UTM

UNIVERSITI TEKNOLOGI MALAYSIA

PROJECT: PHASE 3

SECD2523 - DATABASE
SEMESTER I, SESSION 2023/2024

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1.0 Introduction

In the next phase, phase 3 of the Iskandar Puteri City Council's Low Carbon Initiatives Community Monitoring System project, our database project mainly focuses on transitioning the conceptual design into a normalized logical database structure. In the previous phase, we thoroughly analyzed the case study, identified the business rules, and concurrently constructed an ERD. In this phase, our aim is to transform the existing conceptual ERD into a logical ERD in order to make the overall structure become more organized.

The goal for this phase is to ensure that our team not only creates a database capable of storing information, but also be able to provide a user-friendly interface for users to engage with the system. The main idea here is to implement a user interface design that caters to various user requirements, ensuring straightforwardness, clarity, and ease of use to ensure the usability of this system.

Subsequently, this database will contribute to supporting the Iskandar Puteri City Council in addressing some issues regarding the existing system's shortcomings and help them in tracking carbon consumption efficiently.

2.0 Overview of the Project

Goal 1: Database Structure Enhancement

In this project, we aim to achieve the normalization until BCNF structure. First, we are going to determine the logical database structure from the conceptual one. Next, from the achieved logical database structure, we are going to normalize it into the Boyce-Codd Normal Form (BCNF) so that data in this project is maintained to be secured while developing data organization efficiently. In order to do that, we will thoroughly illustrate the transitioning from the conceptual ERD to a normalized one by removing any elements in the existing database design that do not follow the relational database principles.

Goal 2: User-Friendly Interface

Besides that, our goal is to implement a user-friendly interface. This means that throughout this project, we will enhance user experience when engaging with the Low Carbon Initiatives Community Monitoring System. In order to achieve this, a user-friendly and effective user interface must be deployed to enable a smooth data entry process, as well as the data retrieval and navigation of the system. The main reason for this is to increase users' tendency to keep engaged and actively participate with the system while also maintaining a straightforward manner when interacting with the database.

Goal 3: Validation with Transaction Requirements

In pursuit of Goal 3, we are primarily concerned with making sure that the improved database structure and operational requirements are incorporated smoothly by validating the logical ERD with the system’s transaction requirement. First of all, in order to ensure that the data dictionary appropriately represents the data items in the system, we plan to update the data dictionary by using normalized relations which will be shown in ‘4.3 Normalization’. This is one of the crucial steps in keeping a clear grasp of the attributes and contents of the database. The next objective is to validate the interface design with system transaction, ensuring that it satisfies the requirements of system transaction. As part of the validation process, SQL queries are mapped to the interface design, ensuring that both logical ERD and the anticipated system features can work together seamlessly. Lastly for this goal, we are focusing on accomplishing these goals in order to guarantee that the

enhanced database can complies with the specified transaction requirements while also supports a robust and effective system operation for the Low Carbon Initiatives Community Monitoring System of the Iskandar Puteri City Council.

3.0 Database Conceptual Design

Introduction to the conceptual design, including updated business rules.

Rubric:

- Documented the entire ERD construction process
- Demonstrated a full understanding of project requirements based on the case study

3.1 Updated Business Rule

Revised business rules based on project progress

Entities

1. **ResidentialUsers:**
   - Attributes:
     i. UserID (PK)
     ii. TypeOfHouse
     iii. ElectricityConsumption
     iv. WaterConsumption
     v. RecycledCookingOilConsumption
2. **Institutions:**
   - Attributes:
     i. InstitutionID (PK)
     ii. EnergyConsumption
     iii. ResourceConsumption
     iv. DataFeasibility
3. **DivisionsMBIP:**
   - Attributes:
     i. DivisionID (PK)
     ii. DataContribution
     iii. DigitalCarbonFootprint
4. **StaffMBIP:**
   - Attributes:
     i. StaffID(PK)
     ii. DivisionID (FK)
     iii. PersonalCarbonFootprint
     iv. CorporateCarbonFootprint
5. **AdministrativeUsers:**
   - Attributes:
     i. AdminID (PK)
     ii. AccessControl
     iii. SystemConfiguration

Relationships

ResidentialUsers - Institutions:

- ResidentialUser will contribute its data to Institutions.
- **Business Rule:**
  i. Many residential users may contribute their data to many institutions.

