL.
EMAIL
CNIC
Man ID NO
PROJECT
P_ID_NO
TITLE
TYPE
PRICE
Man_ID-NO
CUSTOMER
ID_NO
NAME
ADDR.
CONTACT
WANTS-
Man_ID-NO

3. Normalization

First we have to check whether any **Anomaly** exist in relation or not then go for normalizing relation **if any anomaly exists**.

Chief Executive Officer table

CHIEF EXECUTIVE OFFICER (CEO)				
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4	2018	M. FAHAD	fahad@example.com	3901-323123-2
5	2019	M. SAAD	saad@example.com	37431-32001-9

Checking for Anomalies

- **Insertion Anomaly**

As we can easily insert data and none of the data depend on other so no insertion anomaly exists in this relation

- **Modification Anomaly**

We can easily update data as there is no copies of data present in relation, So there is no modification anomaly present in relation.

- **Deletion Anomaly**

We can easily delete any data in this relation as it does not cause deletion of some other data. So deletion anomaly not exist here.

Normalization – Normal Forms

- **1st Normal Form**

  Relation is already in 1NF as there is no **repeating group** present in relation.

- **2nd Normal Form**

  Relation is already in 2NF as there is no **partial functional dependency** exist in relation

- **3rd Normal Form**

  Relation is already in 3NF as there is no **transitive dependency** exist in relation

So the relation **CEO** is already in Normal Form (s)

Product Manager table

PRODUCT MANAGER				
ID-NO	**NAME**	**EMAIL**	**TOTAL SUBORDINATES**	**RESPONSIBILITY**
2	DAIM	daim@example.com	10	Web Apps Dev
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So the relation **Product Manager** is already in Normal Forms

Department table

DEPARTMENT				
ID-NO	**NAME**	**LOCATION**	**CAPACITY**	**HEAD**
100	WEB APPS DEP	Block A	50	DAIM
105	MOBILE APPS DEP	Block A	70	SHAHMEER
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- **3rd Normal Form**

  We can easily determine **location, capacity** of department inside software house if we know department's **name,** so in above relation, **transitive dependency** is present.

  So in order to remove this transitive dependency and reform relation in 3NF, we will make separate relation for all dependent attributes and set foreign key in department table to relate both relations

DEPARTMENT		
ID-NO	HEAD	**NAME**
100	DAIM	WEB APPS DEP
105	SHAHMEER	MOBILE APPS DEP
103	SARMAD	DATABASE DEP
102	KASHIF	AI APPS DEP
104	NABEEL	DEVOPS

LOCATION		
NAME	LOCATION	CAPACITY
WEB APPS DEP	Block A	50
MOBILE APPS DEP	Block A	70
DATABASE DEP	Block B	30
AI APPS DEP	Block A	35
DEVOPS	BLOCK B	40

Now the department table is in 3NF and satisfy all conditions of Normal Forms

Developer table

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ID-NO	NAME	SPECILIZATION	EMAIL	CNIC
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  Relation is already in 3NF as there is no **transitive dependency** exist in relation

So the relation **Developer** is already in Normal Forms

Project table

PROJECT				
ID-NO	**TITLE**	**TYPE**	**PRICE**	**LEAD BY**
1	Web App for Sales store	WEB APP	50000	DAIM
2	Mobile App for Daraz	ANDROID APP	30000	SHAHMEER
3	Design DataBase for Retail Sector	DATABASE DEV	60000	SARMAD
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So the relation **Project** is already in Normal Forms

Stockholder/Customer table

STACKHOLDER				
ID-NO	**NAME**	**ADDRESS**	**CONTACT NO**	**WANTS**
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2	Aslam	Pakistan	9243434232	ANDROID APP
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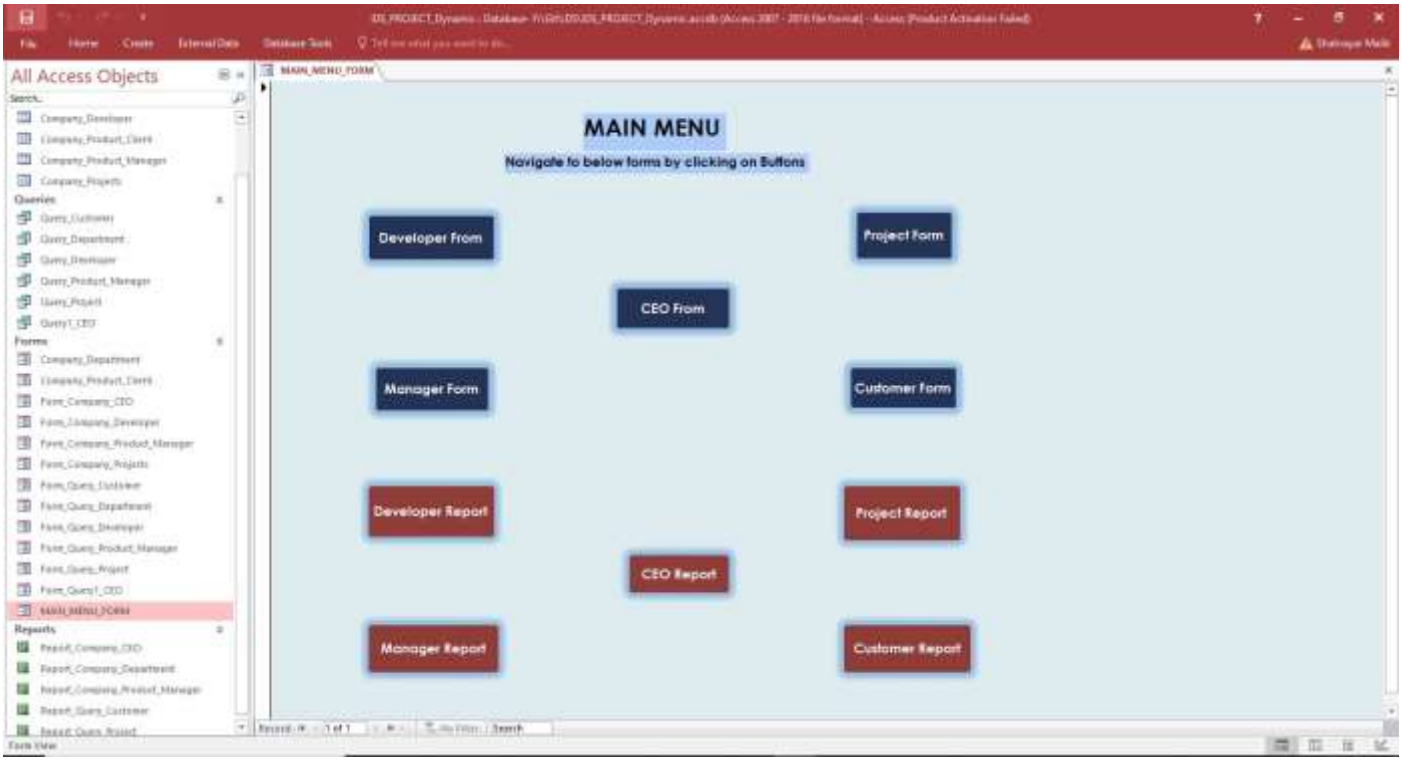
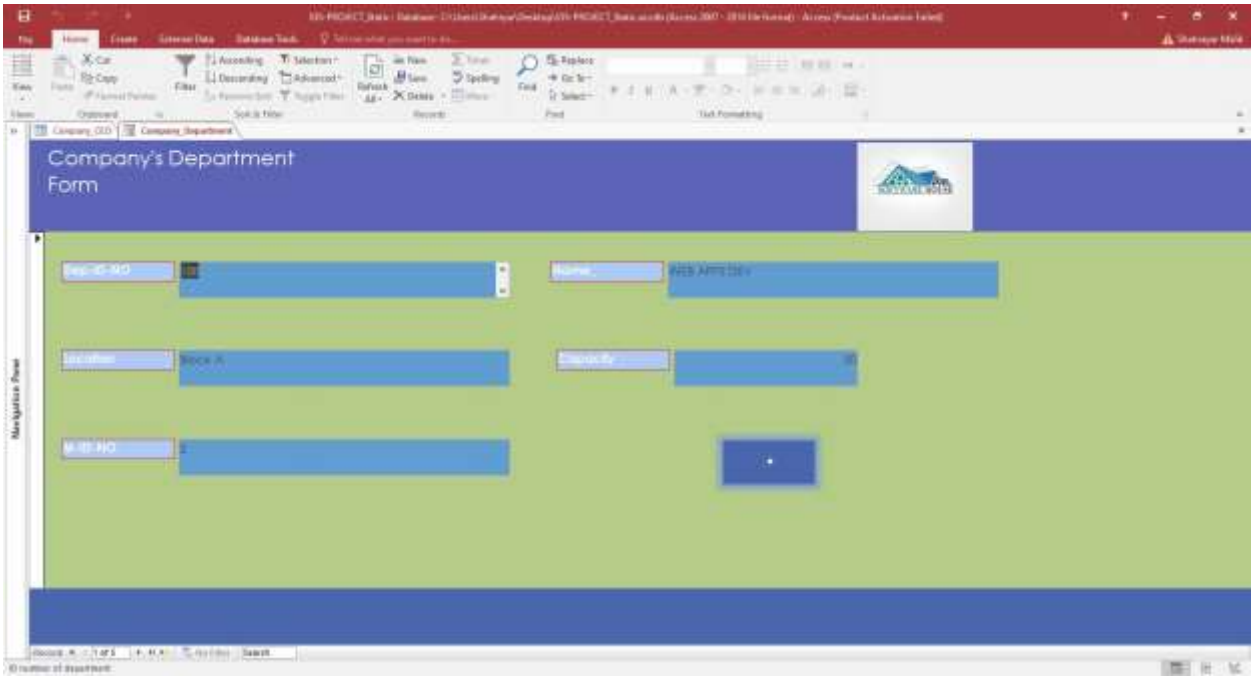
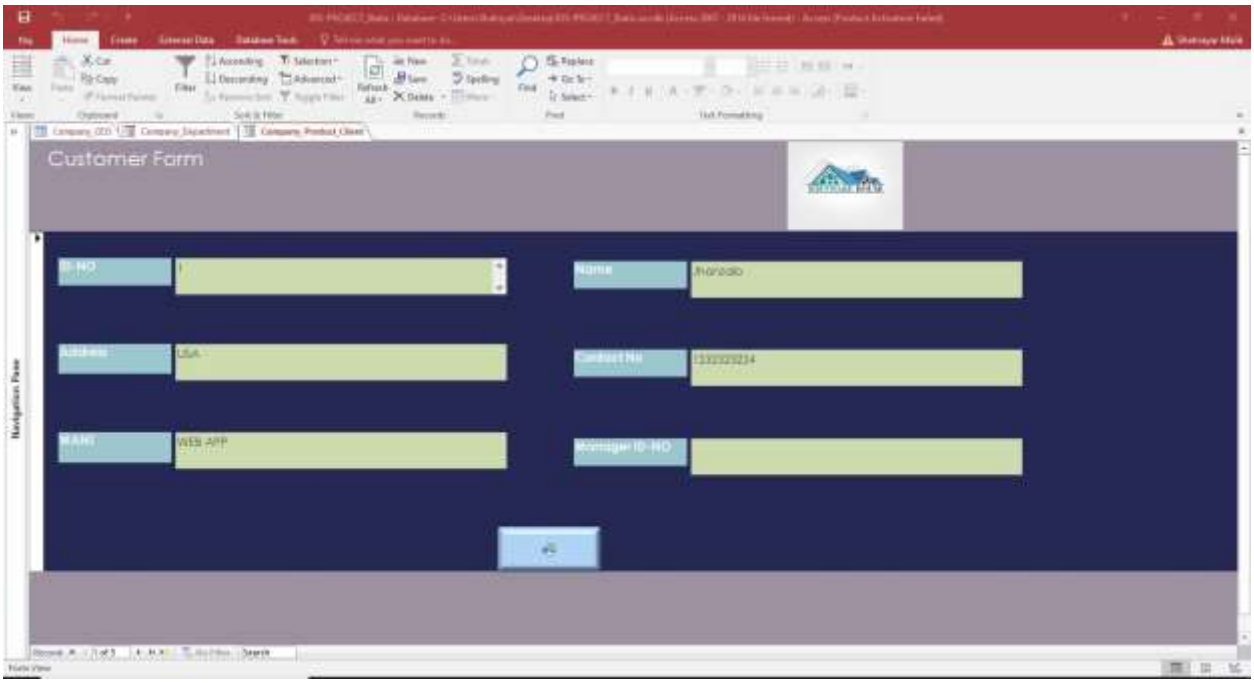
So the relation **Customer** already in Normal Forms.

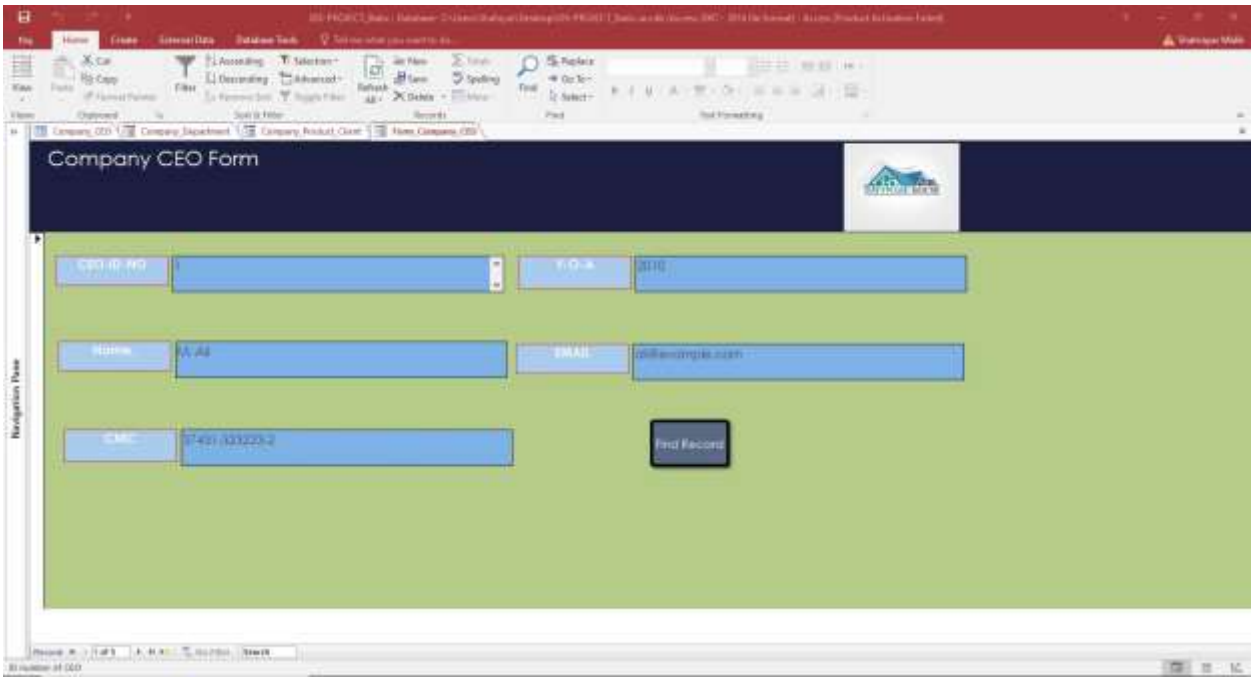
Screenshots

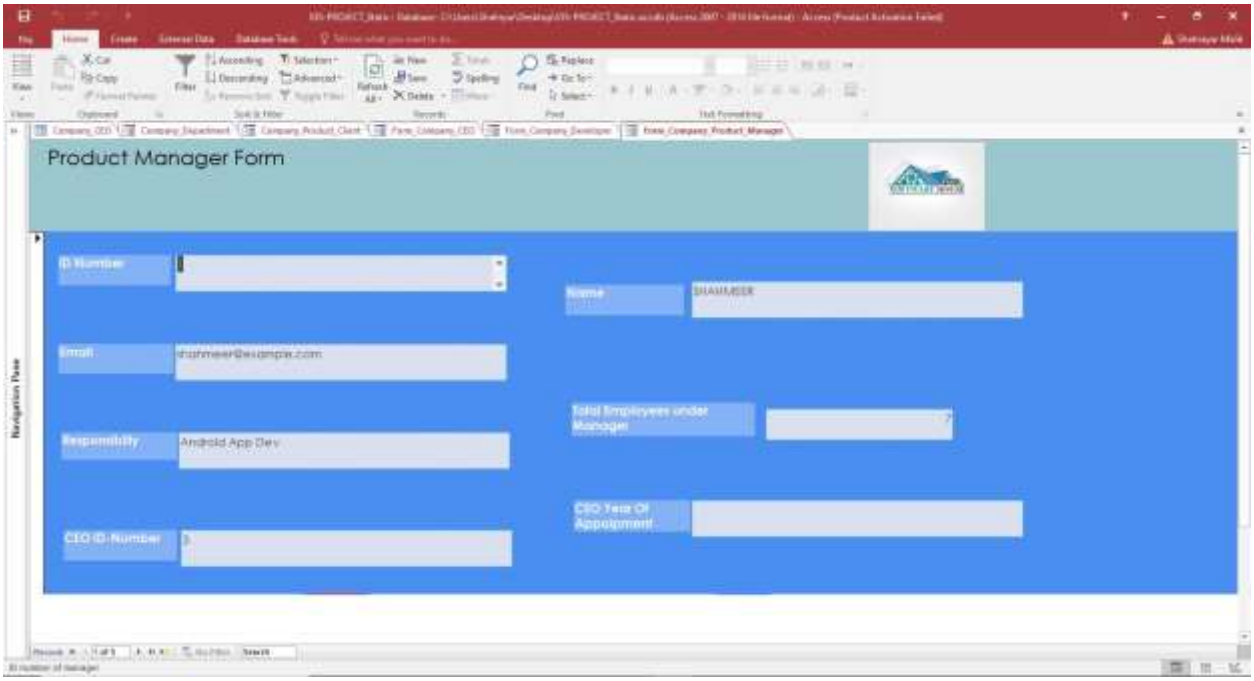
Forms - Static

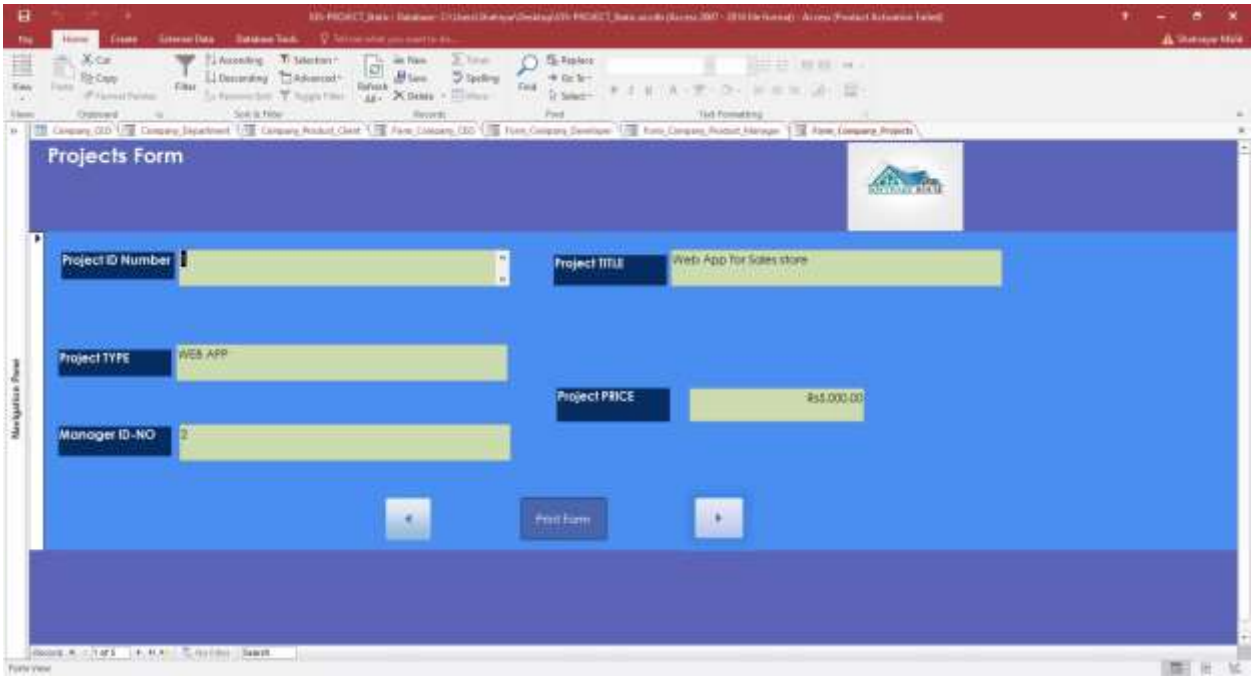


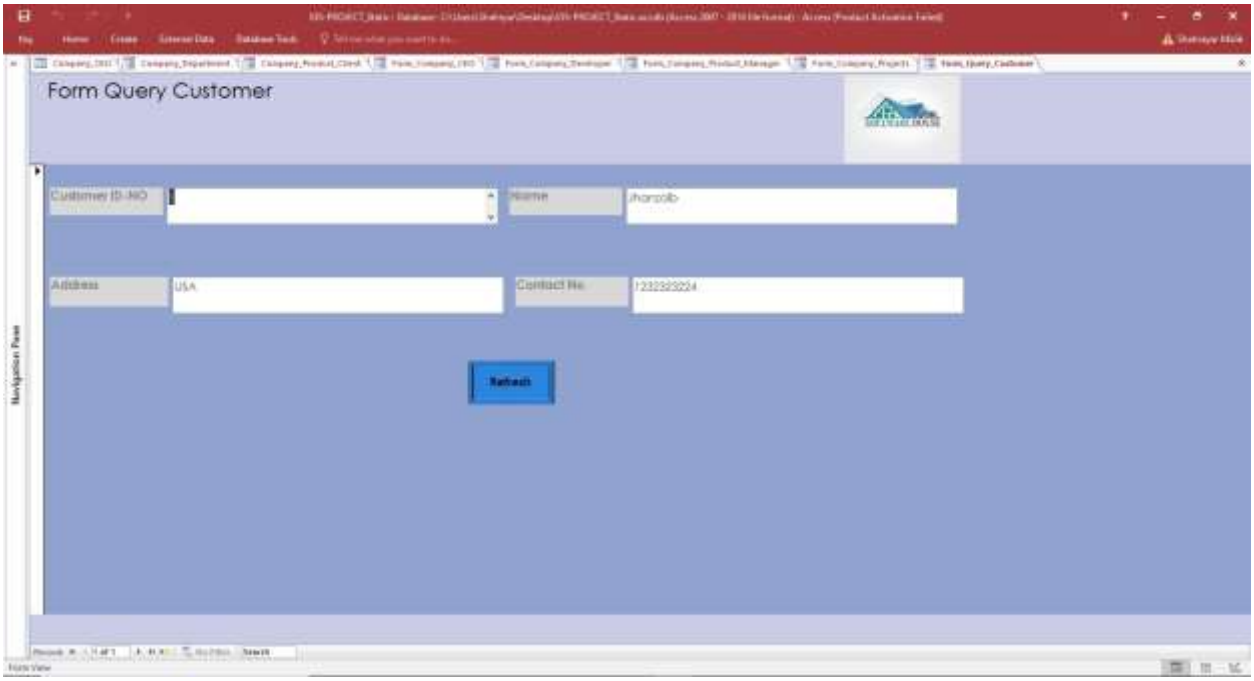

Company's Department
Form


Customer Form


Company CEO Form
Find Record


Product Manager Form
Email
Responsibility
Android App Dev
Total Employees under Manager
CEO ID Number