DivisionsMBIP - Institutions:

- DivisionsMBIP will contribute its data to Institutions.
- **Business Rule:**
  i. Many institutions may contribute their data to at most one MBIP division.

StaffMBIP - DivisionsMBIP:

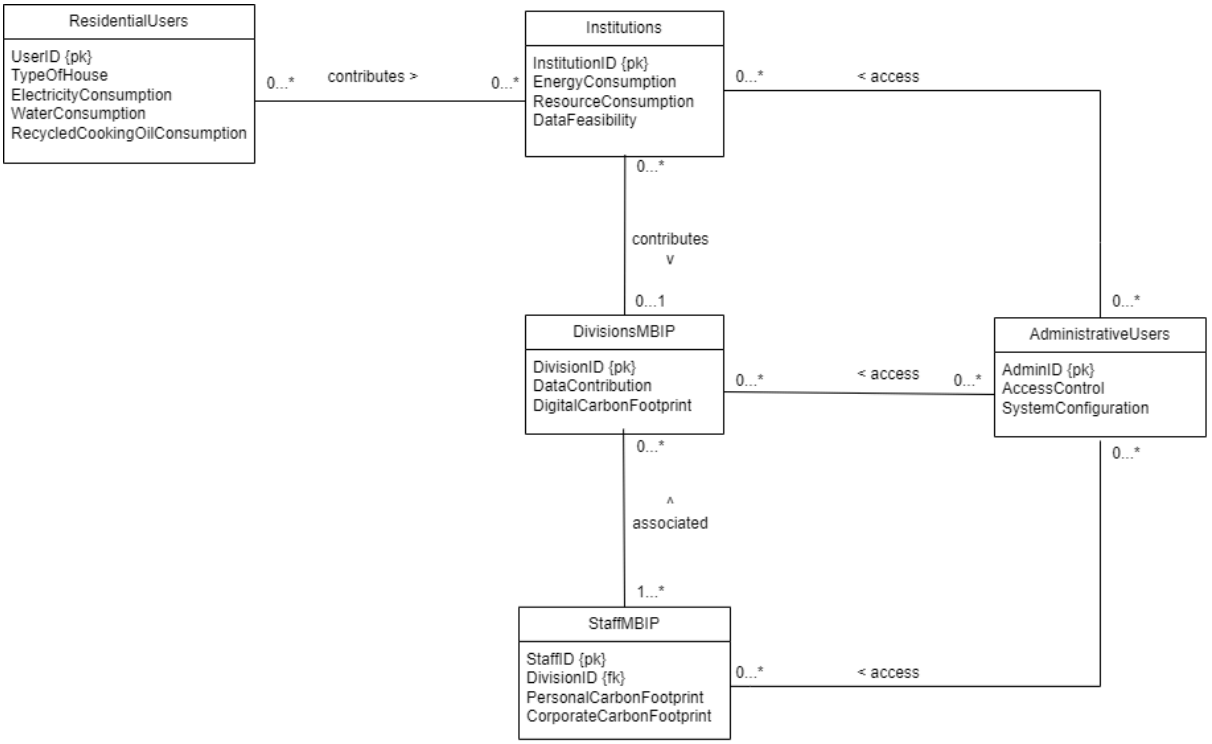
- Both StaffMBIP are associated with DivisionsMBIP.
- **Business Rule:**
  i. At least one or more MBIP Staff must be associated with only one MBIP division.

AdministrativeUsers

- Have access to most of the entities which are Institutions, DivisionMBIP, and StaffMBIP.
- **Business Rule:**
  i. Many administrative users may have access to more than one institution.
  ii. Many administrative users may have access to more than one MBIP division.
  iii. Many administrative users may have access to more than one MBIP staff.

3.2 Conceptual ERD

Overview of the original conceptual ERD



4.0 DB Logical Design

Transition to logical design

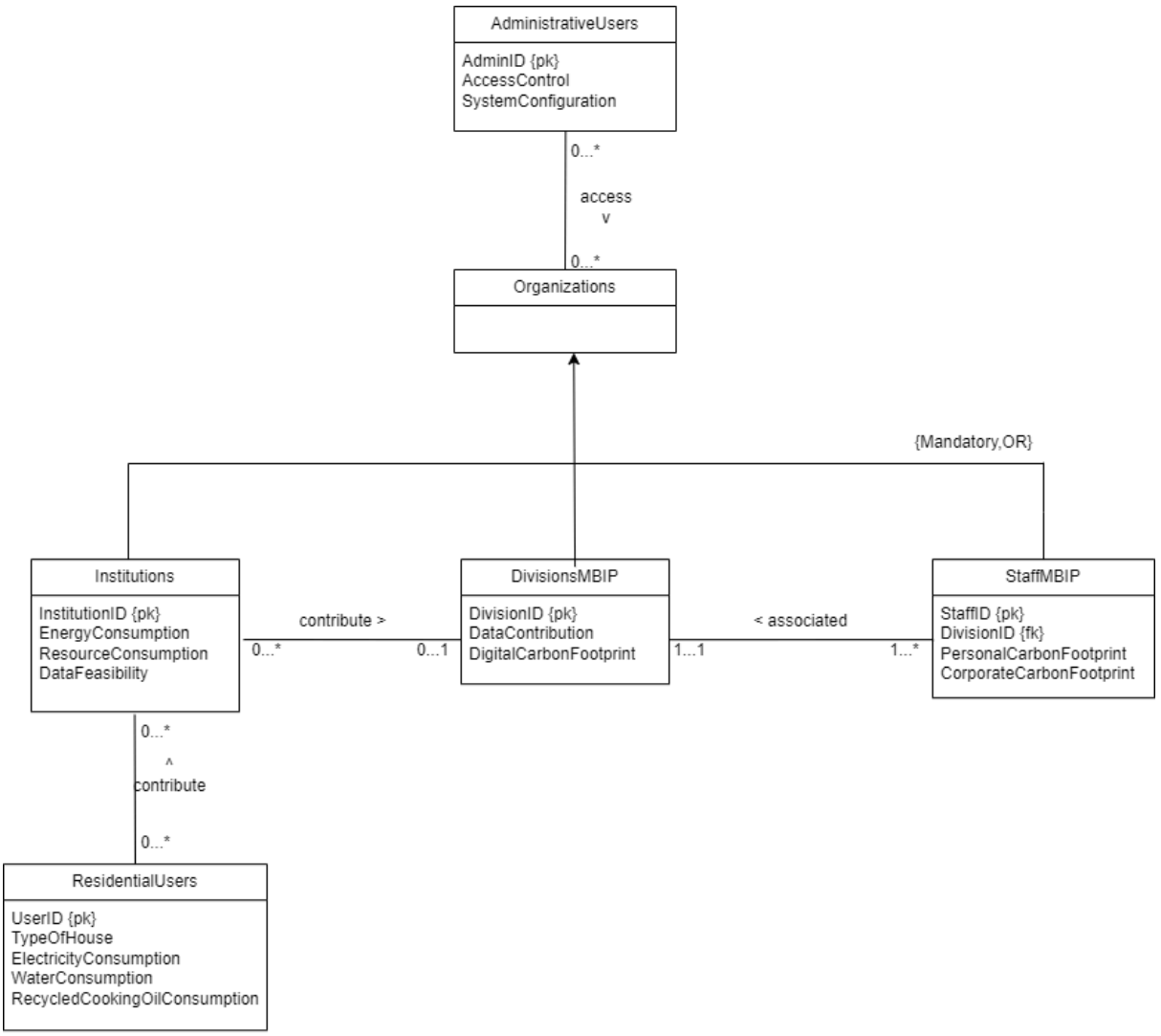