Projects Form
Project ID Number
Project TITLE
Web App for Sales store
Project TYPE
WEB APP
Project PRICE
Rs5,000.00
Manager ID-NO
2
Print Form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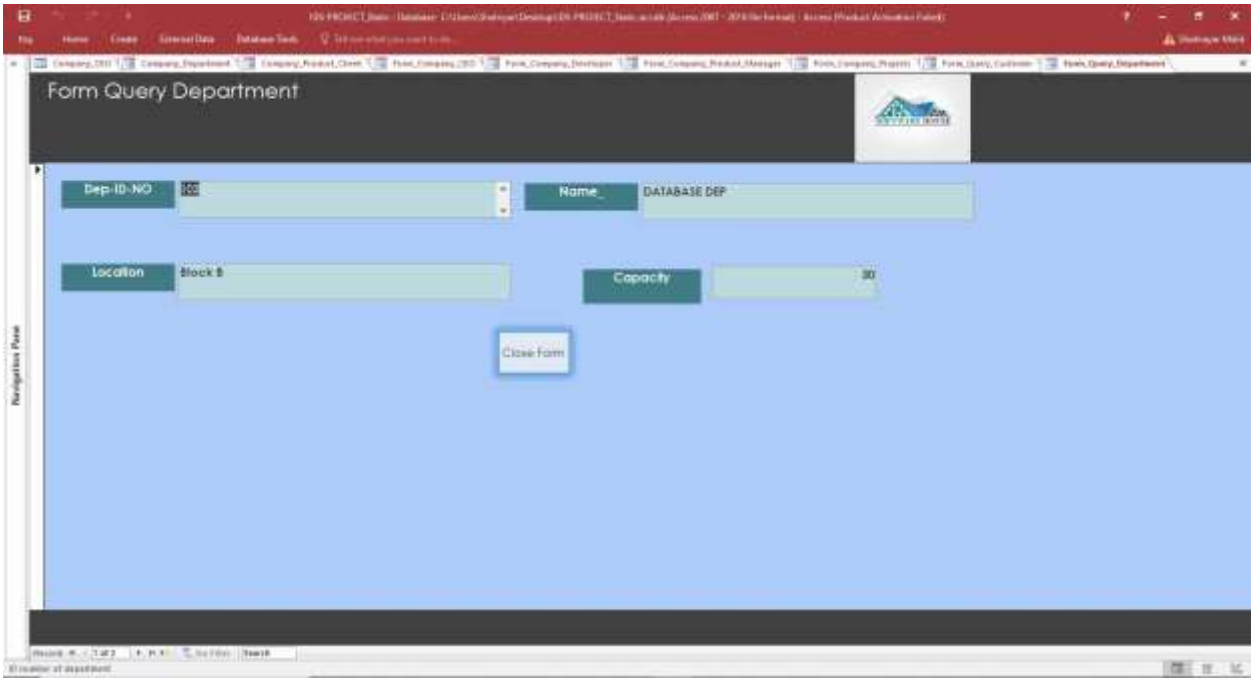
Customer ID-NO
Name
Address
USA
Contact No
1232323224
Refresh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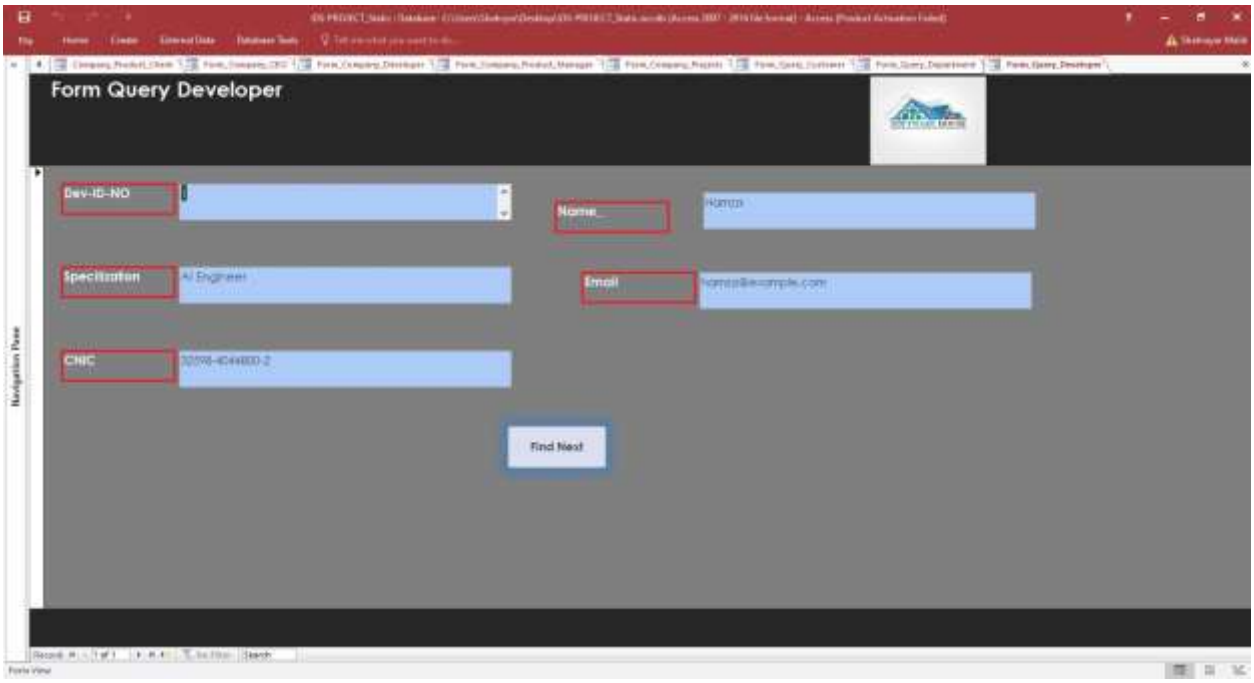
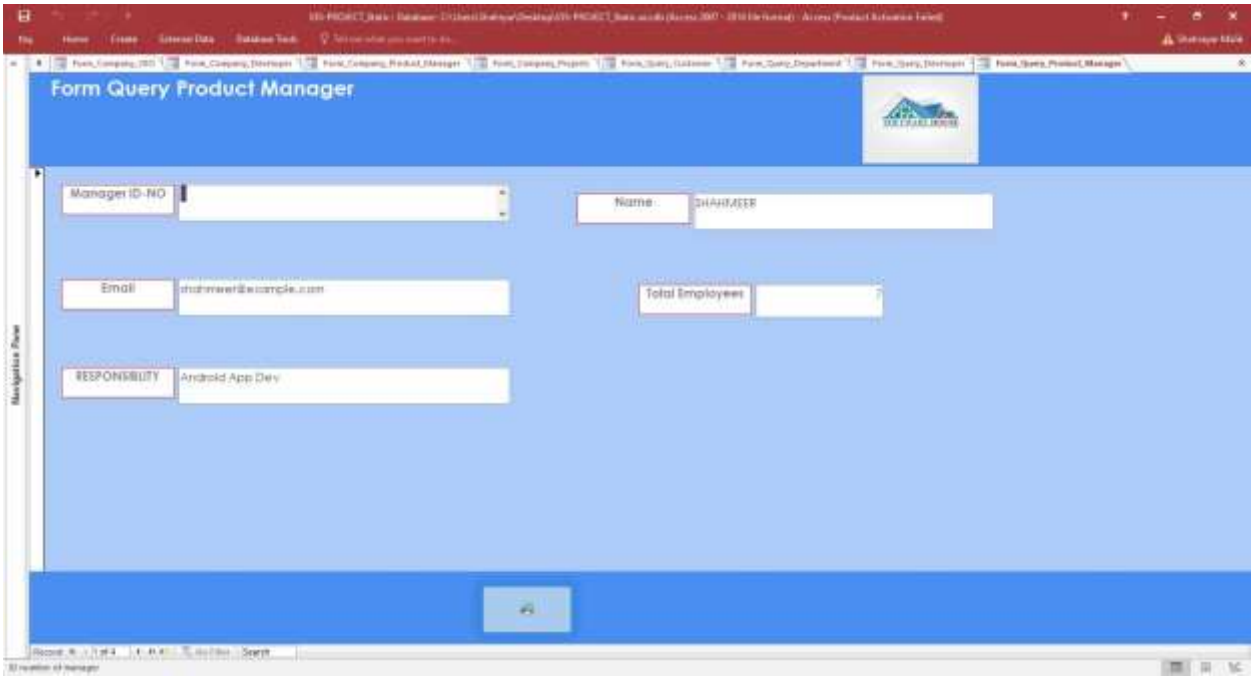
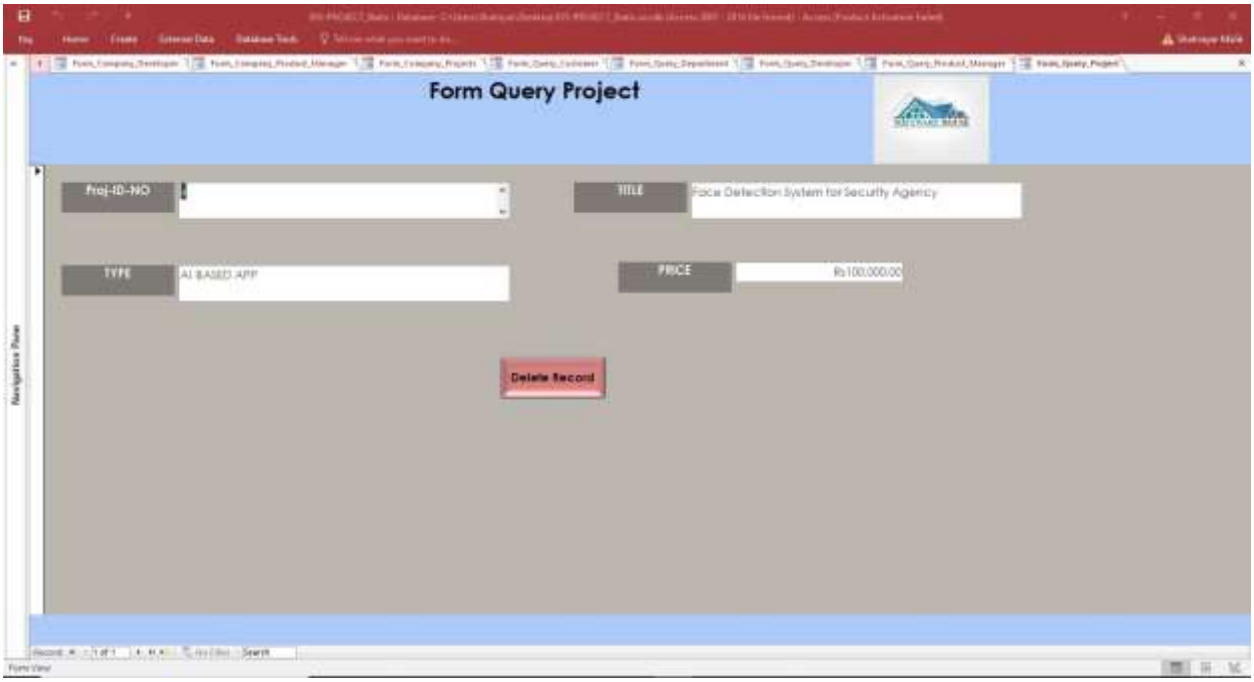
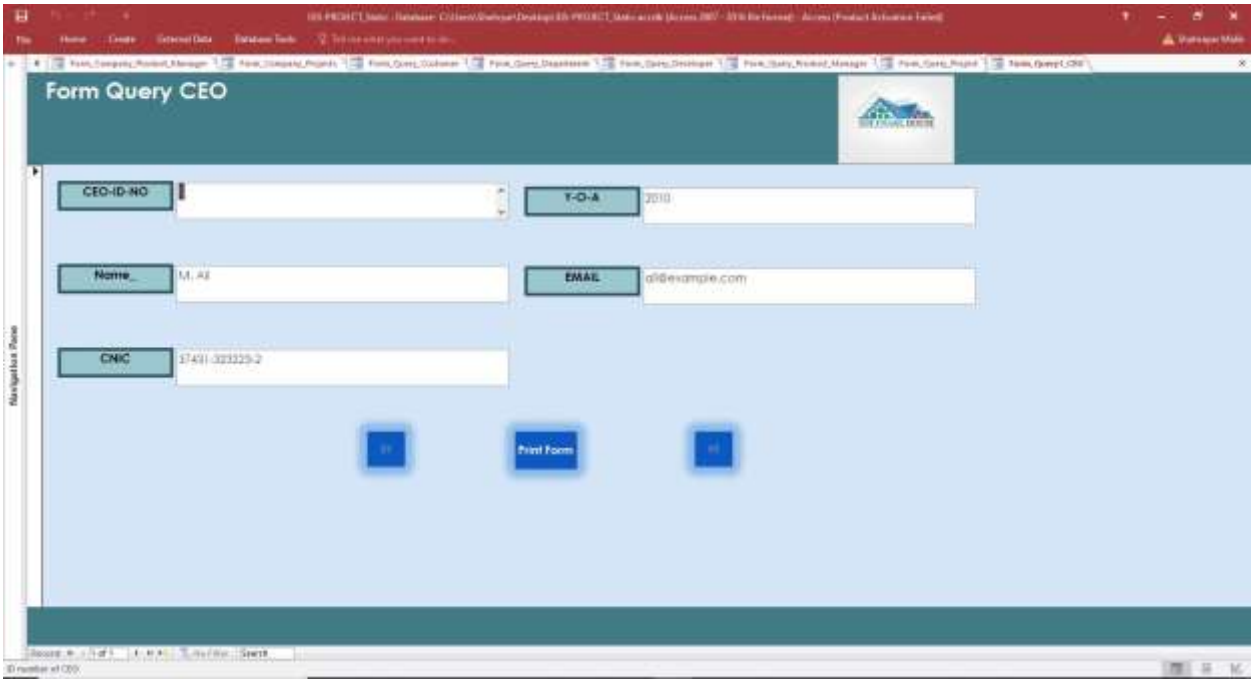
Dep-ID-NO
Name_
DATABASE DEP
Location
Block B
Capacity
Close Form

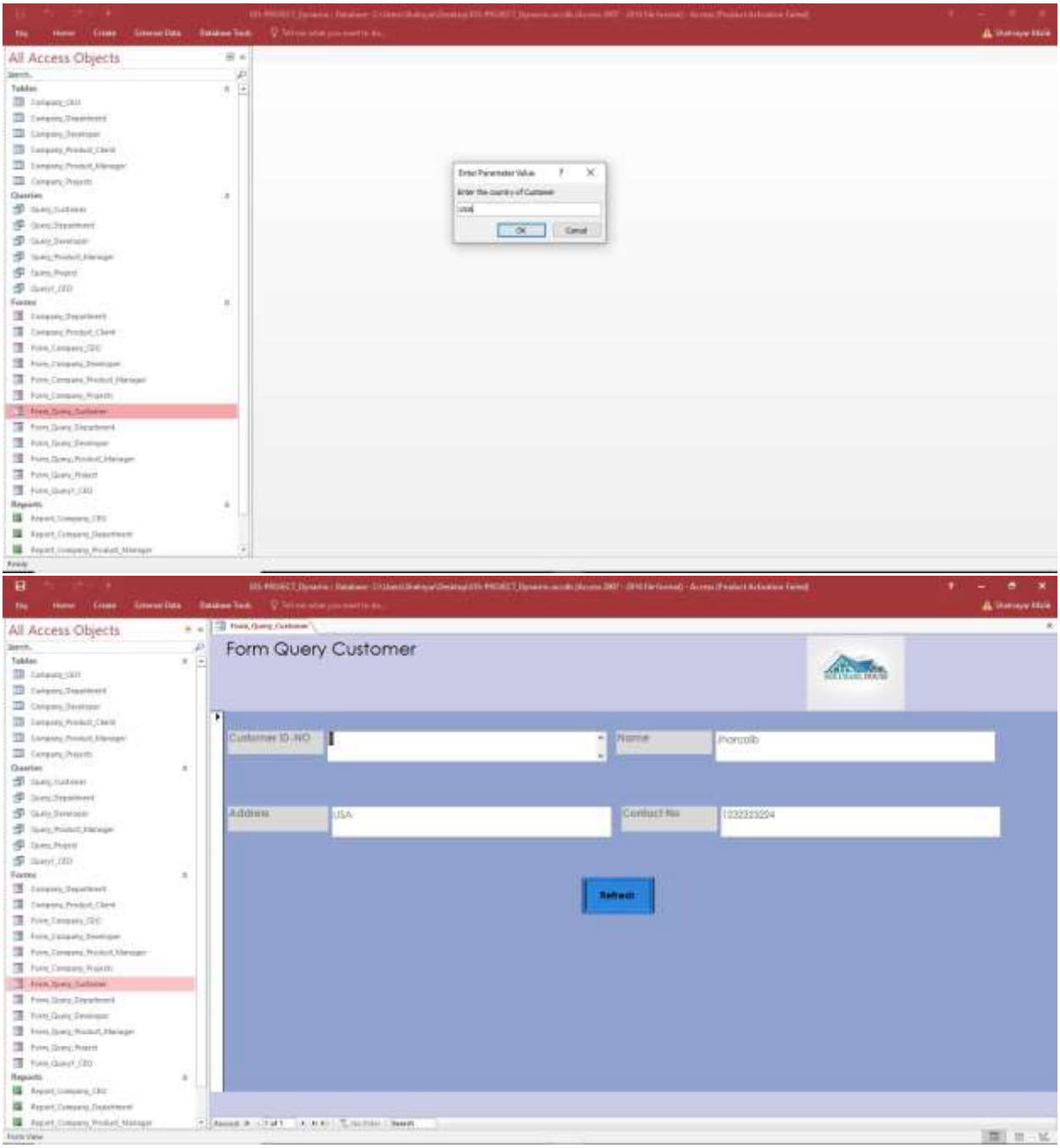

Form Query Developer
Dev-ID-NO
Name_
Specilization
Email
CNIC
Find Next

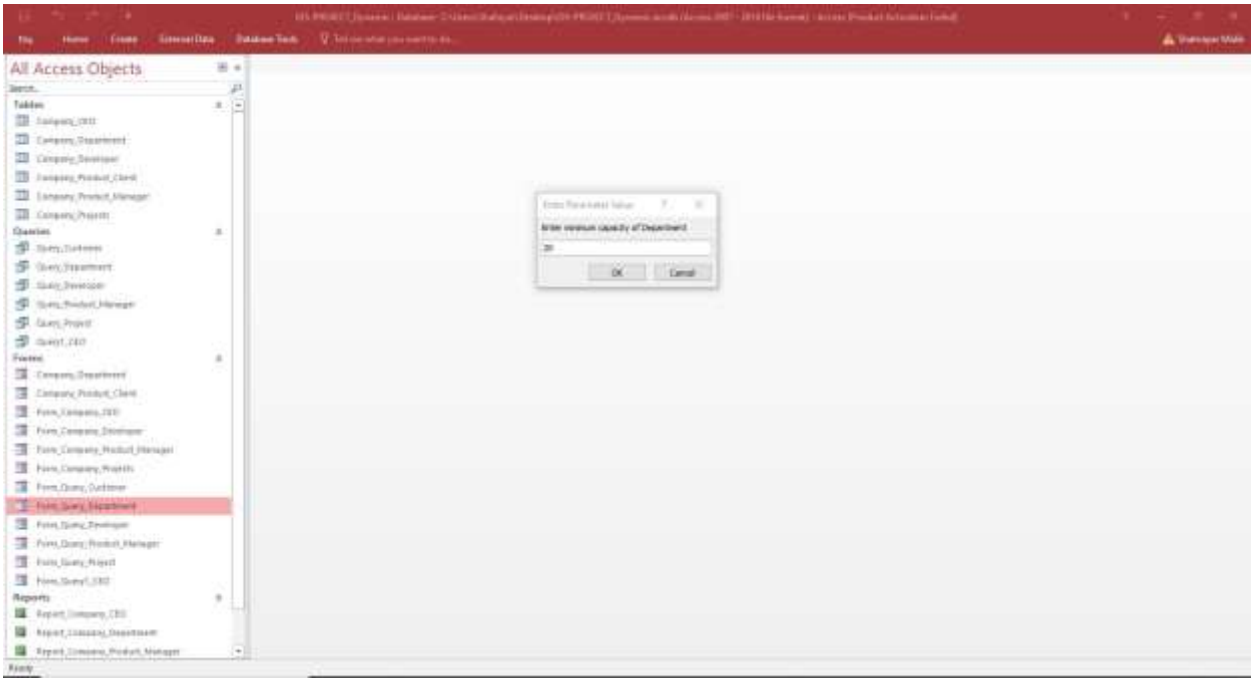

Form Query Product Manager
Manager ID-NO
Name
SHAHMEER
Email
Total Employees
RESPONSIBILITY
Android App Dev


Form Query Project
Proj-ID-NO
TITLE
Face Detection System for Security Agency
TYPE
AI BASED APP
PRICE
Rs100,000.00
Delete Record


Form Query CEO
CEO-ID-NO
Y-O-A
2010
Name_
M. Ali
EMAIL
ali@example.com
CNIC
Print Form

Forms – Dynamic

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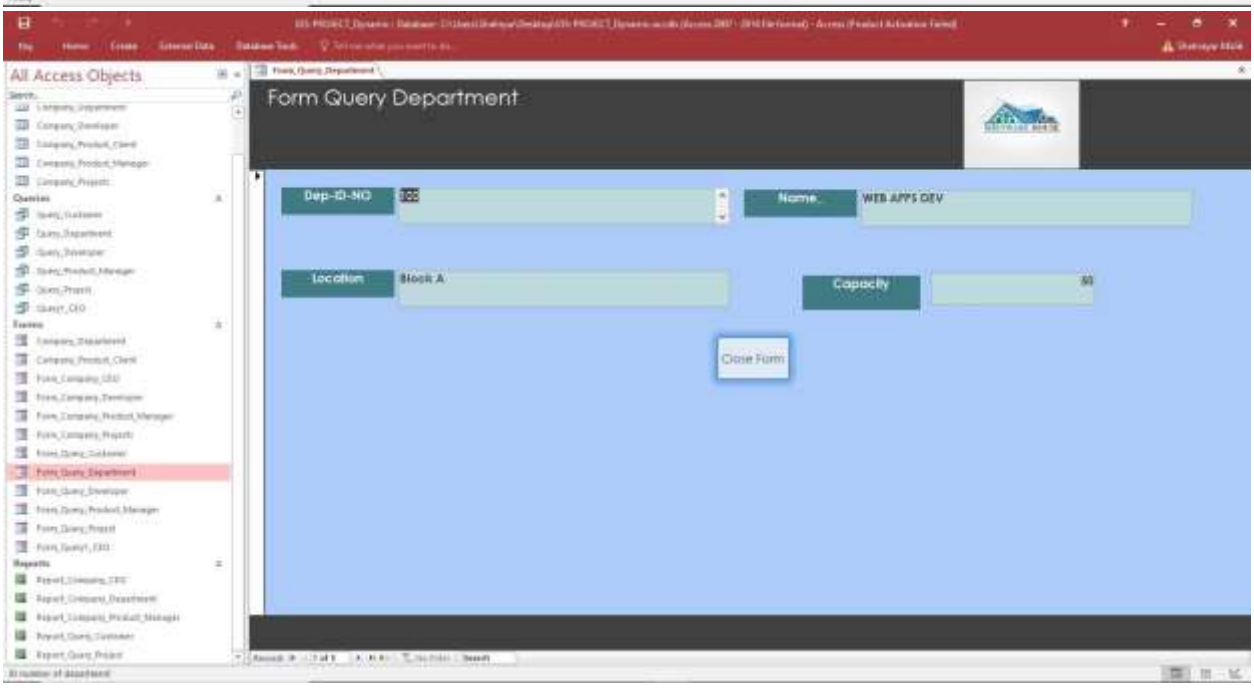
Enter minimum capacity of Department
20
OK
Cancel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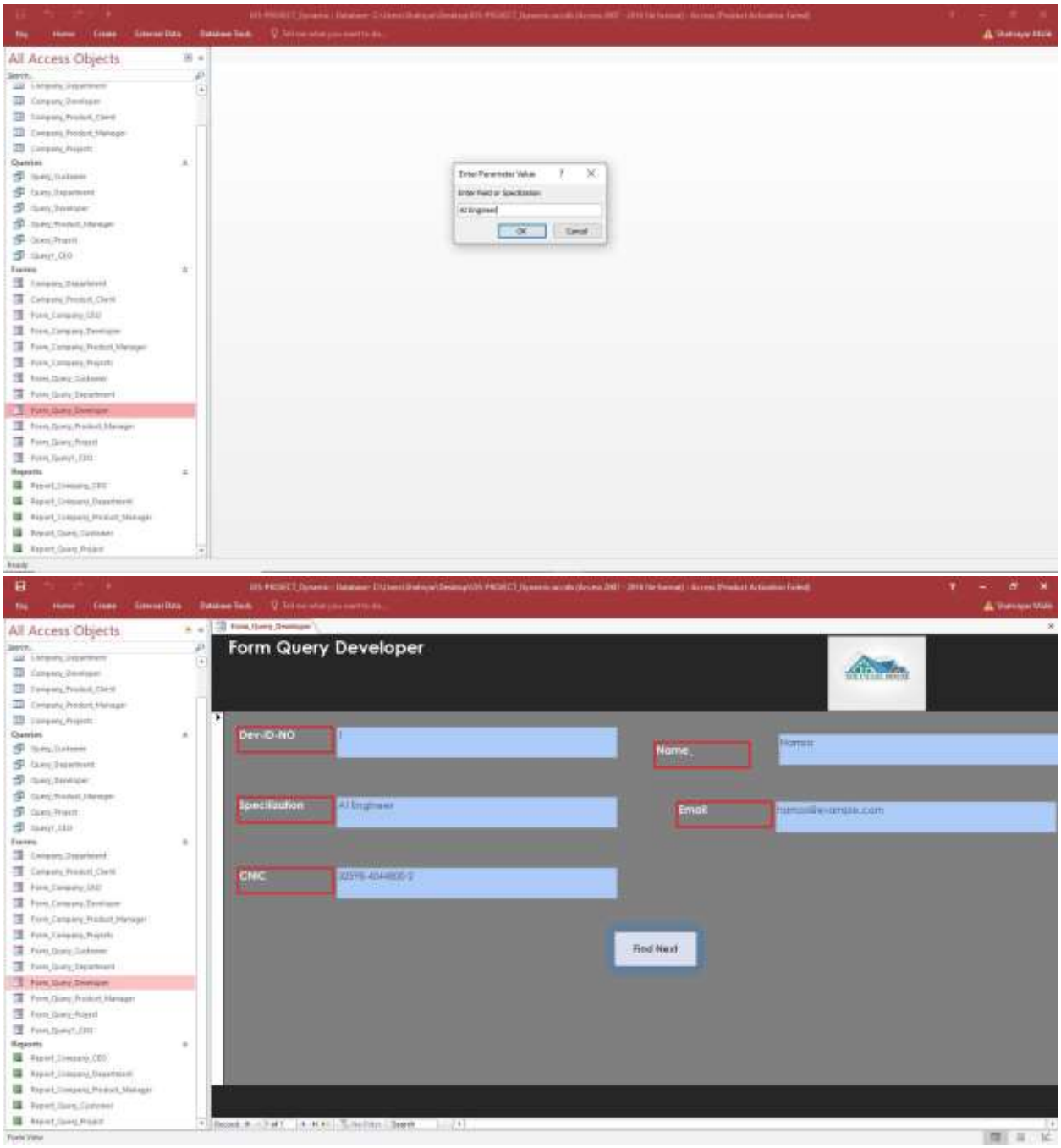
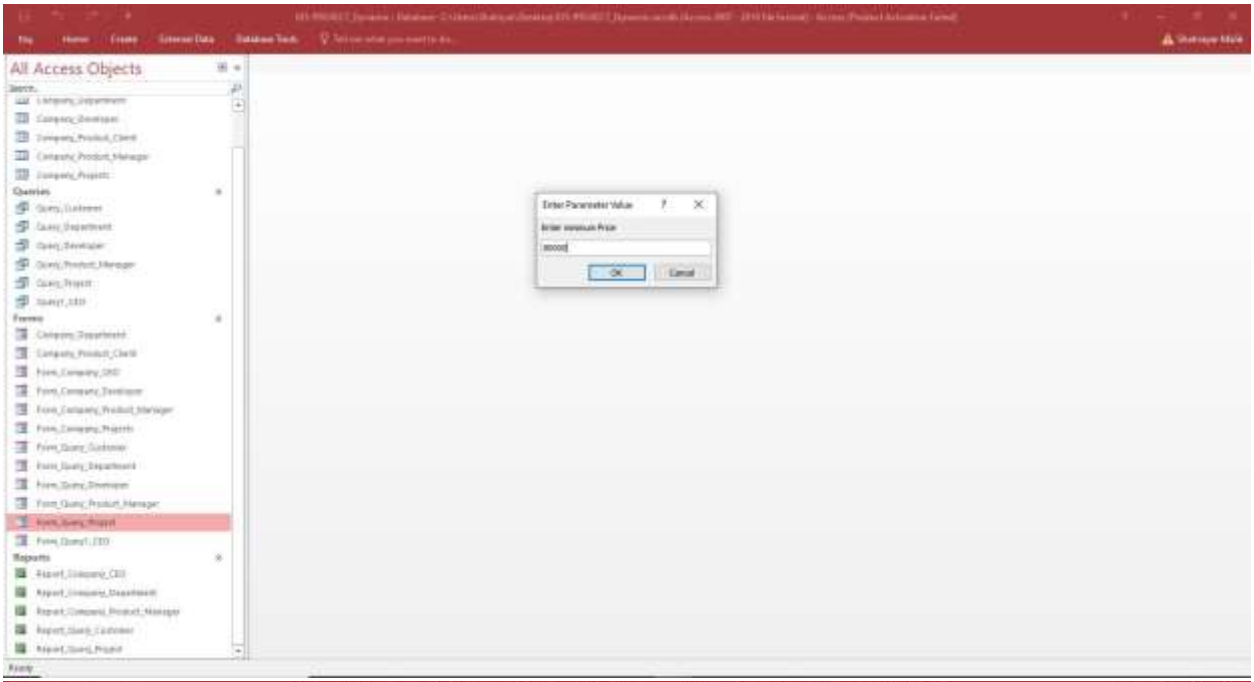
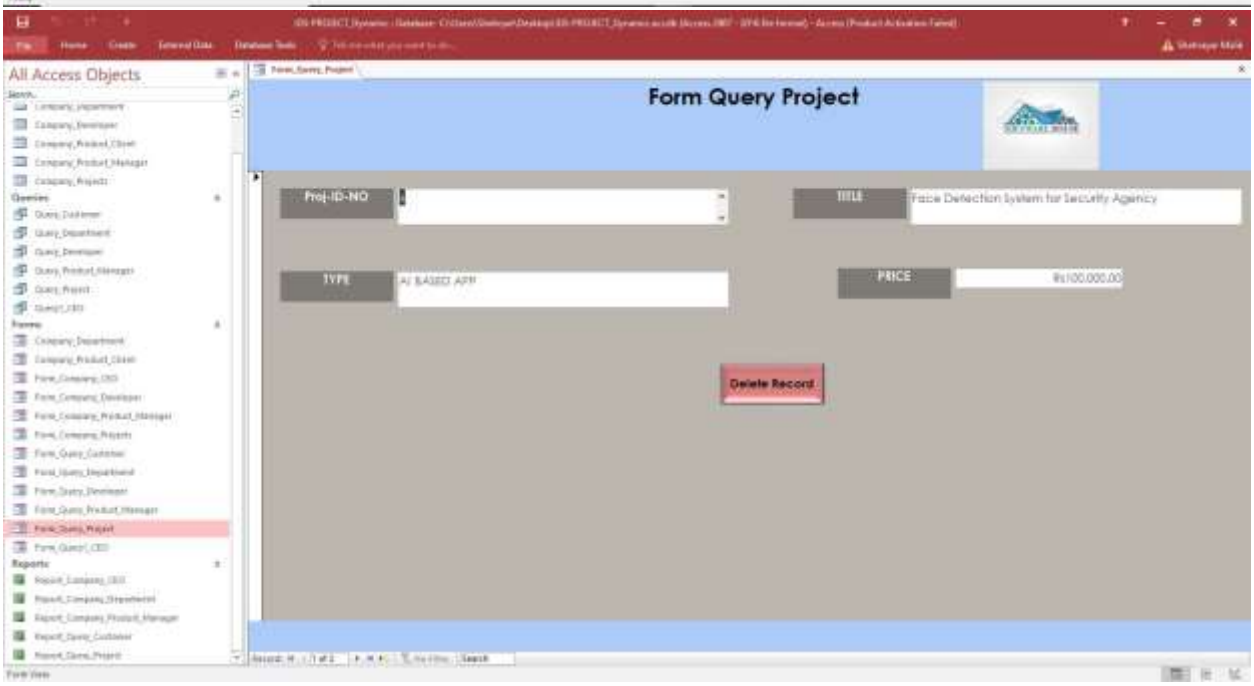
Form Query Department
Dep-ID-NO
Name
WEB APPS DEV
Location
Block A
Capacity
Close Form


All Access Objects
Enter Parameter Value
Enter Field or Specification:
AI Engineer
OK
Cancel
All Access Objects
Form Query Developer
Dev-ID-NO
Name
Specification
AI Engineer
Email
CNIC
Find Next


All Access Objects
Enter Parameter Value
Enter minimum Price
OK
Cancel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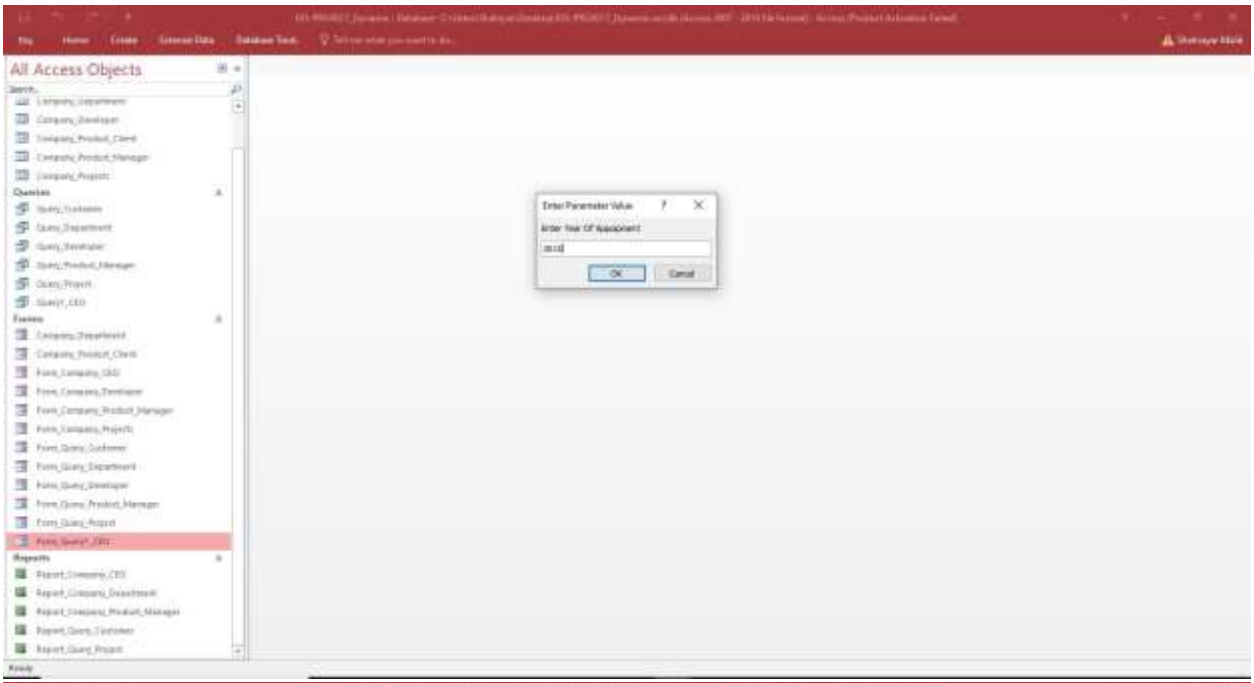
Form Query Project
Proj-ID-NO
TITLE
Face Detection System for Security Agency
TYPE
AI BASED APP
PRICE
Rs100,000.00
Delete Record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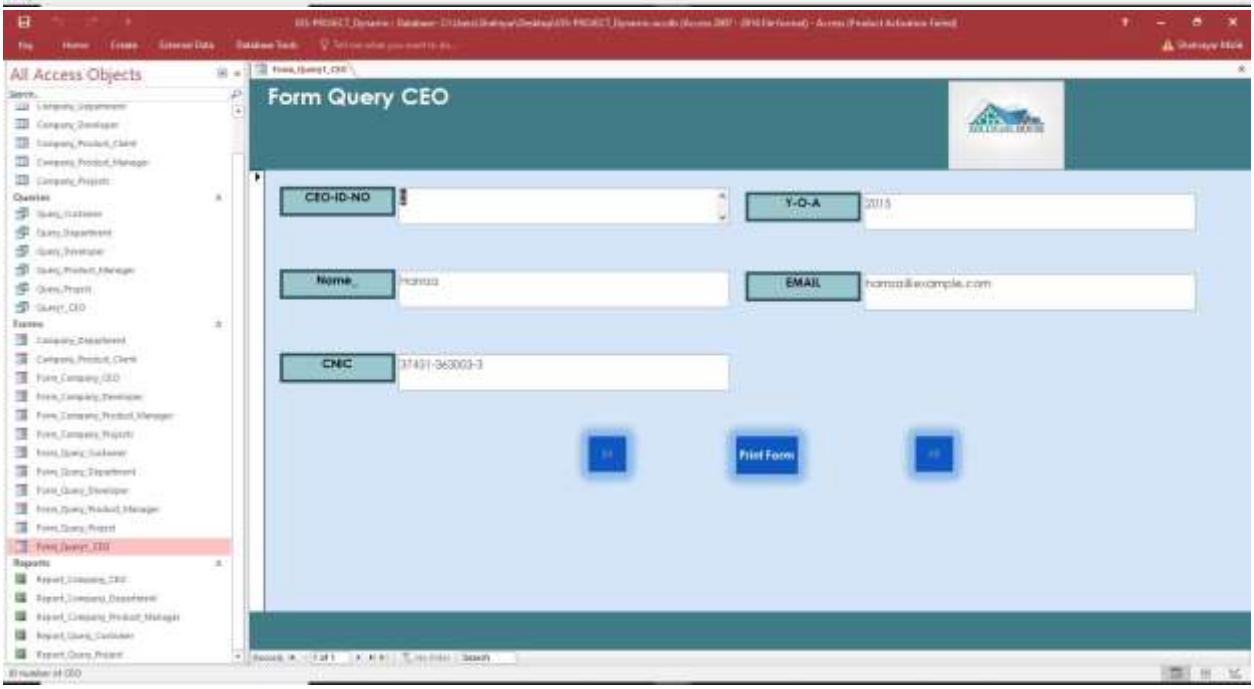
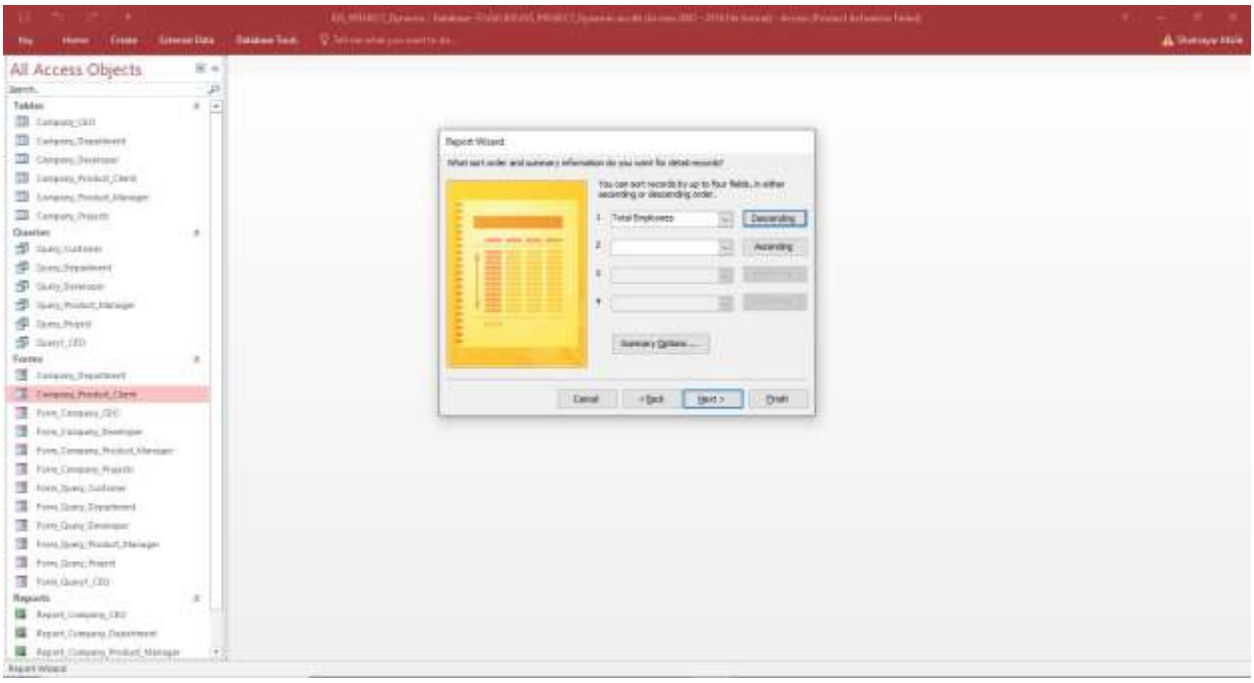
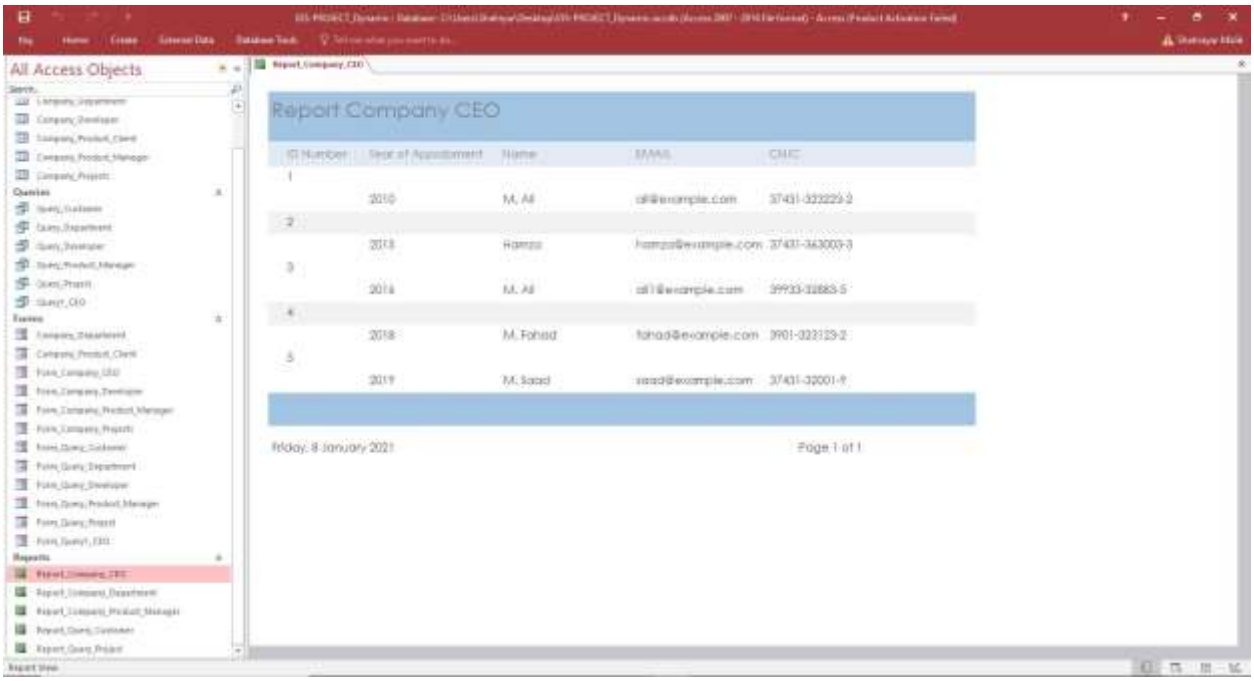
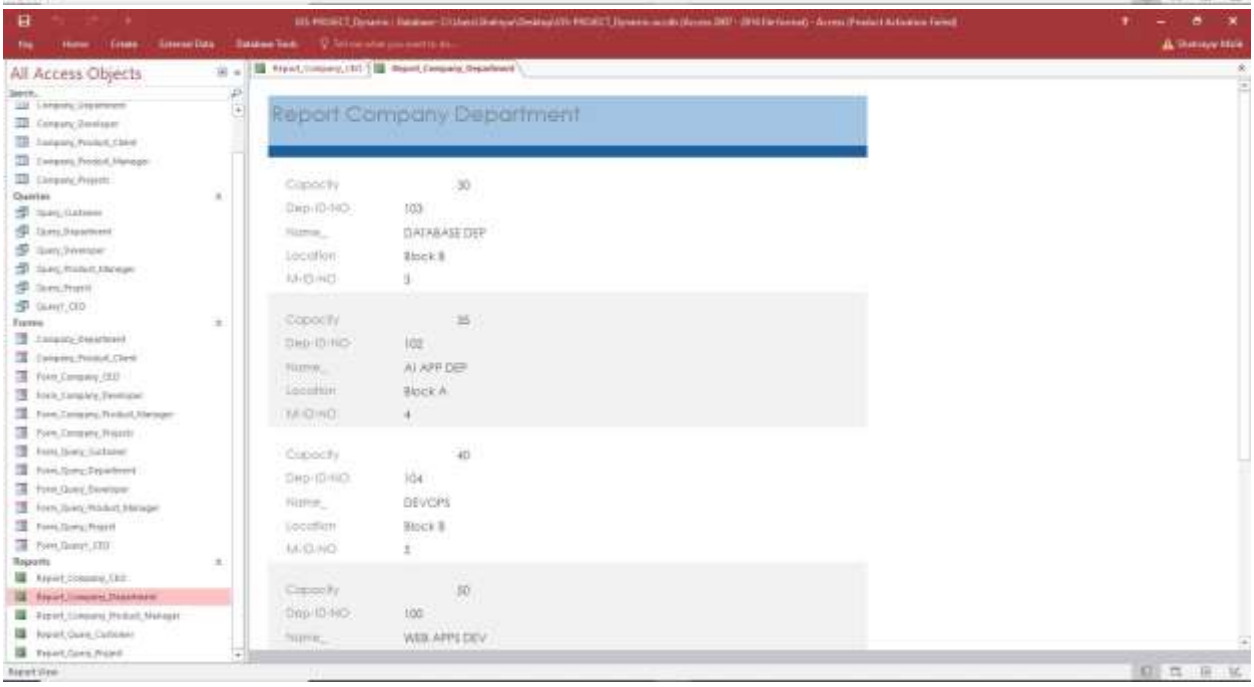
Enter Parameter Value
Enter Year Of Appointment
OK
Cancel