4.1 Logical ERD

Presentation and explanation of the final logical ERD

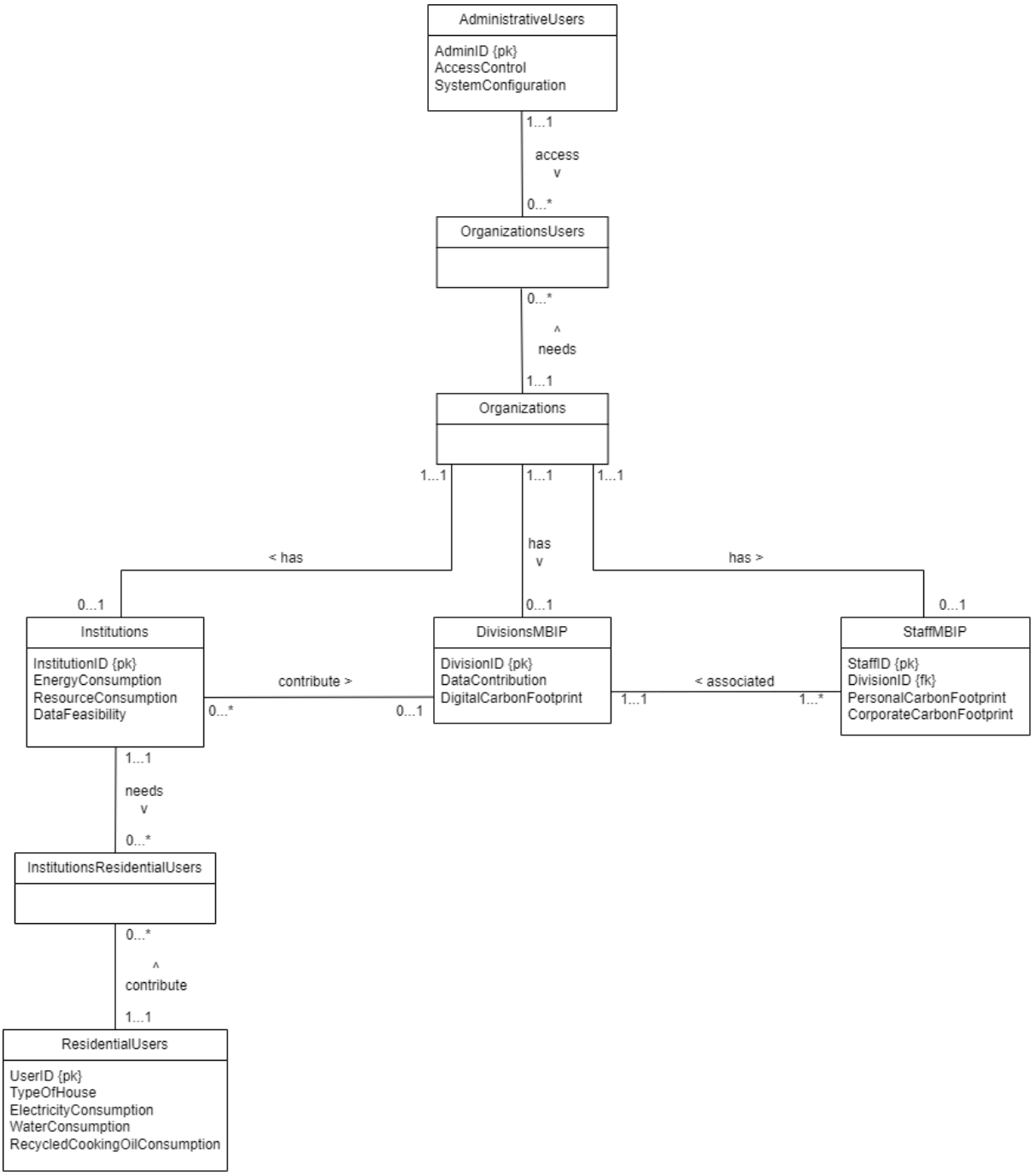
Rubric:

- Thoroughly drew the logical ERD and derived relations
- Complete understanding of ERD concepts and normalization steps
- Accurately represents the dependency diagrams and relational schemas
- Correctly labeled transitive and partial dependencies

4.1.1 Enhanced ERD



4.1.2 Logical ERD



4.2 Updated Data Dictionary - Aqil

Comprehensive data dictionary reflecting changes in the logical design

Rubric:

- Appropriate design for the target user
- Simple and intuitive interaction usability

4.2.1 Description of Entity

Entity	**Description**	**Occurrence**
Institution	Holds institution information	Show all the details about the institution
ResidentialUsers	Holds the residential users information	Users key in the details about their house type and also the total of consumption
DivisionsMBIP	Holds the MBIP details	Contribute in the carbon footprint calculations
StaffMBIP	Holds the staff information	Included in the system and also operate the system
AdministrativeUsers	Holds the admin information	Manage and maintain the system

4.2.2 Description of Relationship

Entity	Multiplicity	Relationship	Multiplicity	Entity
Institution	0...*	contribute	0...1	DivisionsMBIP
	1…1	need	0…*	InstitutionalResidentialUsers
StaffMBIP	1…*	associated	1…1	DivisionsMBIP
ResidentialUsers	1…1	contribute	0…*	InstitutionalResidentialUsers
Organization	1…1	has	0…1	Institution
	1…1	has	0…1	DivisionsMBIP
	1…1	has	0…1	StaffMBIP
	1…1	needs	0...*	OrganizationUsers
AdministrativeUsers	1…1	access	0...*	OrganizationUsers

Entity Attributes

Entity	**Attribute**	**Description**	**Data type & Length**	**Constraints**
ResidentialUsers	UserID	Resident Identification number	VARCHAR2(20)	Primary Key, Not NULL, Unique
	TypeOfHouse	Type of house that the resident stay at	VARCHAR2(20)	Not NULL
	ElectricityConsumption	Total electricity that	NUMBER(7)	Not NULL

		the resident consume		
	WaterConsumption	Total water that the resident consume	NUMBER(7)	Not NULL
	RecycledCookingOilConsumption	Total cooking oil that the resident use	NUMBER(7)	Not NULL
Institution	InstitutionID	Identification number that the institution use	VARCHAR2(20)	Primary Key, Not NULL, Unique
	EnergyConsumption	Total energy use by the institution	NUMBER(7)	Not NULL
	ResourceConsumption	Total resource use by the institution	NUMBER(7)	Not NULL
	DataFeasibility	Relevant data	VARCHAR(8)	Not NULL
DivisionsMBIP	DivisionID	The Identification number for the MBIP division workers	VARCHAR2(20)	Primary Key, Not NULL, Unique
	DataContribution	Identify either the data level	VARCHAR2(20)	Not NULL
	DigitalCarbonFootprint	Calculation for the carbon footprint based on the total consumption	NUMBER(7)	Not NULL
StaffMBIP	StaffID	Staff Identification number	VARCHAR2(20)	Primary Key, Not NULL, Unique
	DivisionID	The Identification number for the	VARCHAR2(20)	Primary Key, Not NULL, Unique

		MBIP division workers		
	PersonalCarbonFootprint	Total carbon footprint that have been produce by the staff himself	NUMBER(7)	Not NULL
Administrative Users	AdminID	Identification number that admin for the system use	VARCHAR2(20)	Primary Key, Not NULL, Unique
	AccessControl	Role that have been distribute among the workers	VARCHAR2(10)	Not NULL
	SystemConfiguration	Hold the settings option, how the system will be operate	VARCHAR2(20)	Not NULL, Unique

4.3 Normalization

Explanation of the normalization steps undertaken

Rubric:

- Complete understanding of ERD concepts and normalization steps,
- Illustrated normalization steps from 1NF to BCNF

First Normal Form (1NF)