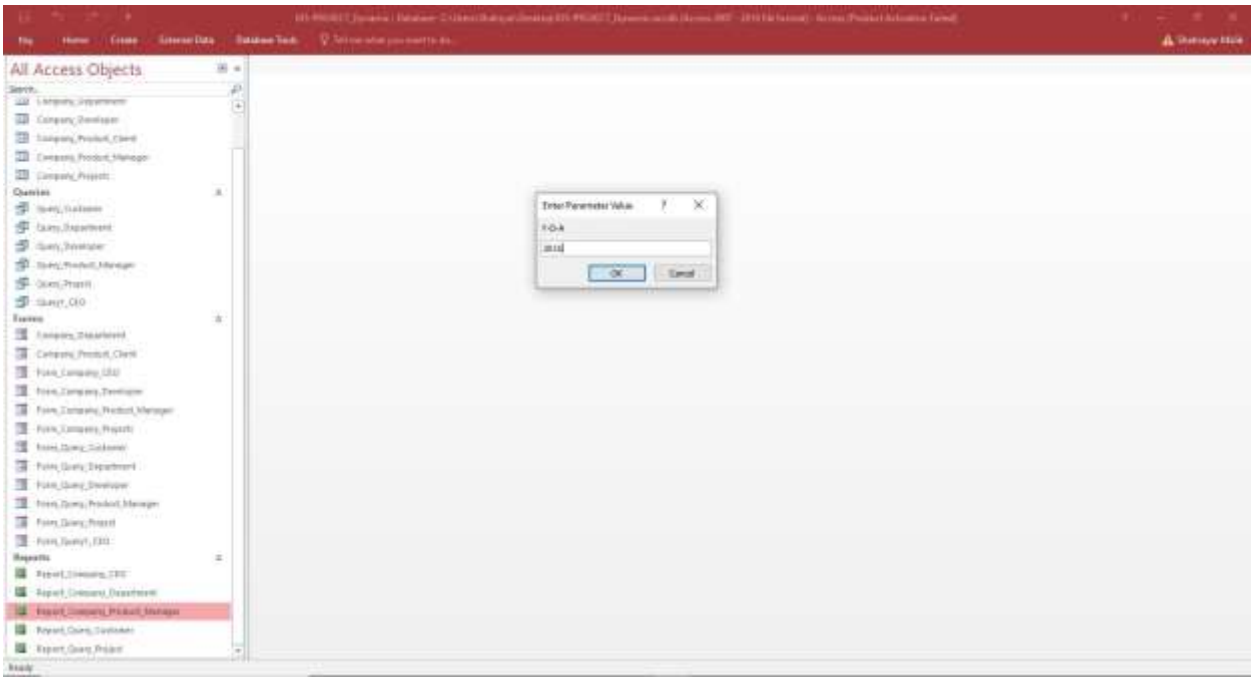

All Access Objects
Form Query CEO
CEO-ID-NO
Y-O-A
2015
Name_
Hamza
EMAIL
hamza@example.com
CNIC
37401-363003-3
Print Form

Reports




All Access Objects
Report Company CEO
ID Number
Year of Appointment
Name
EMAIL
CNIC
1
2010
M. Ali
ali@example.com
37401-323229-2
2
2013
Hamza
hamza@example.com
37401-363003-3
3
2016
M. Ali
ali1@example.com
39933-33883-5
4
2018
M. Fahad
fahad@example.com
3901-323129-2
5
2019
M. Saad
saad@example.com
37401-32001-9
Friday, 8 January 2021
Page 1 of 1


All Access Objects
Report Company Department
Capacity 30
Dep ID NO 103
Name_ DATABASE DEP
Location Block B
M ID NO 3
Capacity 35
Dep ID NO 102
Name_ AI APP DEP
Location Block A
M ID NO 4
Capacity 40
Dep ID NO 104
Name_ DEVOPS
Location Block B
M ID NO 1
Capacity 50
Dep ID NO 100
Name_ WEB APPS DEV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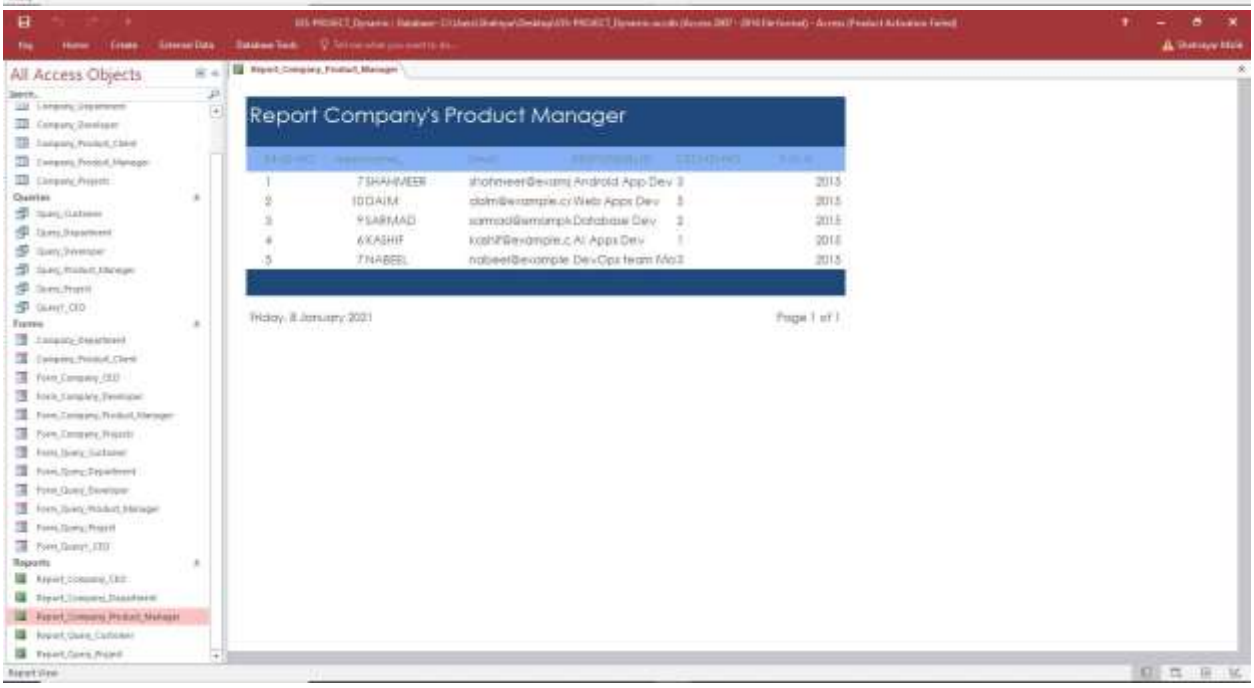
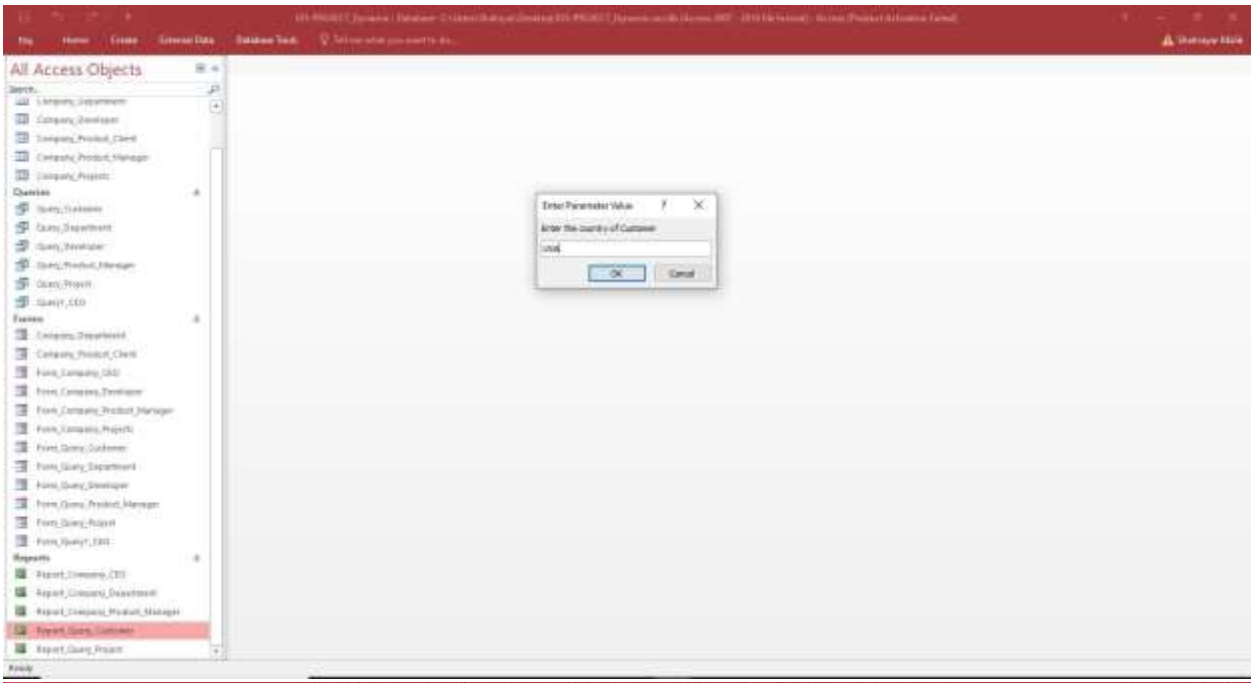
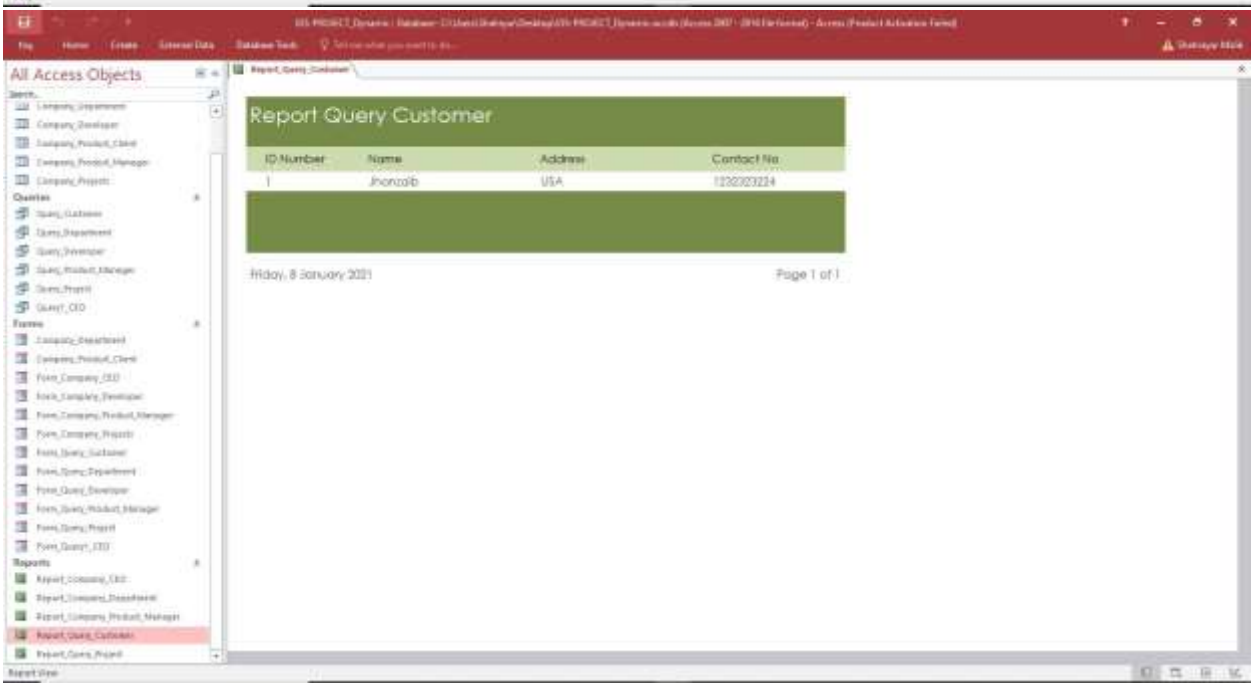
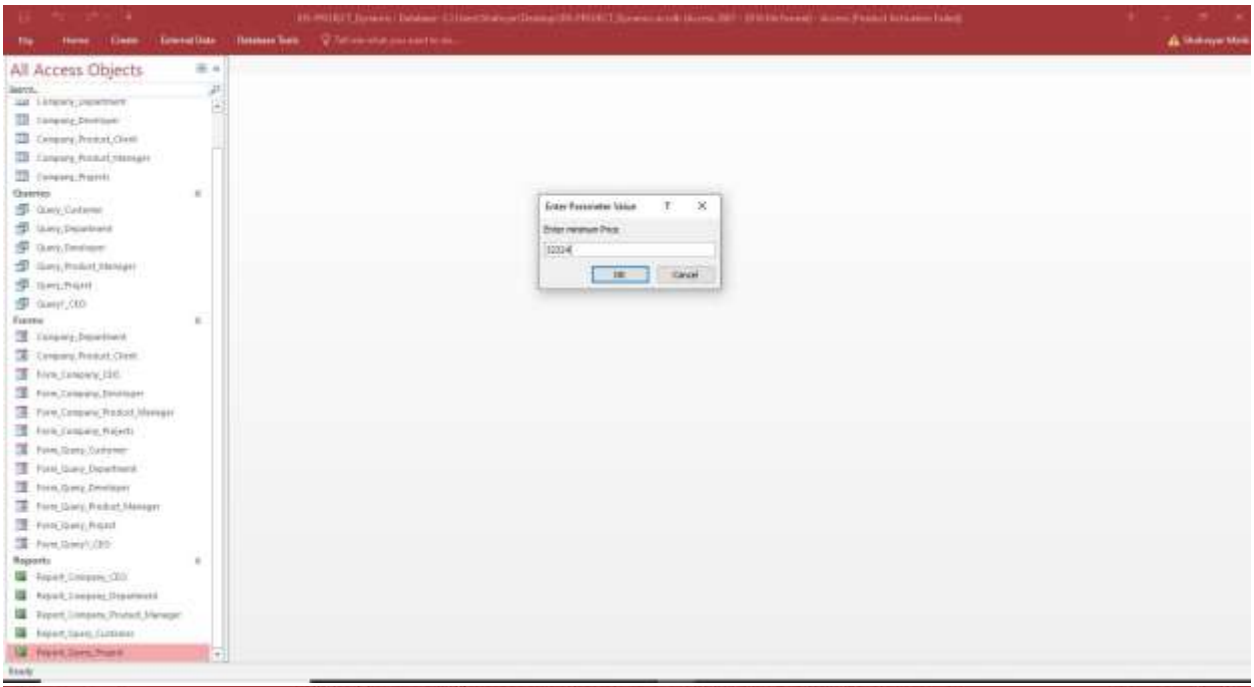
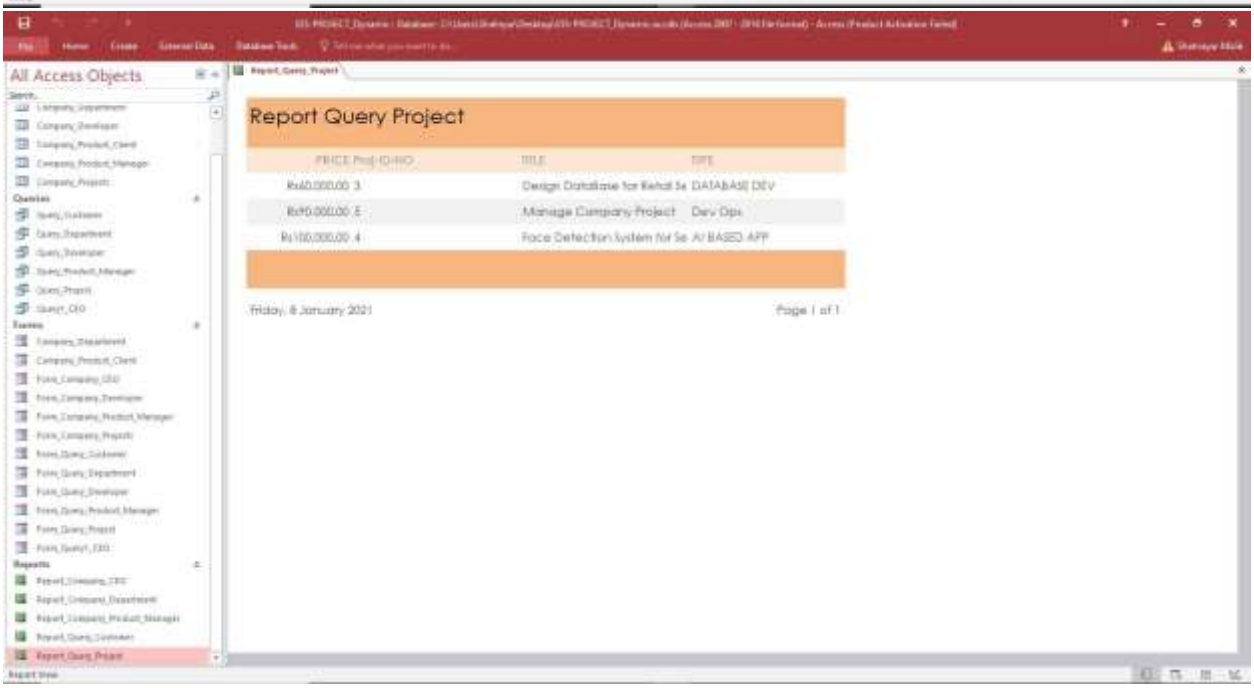
Cancel

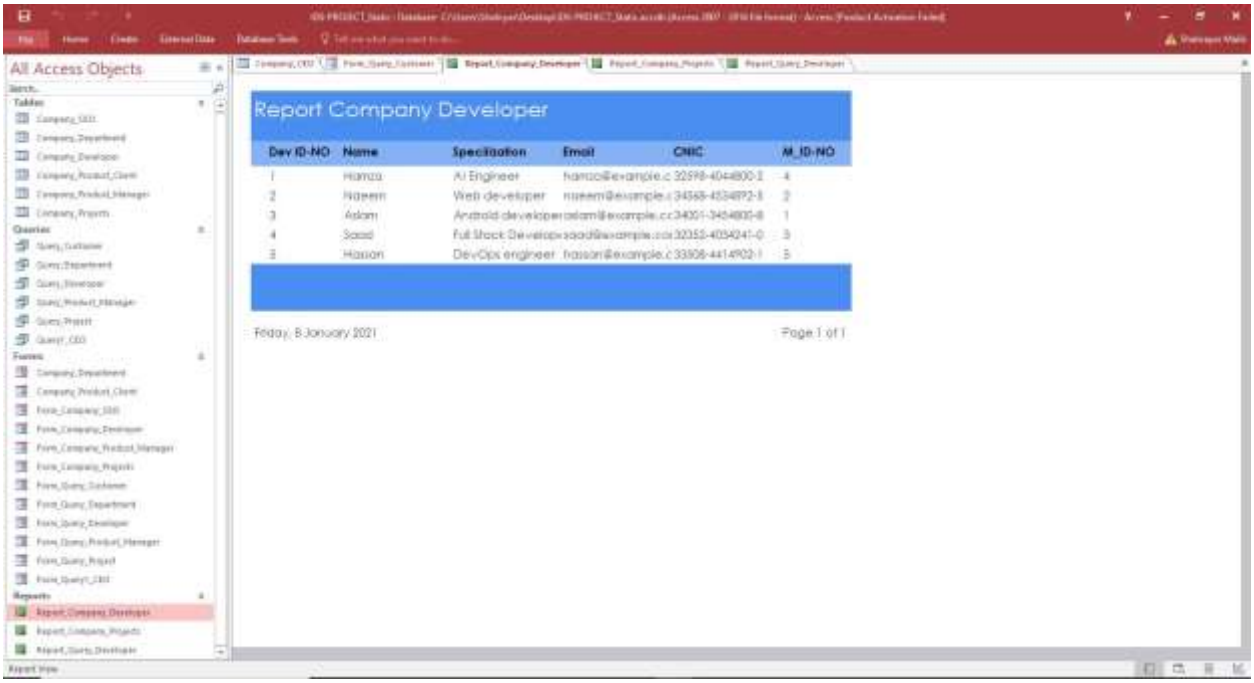

All Access Objects
Report_Company_Product_Manager
Report Company's Product Manager
1 7 SHAHVEER shahveer@example Android App Dev 3 2015
2 10 OAIM oaim@example.cv Web Apps Dev 3 2015
3 9 SABMAD samood@example Dotnbase Dev 3 2015
4 6 KASHIF kashif@example.c AI Apps Dev 1 2015
5 7 NABEEL nabeel@example Dev+Ops team Mo3 2015
Friday, 8 January 2021
Page 1 of 1

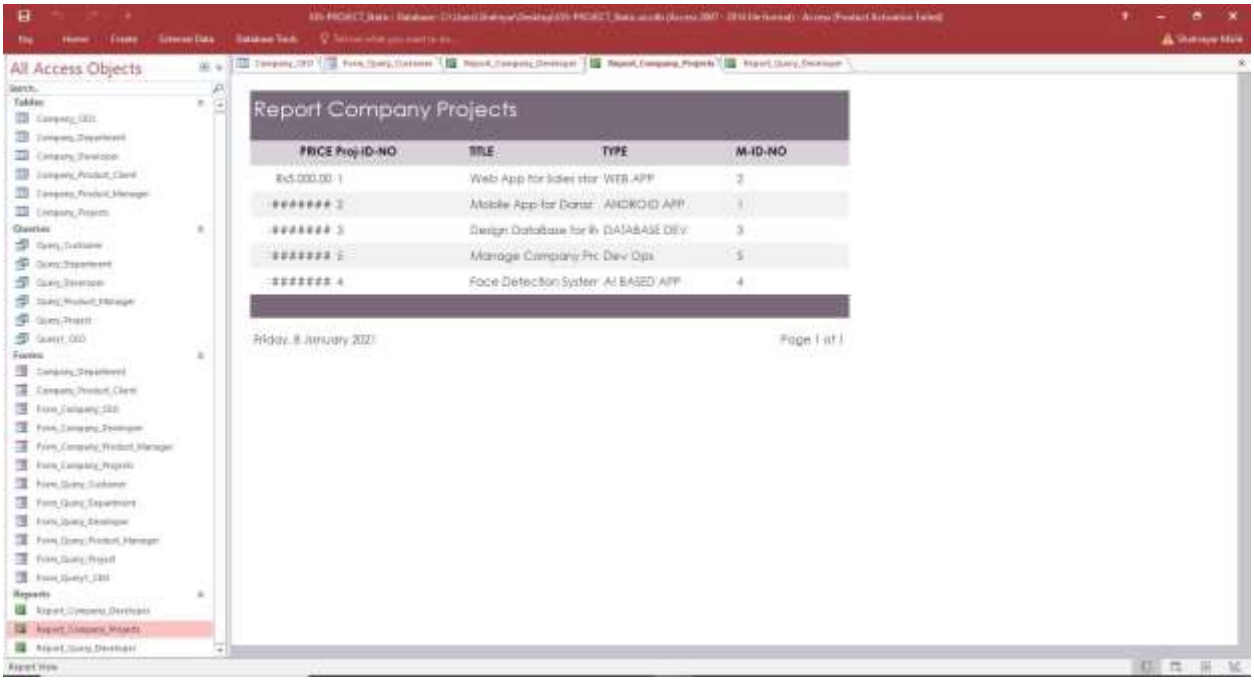

All Access Objects
Enter Parameter Value
Enter the country of Customer
USA
OK
Cancel

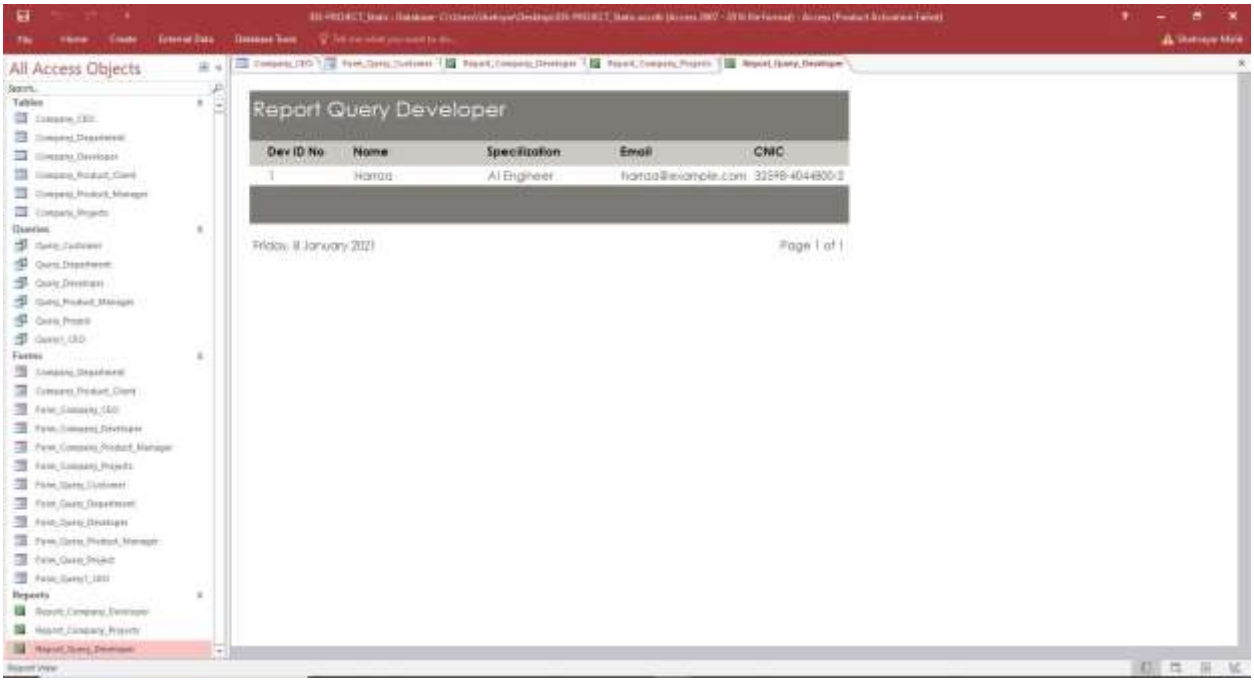

All Access Objects
Report Query Customer
ID Number
Name
Address
Contact No
1
Jhonzolb
USA
1232323224
Friday, 8 January 2021
Page 1 of 1


All Access Objects
Enter Parameter Value
Enter minimum Price
12224
OK
Cancel

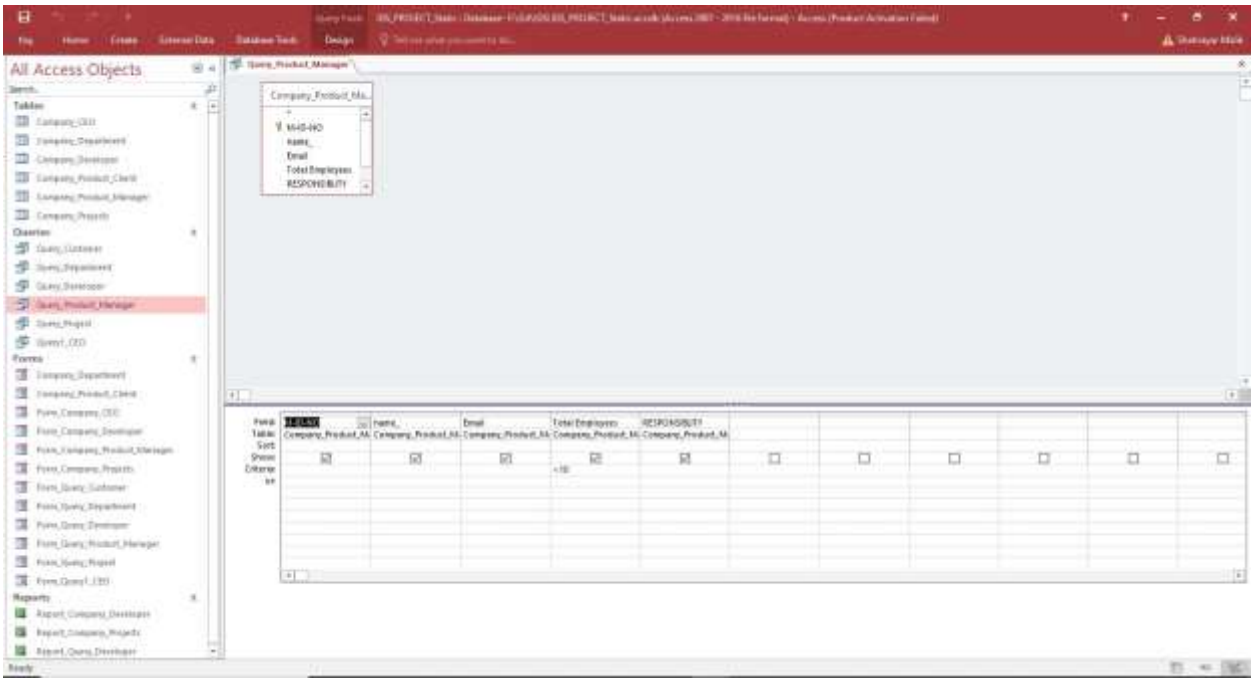

All Access Objects
Report_Query_Project
Report Query Project
PRICE Proj-ID-NO
TITLE
TYPE
Rs60,000.00 3
Design DataBase for Rehdi Se
DATABASE DEV
Rs90,000.00 5
Manage Company Project
Dev Ops
Rs100,000.00 4
Face Detection System for Se
AI BASED APP
Friday, 8 January 2021
Page 1 of 1

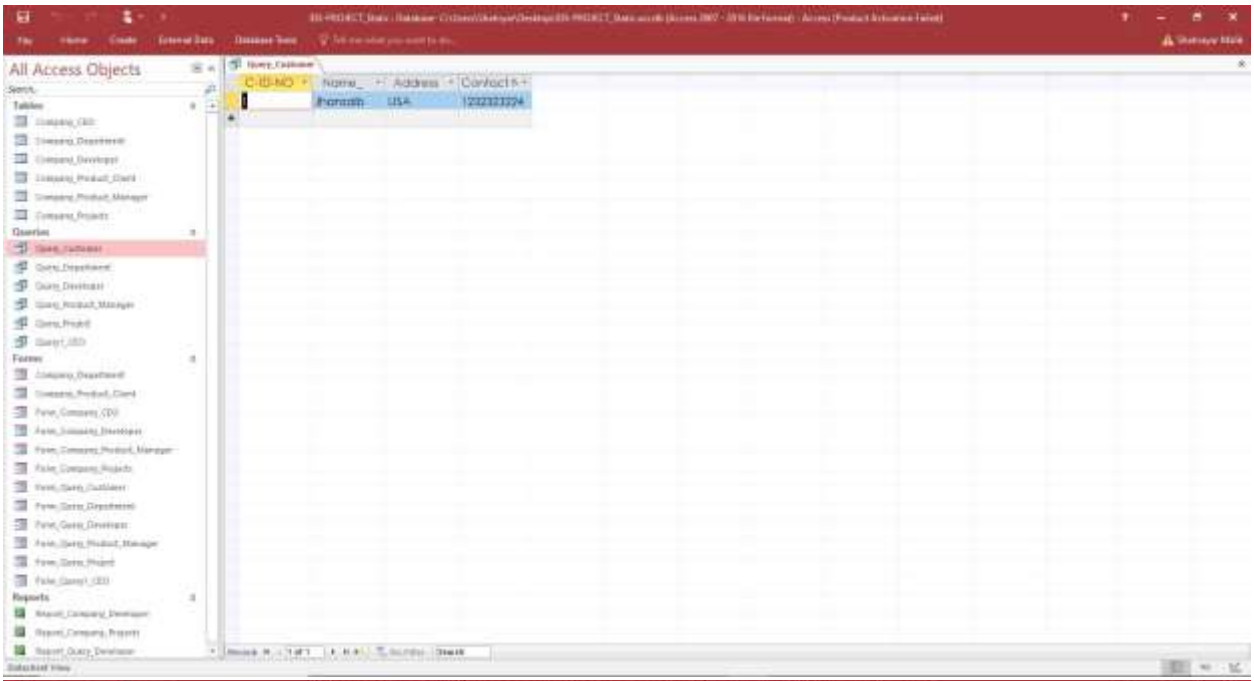

All Access Objects
Report Company Developer
Dev ID-NO Name Specilaation Email CNIC M_ID-NO
1 Hamza AI Engineer hamza@example.c 32598-4044800-3 4
2 Nqeem Web developer nqeem@example.c 34568-4534892-8 2
3 Adam Android developer adam@example.cc 34001-3454800-8 1
4 Saad Full Stack Developer saad@example.coi 32352-4034241-0 3
5 Hasan DevOps engineer hasan@example.c 33908-4414902-1 5
Friday, 8 January 2021
Page 1 of 1

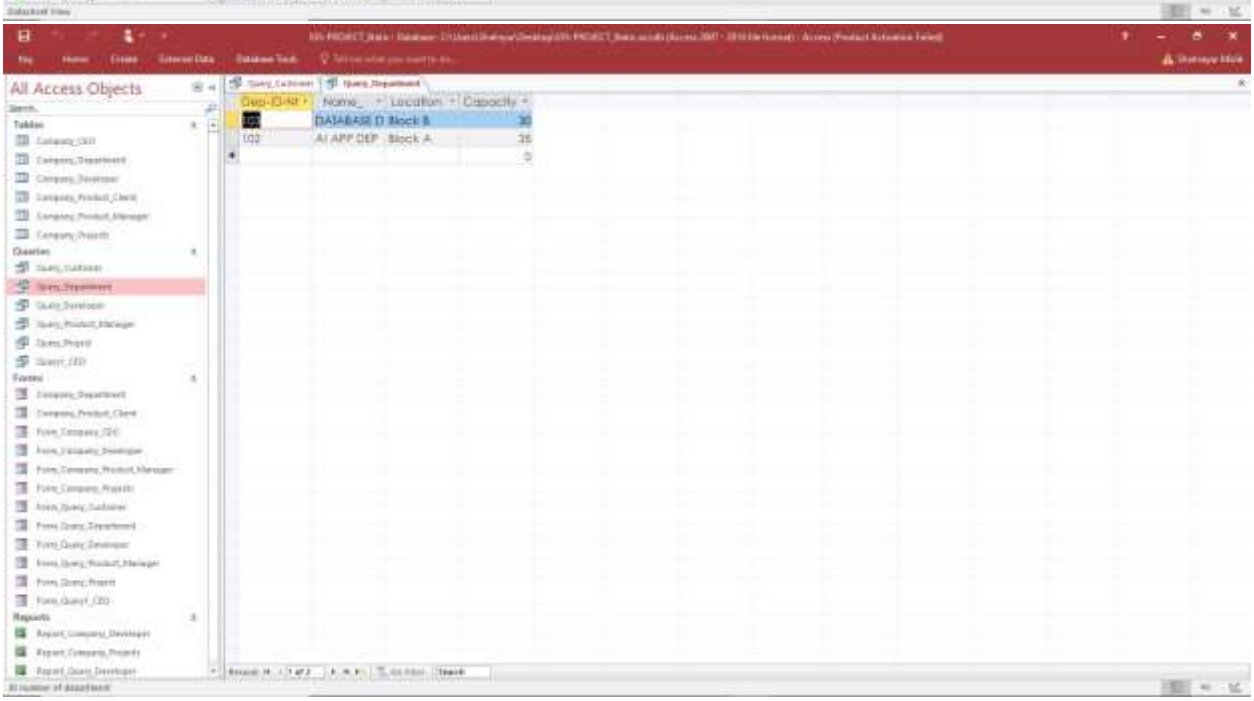

All Access Objects
Report Company Projects
PRICE Proj-ID-NO TITLE TYPE M-ID-NO
Rs5,000.00 1 Web App for ladies stor WEB APP 2
######## 2 Mobile App for Darsa ANDROID APP 1
######## 3 Design DataBase for th DATABASE DEV 3
######## 5 Manage Company Prc Dev Ops 5
######## 4 Face Detection Systen AI BASED APP 4
Friday, 8 January 2021
Page 1 of 1

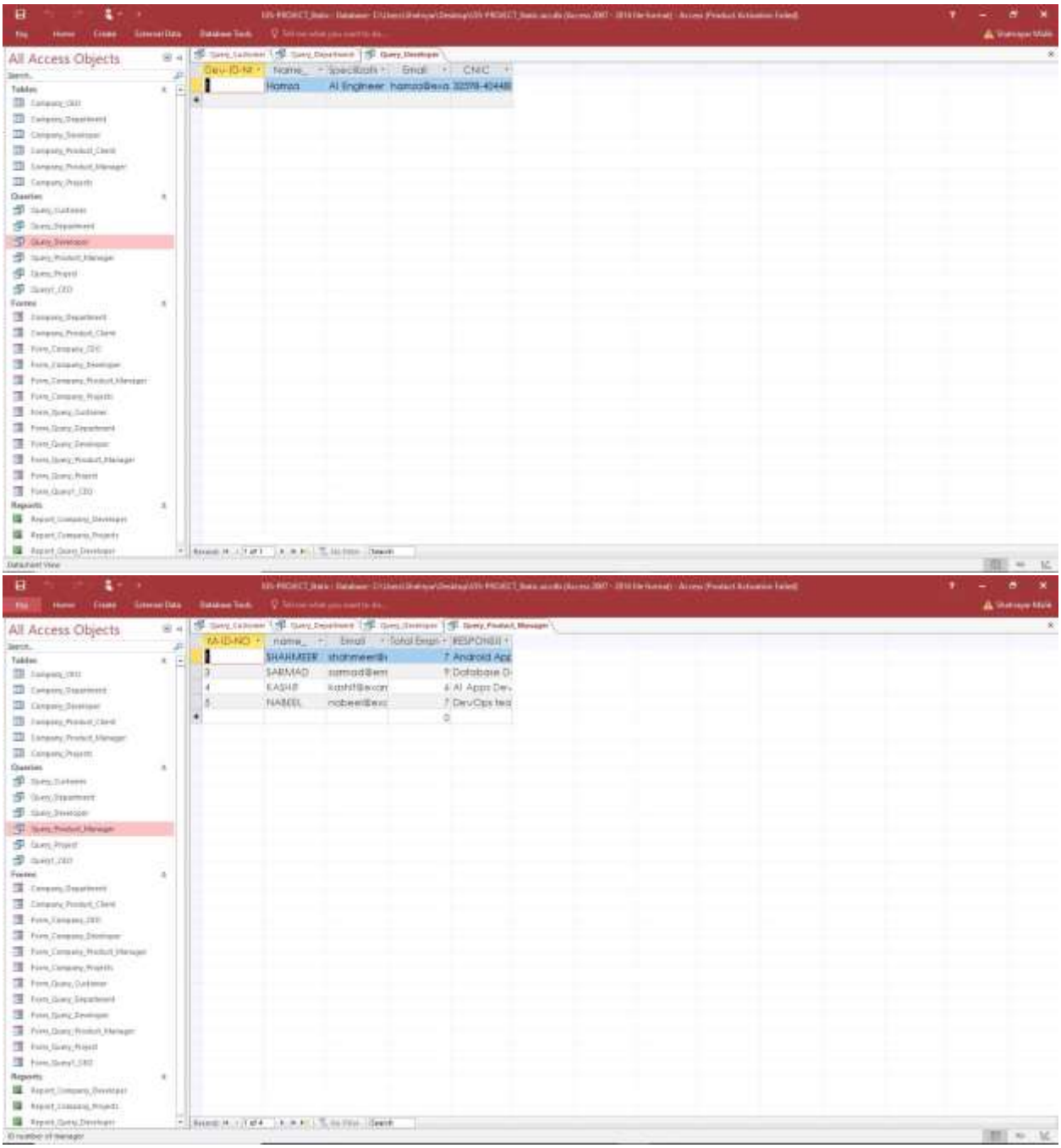

All Access Objects
Report Query Developer
Dev ID No
Name
Specilization
Email
CNIC
1
Hamza
AI Engineer
hamza@example.com
Friday, 8 January 2021
Page 1 of 1

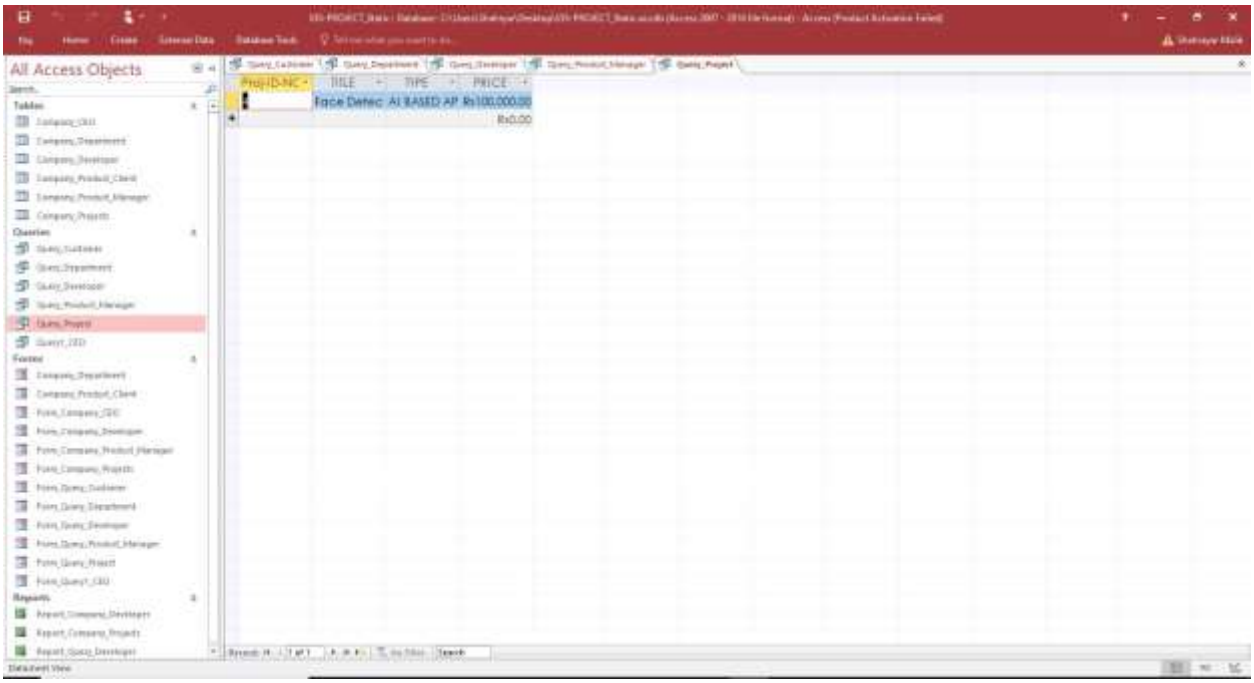
Queries – Static




All Access Objects
C-ID-NO
Name_
Address
Contact N
Pranoth
USA
1232323224


All Access Objects
Dep-ID-NO
Name_
Location
Capacity
001
DATABASE D
Block B
30
002
AI APP DEP
Block A
35


All Access Objects
Dev-ID-NO
Name_
Specialization
Email
CNIC
Hamza
AI Engineer
hamza@exa
32598-40448
All Access Objects
PA-ID-NO
name_
Email
Total Emps
RESPONSI
SHAHMEER
shahmeer@i
7 Android App
SAMMAD
samad@em
9 Database D
KASHIF
kashif@exam
6 AI Apps Dev
NABEEL
nabeel@exc
7 DevOps tea
0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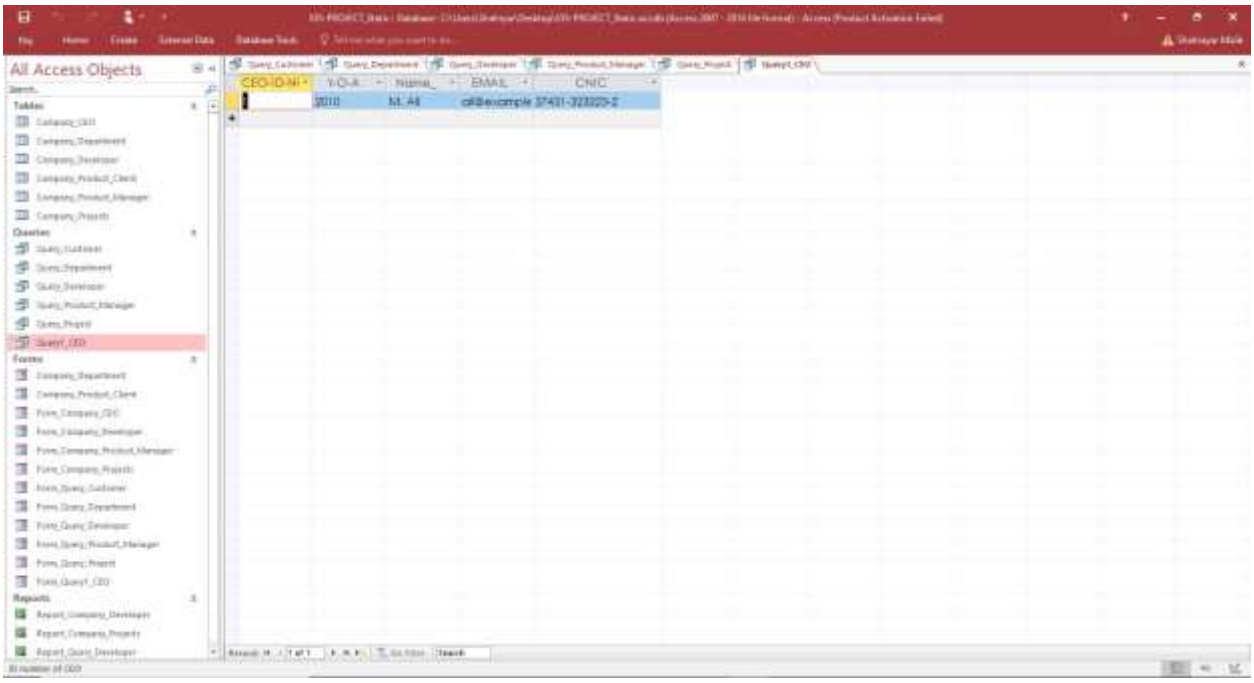
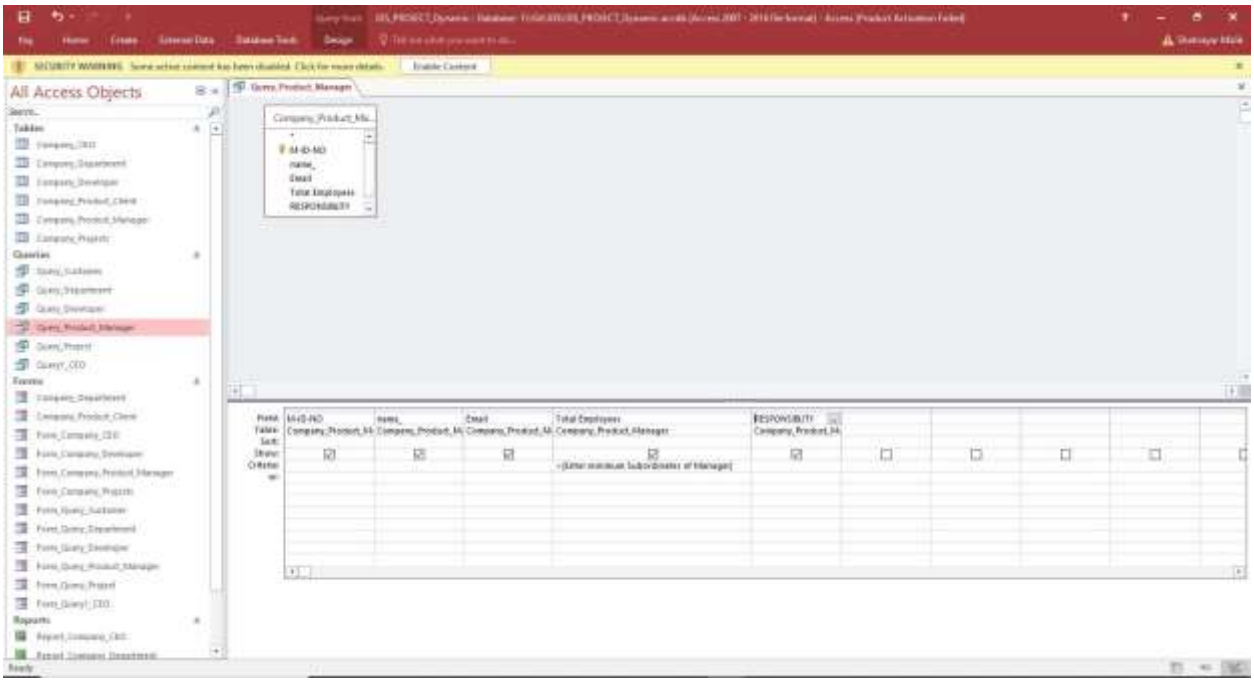
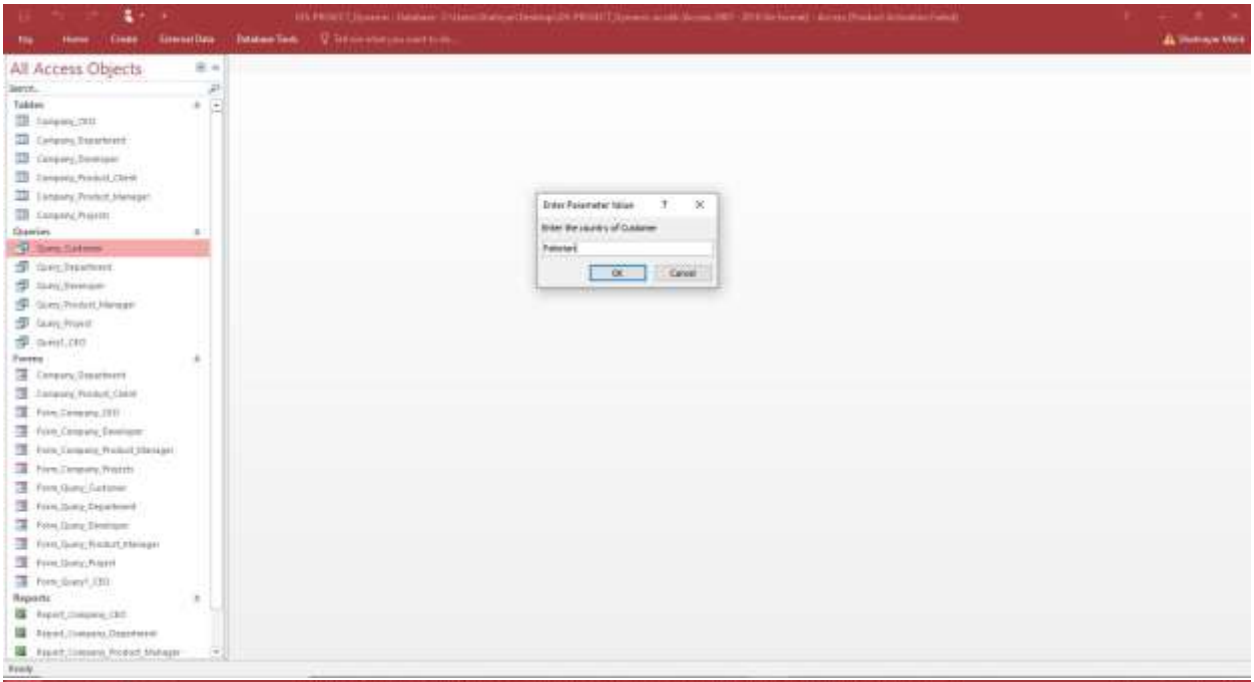
ProjID-NC
TITLE
TYPE
PRICE
Face Detec
AI BASED AP
Rs100,000.00
Rs0.00


All Access Objects
CEO-ID-NI
Y-O-A
Name_
EMAIL
CNIC
2010
M. Ali

Queries – Dynamic




All Access Objects
Enter Parameter Value
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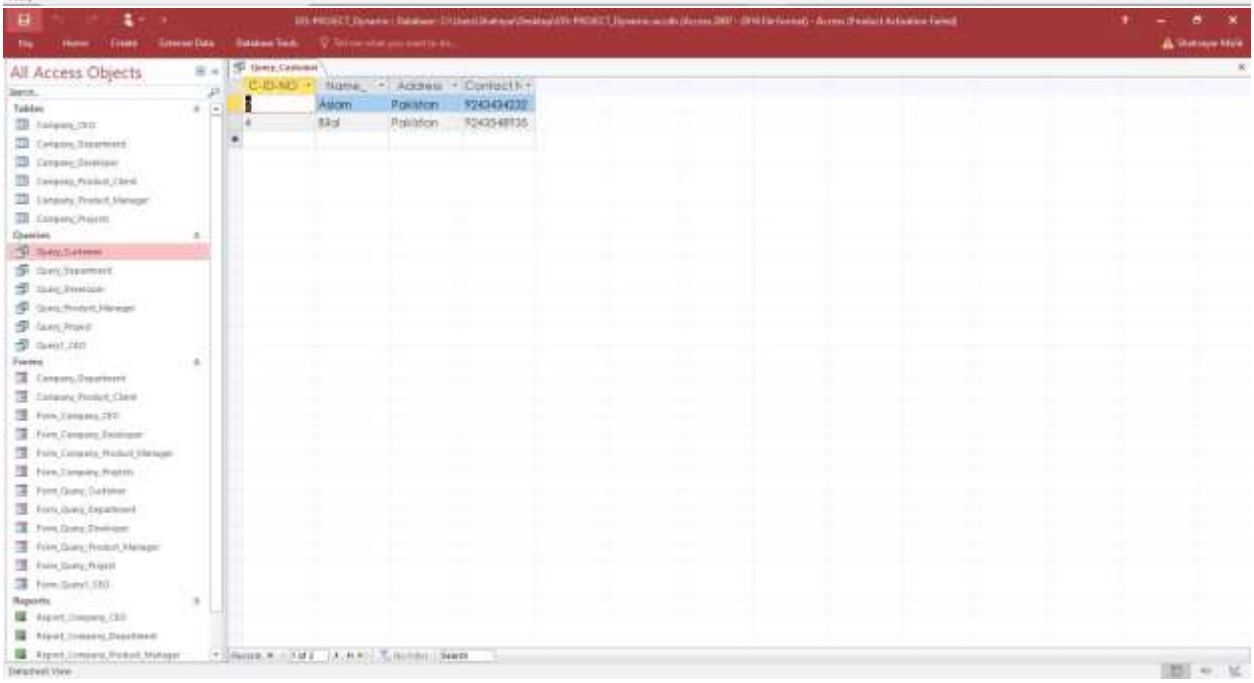
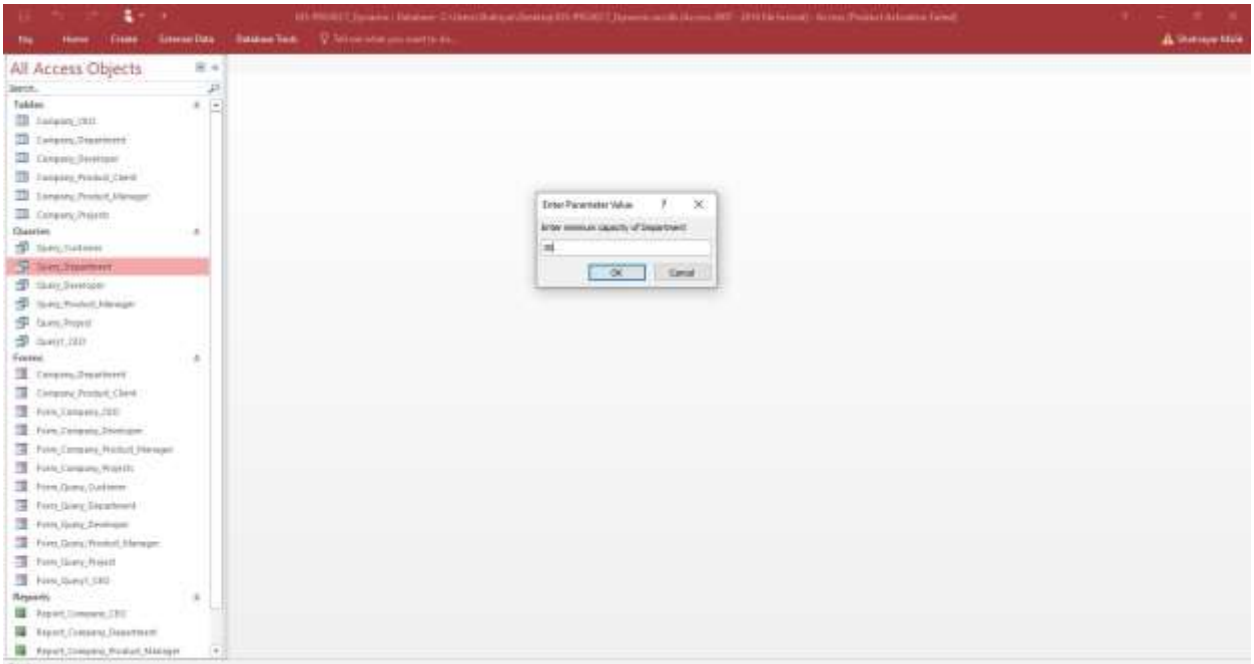
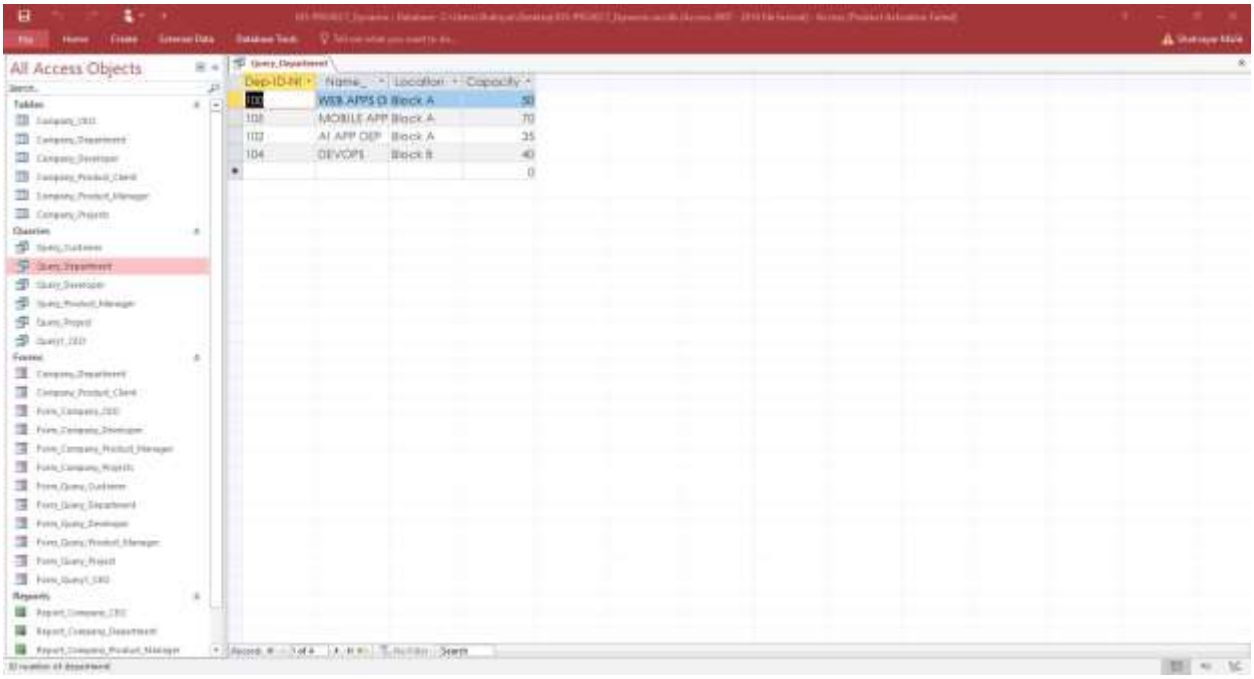
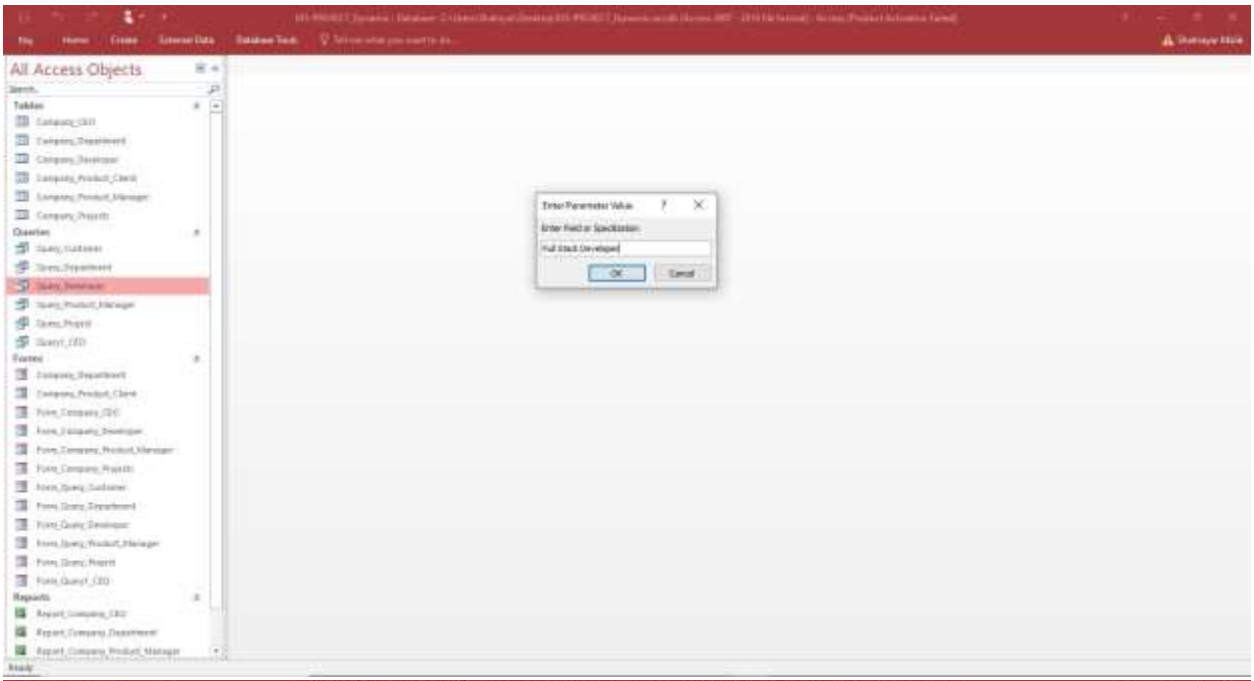
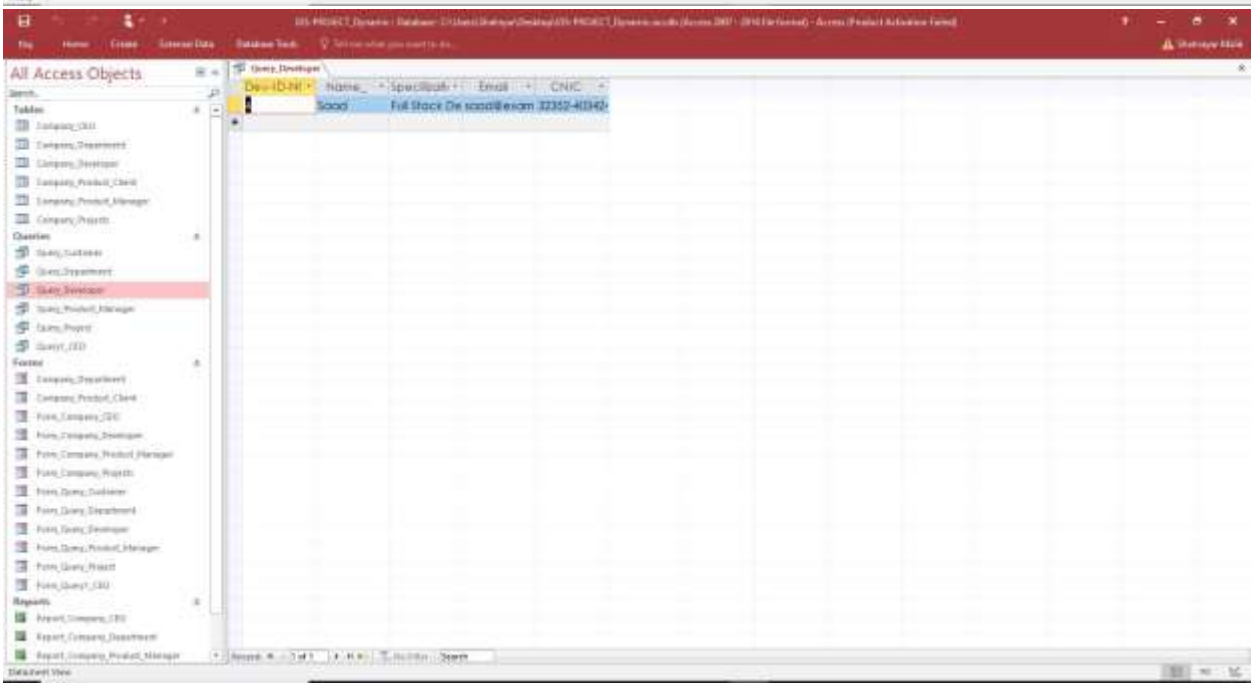
Cancel

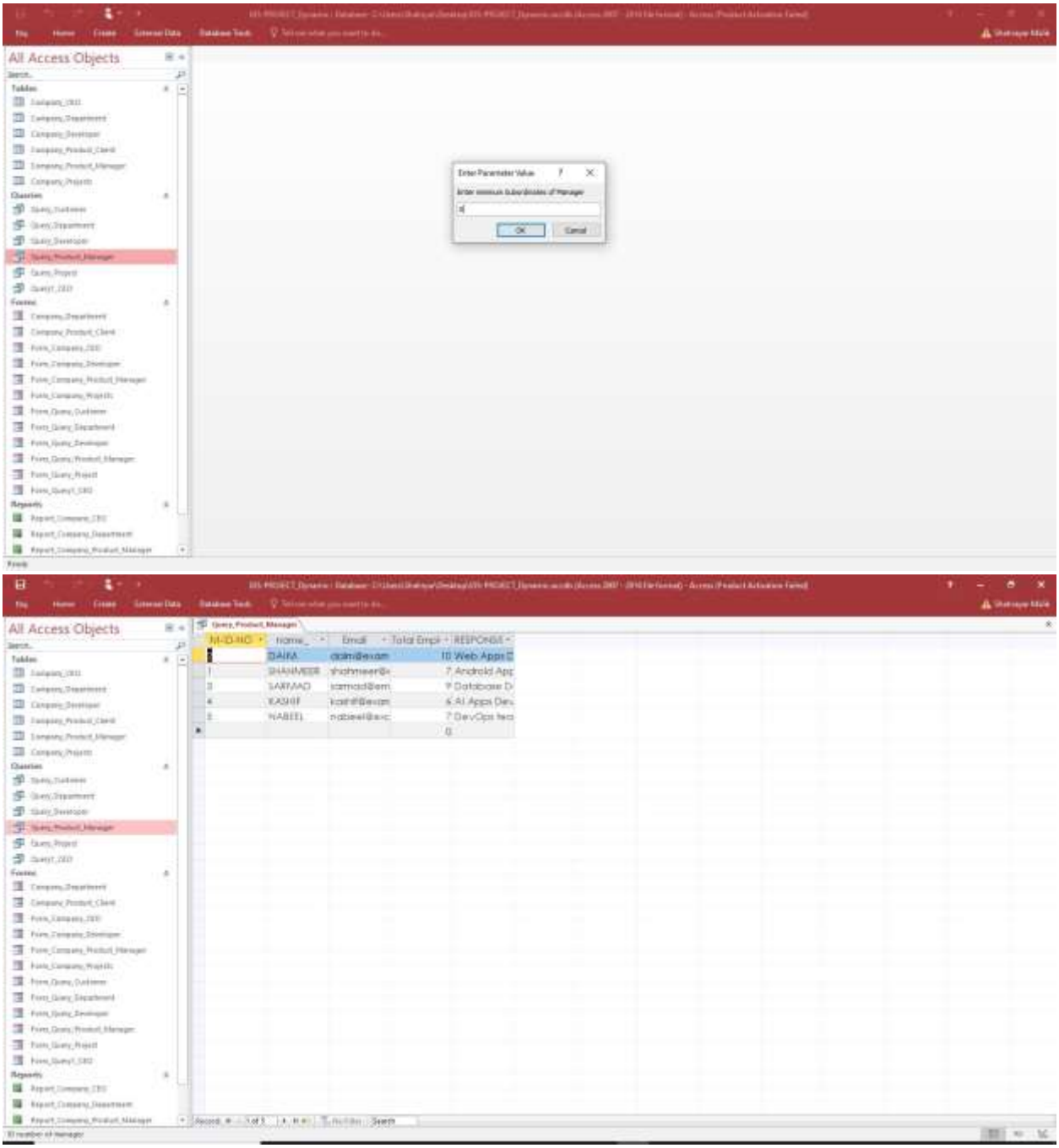

All Access Objects
Query_Customer
C_ID-NO
Name_
Address
Contact No
Aslam
Pakistan
9240434232
Bilal
Pakistan
9240548135

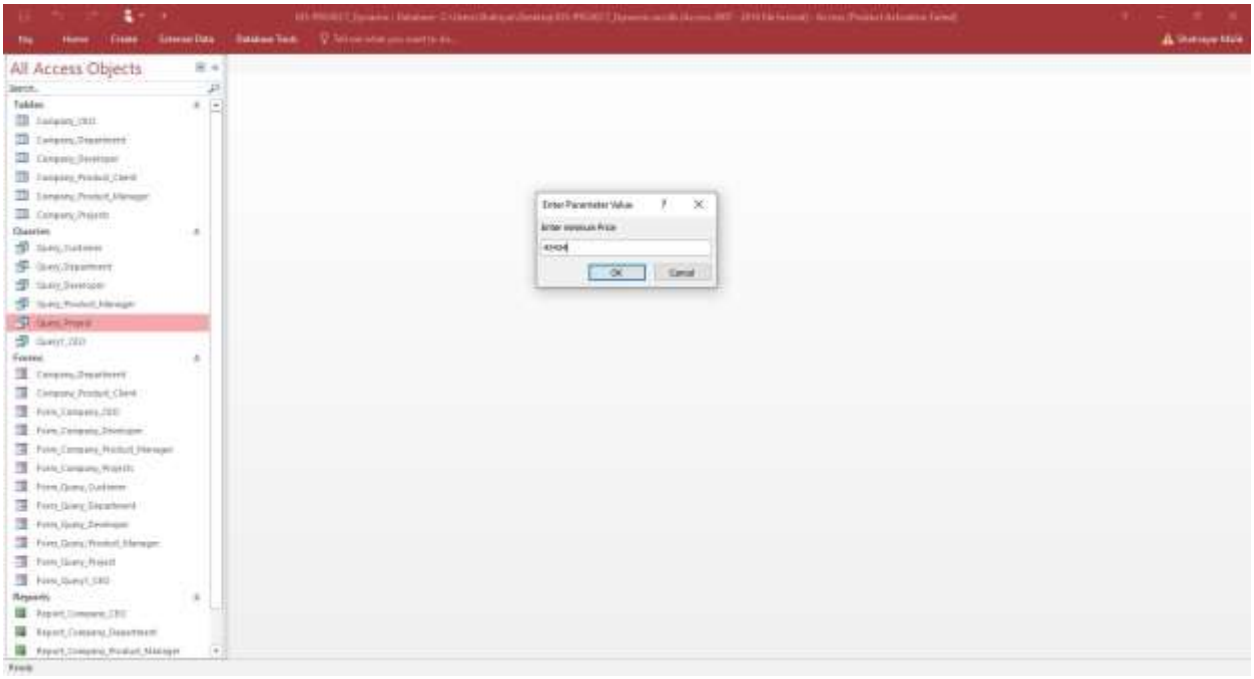

All Access Objects
Enter Parameter Value
Enter minimum capacity of Department
OK
Cancel

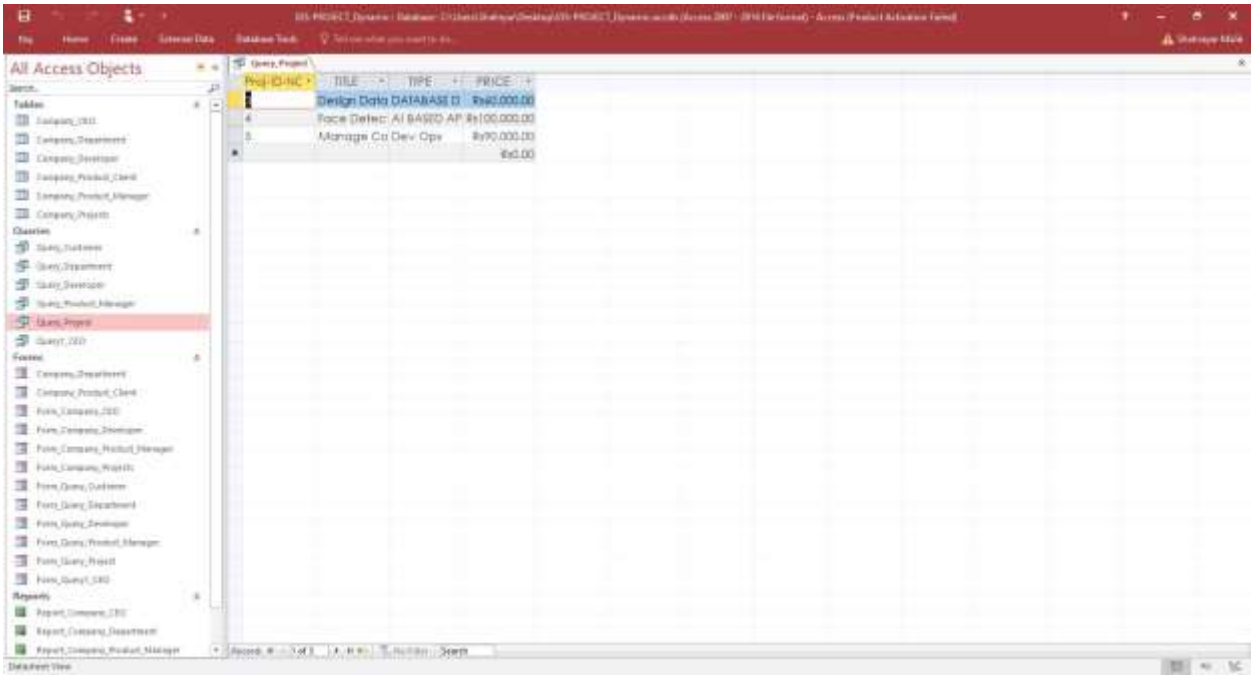

All Access Objects
Query_Department
Dep-ID-NI
Name_
Location
Capacity
101
WEB APPS D
Block A
50
103
MOBILE APP
Block A
70
102
AI APP DEP
Block A
35
104
DEVOPS
Block B
40
0

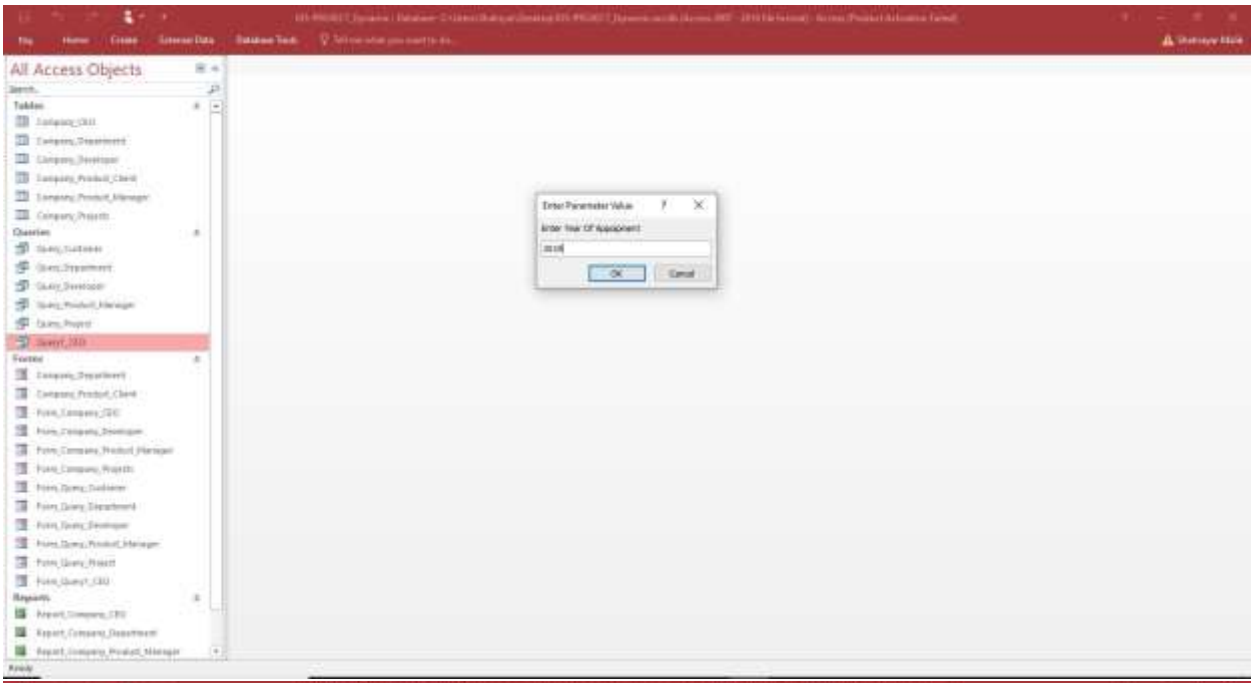

All Access Objects
Enter Parameter Value
Enter Field or Specification:
Full Stack Developer
OK
Cancel

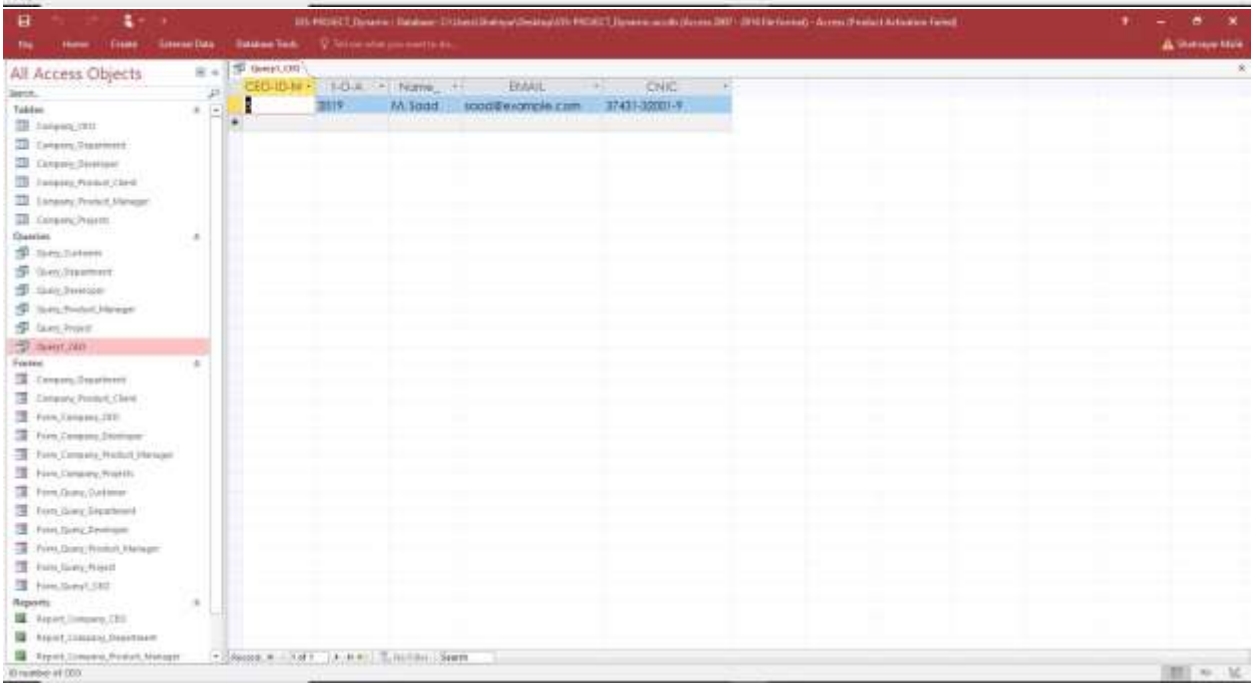

All Access Objects
Query_Developer
Dev-ID-Nf
Name_
Specilizati
Email
CNIC
Saad
Full Stack De
saad@exam
32352-40342-


All Access Objects
Enter Parameter Value
OK
Cancel
All Access Objects
Name_
Email
Total Empl
RESPONSE
DAIRA
SHAHMEER
SARMAD
KASHIF
NABEEL

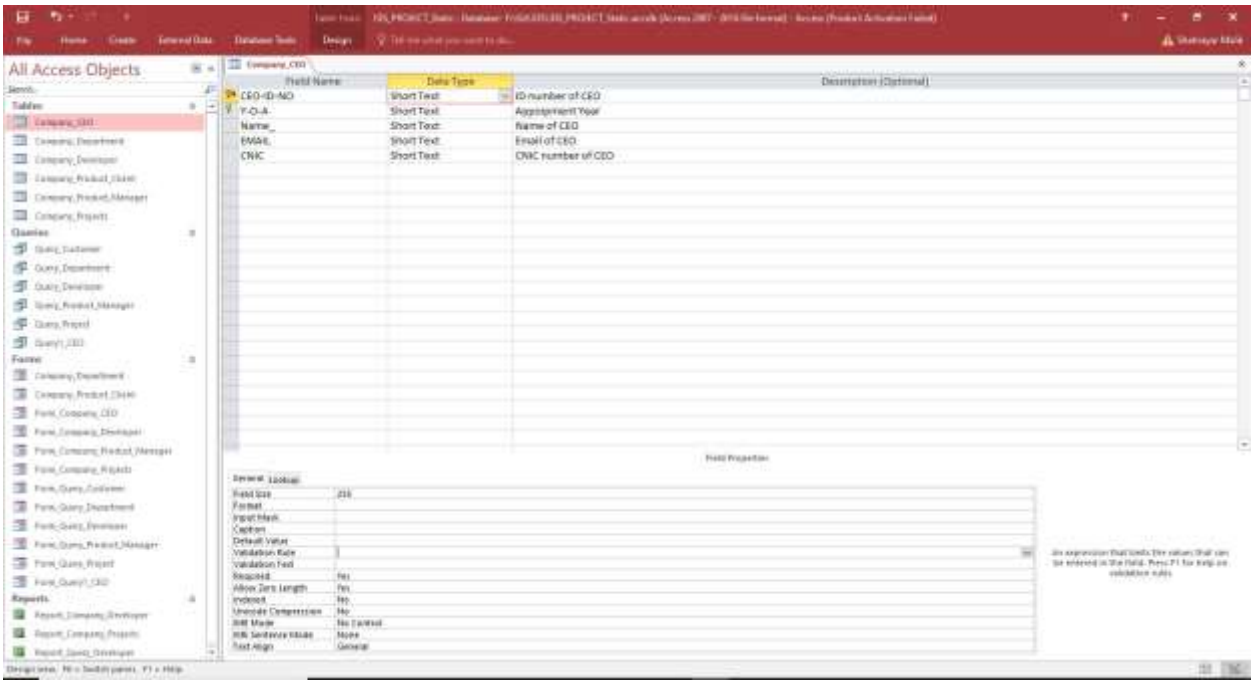

All Access Objects
Enter Parameter Value
Enter minimum Price
OK
Cancel


All Access Objects
Query_Project
Proj-ID-NC
TITLE
TYPE
PRICE
Design Data DATABASE D
Rs40,000.00
4
Face Detec AI BASED AP
Rs100,000.00
5
Manage Co Dev Ops
Rs90,000.00
Rs0.00


All Access Objects
Enter Parameter Value
Enter Year Of Appointment
OK
Cancel


All Access Objects
CEO-ID-N
Name_
EMAIL
CNIC
3019
AA Saad
saad@example.com
37431-32001-9

Tables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Data Type
Description (Optional)
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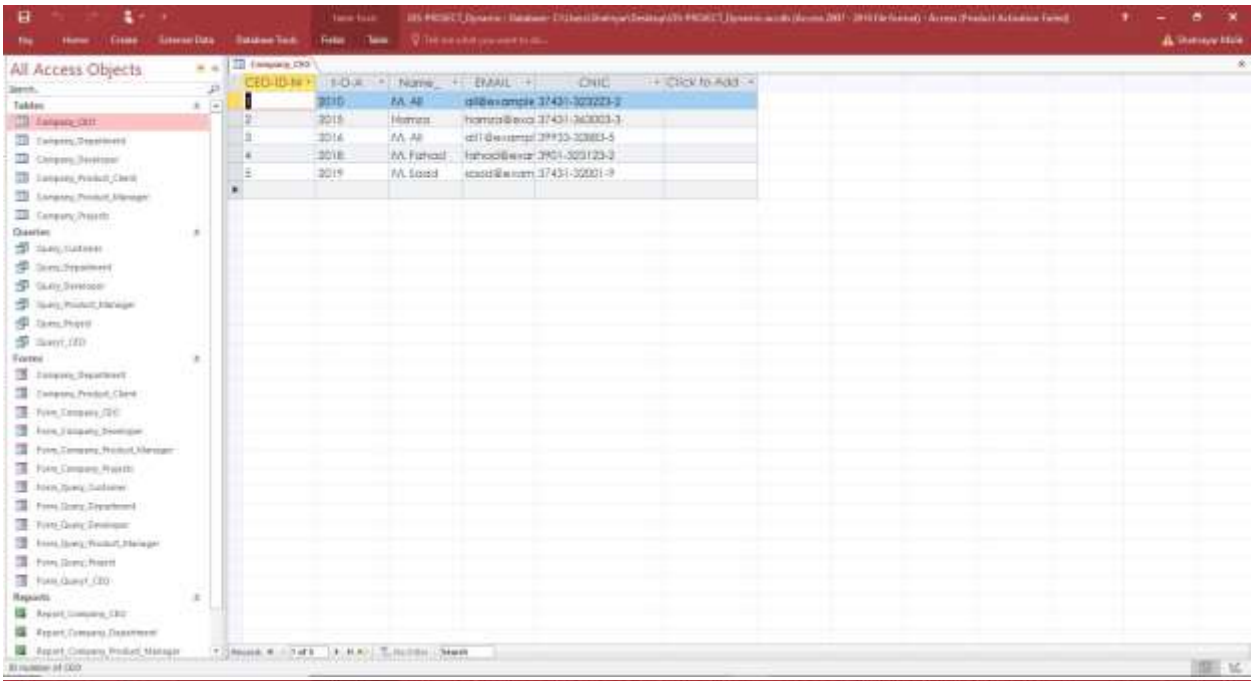
ID number of CEO
Y-O-A
Short Text
Appointment Year
Name_
Short Text
Name of CEO
EMAIL
Short Text
Email of CEO
CNIC
Short Text
CNIC number of CEO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CNIC
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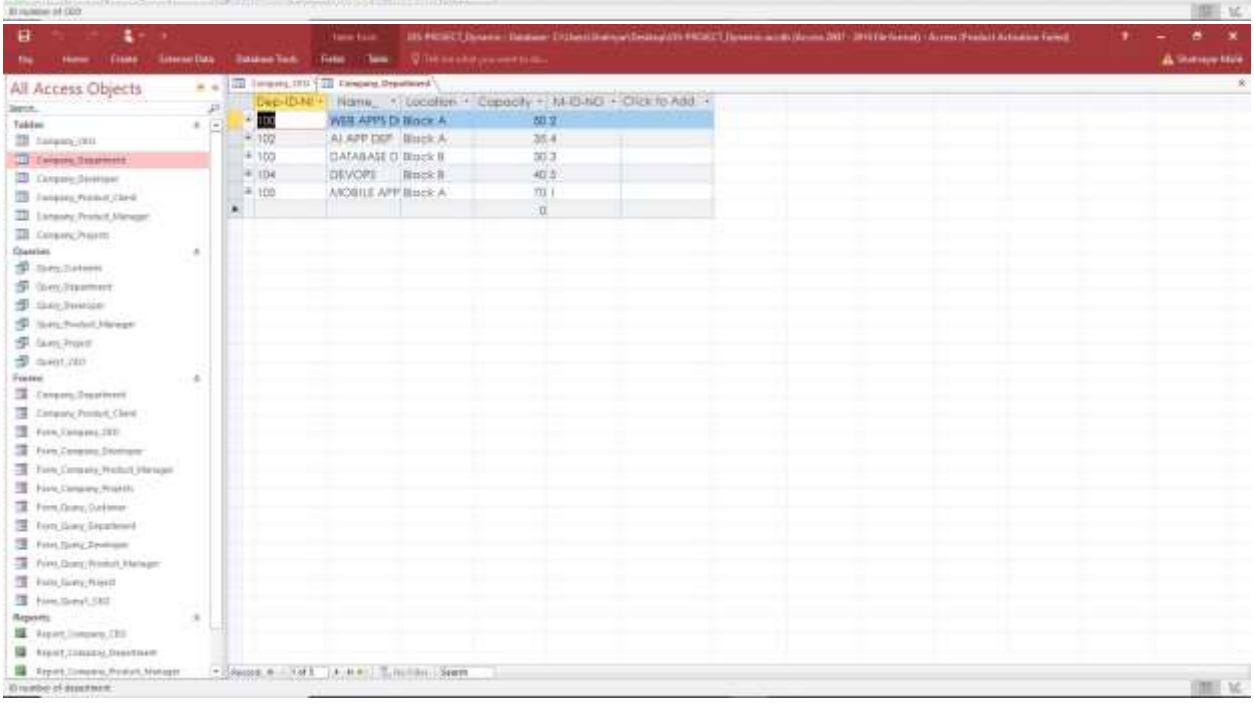
MA Ali
2015
Hamza
2016
MA Ali
2018
MA Fahad
2019
MA Saad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DEVOPS
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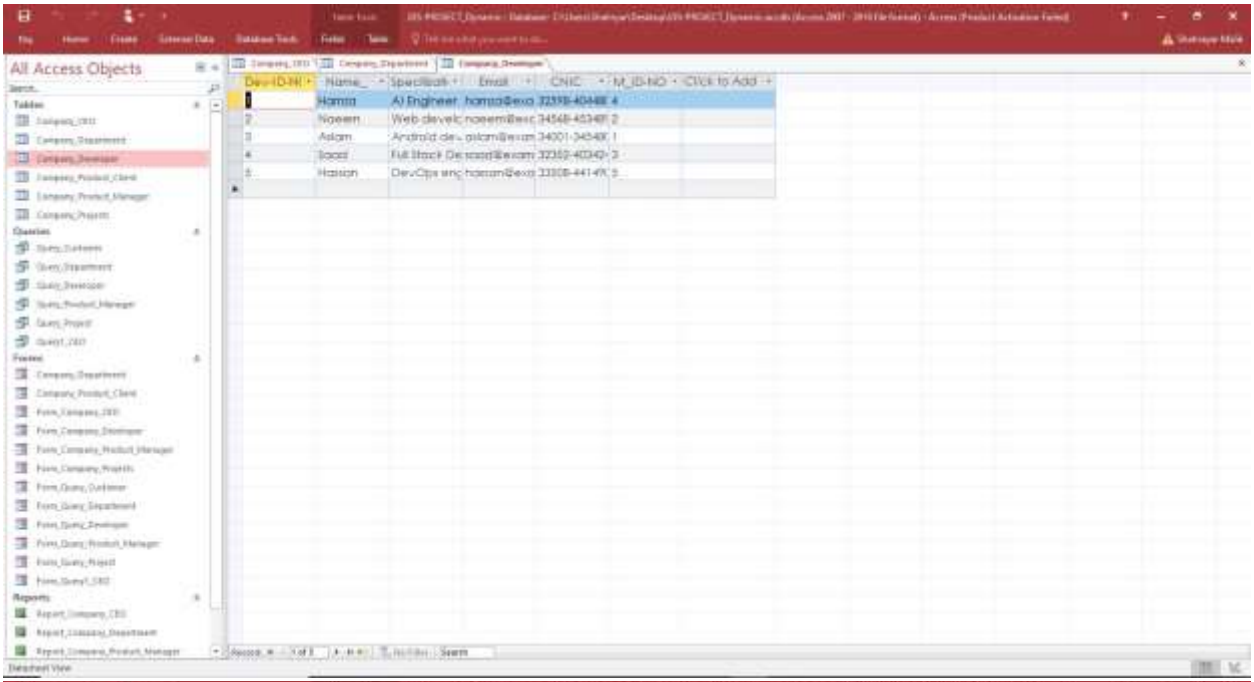
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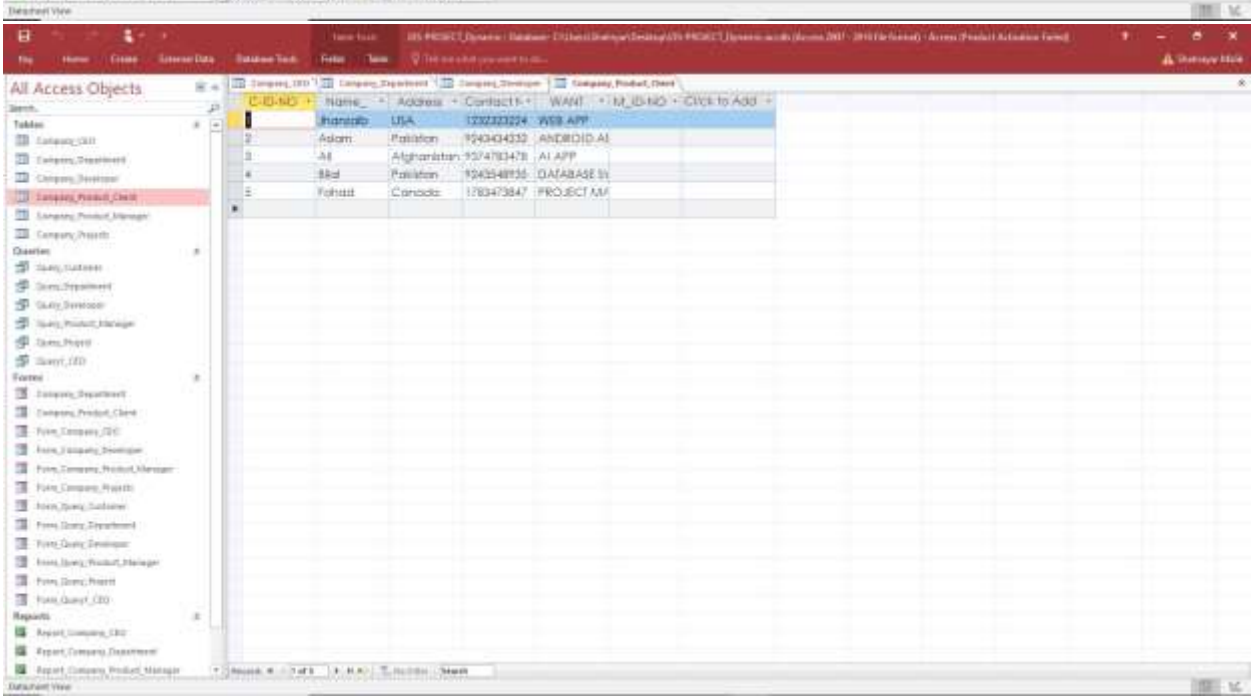
Name_
Specilizat
Email
CNIC
M_ID-NO
Click to Add
Hamza
AI Engineer
hamza@exa
32359-40488
Naeem
Web develc
naeem@exc
34548-45348
Aslam
Android de
aslam@exam
34001-34548
Saad
Full Stack De
saad@exam
32352-40349
Hasan
DevOps eng
hasan@exa
33308-44149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Name_
Address
Contact N
WANT
M_ID-NO
Click to Add
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USA
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WEB APP
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Pakistan
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ANDROID AI
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DATABASE M
Fahad
Canada
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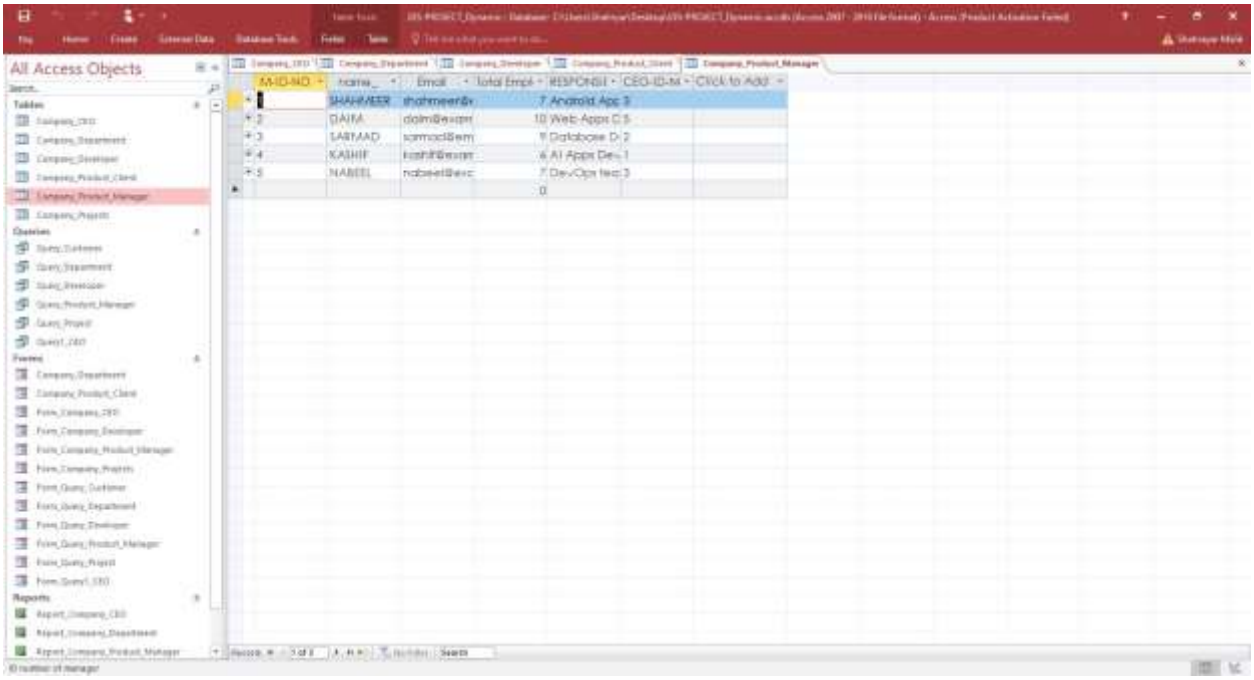
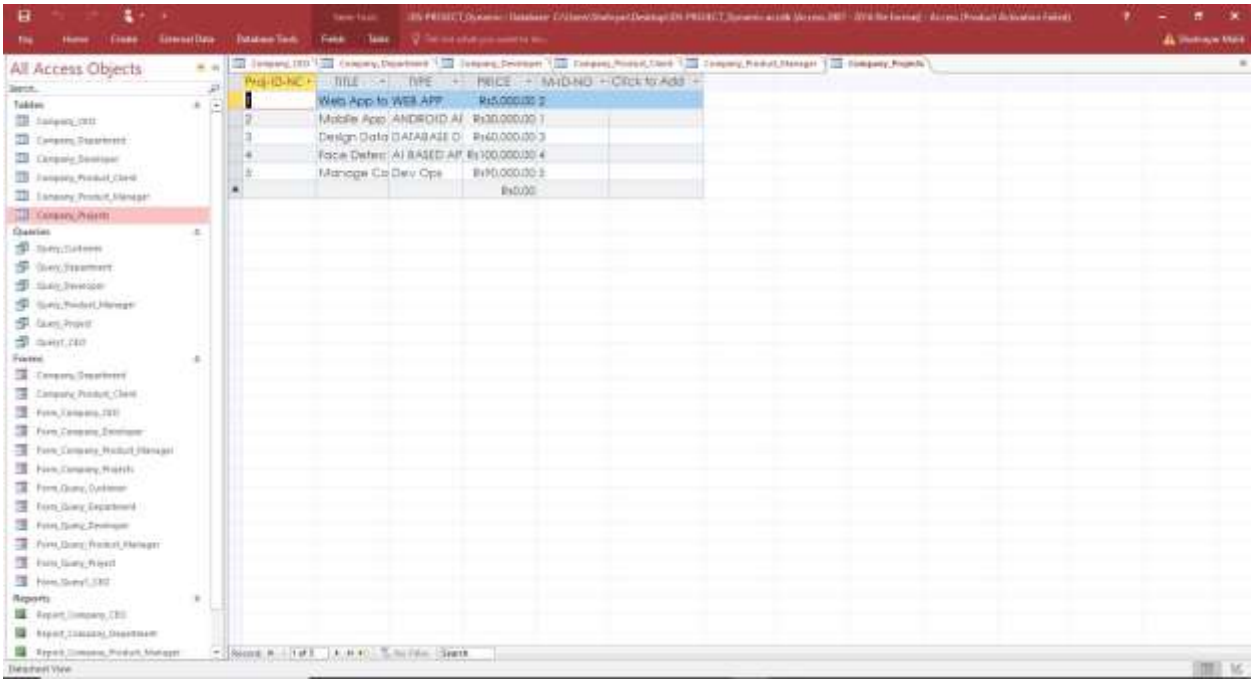
PROJECT MA





---------- End of Project ----------