Relational Schema
ResidentialUsers (UserID,TypeOfHouse,ElectricityConsumption,WaterConsumption,RecycledCookingOilConsumption) Primary Key : UserID

AdministrativeUsers (AdminID, AccessControl, SystemConfiguration) Primary Key : AdminID
Institutions (InstitutionID, EnergyConsumption, ResourceConsumption, DataFeasibility) Primary Key : InstitutionID
DivisionMBIP (DivisionID, DigitalContribution, DigitalCarbonFootprint) Primary Key : DivisionID
StaffMBIP (StaffID, DivisionID, PersonalCarbonFootprint) Primary Key : StaffID

Second Normal Form (2NF)

Relational Schema
ResidentialUsers (UserID,TypeOfHouse,ElectricityConsumption,WaterConsumption,RecycledCookingOilConsumption) Primary Key : UserID
AdministrativeUsers (AdminID, AccessControl, SystemConfiguration) Primary Key : AdminID
Institutions (InstitutionID, EnergyConsumption, ResourceConsumption, DataFeasibility) Primary Key : InstitutionID
DivisionMBIP (DivisionID, DigitalContribution, DigitalCarbonFootprint) Primary Key : DivisionID
StaffMBIP (StaffID, DivisionID, PersonalCarbonFootprint)

Third Normal Form (3NF)

Relational Schema
ResidentialUsers (UserID,TypeOfHouse,ElectricityConsumption,WaterConsumption,RecycledCookingOilConsumption) Primary Key : UserID
AdministrativeUsers (AdminID, AccessControl, SystemConfiguration) Primary Key : AdminID
Institutions (InstitutionID, EnergyConsumption, ResourceConsumption, DataFeasibility) Primary Key : InstitutionID
DivisionMBIP (DivisionID, DigitalContribution, DigitalCarbonFootprint) Primary Key : DivisionID
StaffMBIP (StaffID, PersonalCarbonFootprint)\ Primary Key : StaffID

5.0 Relational DB Schemas (After Normalization)

Presentation of tables after normalization

Rubric:

- Accurately represents dependency diagrams and relational schemas

Administrative User

AdminID	AdminName	AccessControl
001	Fahim	System Admin
010	Ali	Database Admin
100	Eden	Network Admin
002	Liv	Security Admin
090	Charles	System Admin
023	Daniel	Network Admin
012	Robert	System Admin
006	Leo	Database Admin
021	Izz	Network Admin
019	Wan	Database Admin

Institutions

InstitutionID	EnergyConsumption	ResourceConsumption	DataFeasibility
A22	20	30	45
A21	14	30	35
A24	14	30	34
A42	10	67	35
A52	36	26	99
A62	37	22	68
A29	83	43	24
A34	37	38	32
A65	24	24	23
A25	25	25	12
A20	45	41	11

ResidentialUsers

UserID	TypeOfHouse	ElectricityConsumption	WaterConsumption	RecycledCookingOilsConsumption
U1	Bungalow	23	46	78
U4	Terrace	34	67	43
U5	Apartment	35	23	32
U7	Terrace	26	26	28
U2	Terrace	34	65	99
U3	Bungalow	35	43	54
U6	Terrace	21	66	43
U9	Apartment	56	76	65
U10	Bungalow	56	74	89
U8	Apartment	45	46	76

DivisionsMBIP

DivisionID	DataContribution	DigitalCarbonFootprint
D1	Low	122
D4	High	142
D2	Too Low	123
D5	Moderate	542
D7	Low	213
D9	High	325
D10	Moderate	335
D3	Low	245
D8	High	100
D6	Low	89

D11	Moderate	78

Staff MBIP

StaffID	DivisionID	PersonalCarbonFootprint	CorporateCarbonFootprint
S2	D11	23	12
S4	D6	45	70
S3	D2	33	22
S5	D11	12	45
S6	D3	24	64
S9	D10	55	16
S7	D7	45	10
S1	D9	31	40
S9	D8	34	22
S8	D6	65	29

6.0 SQL Statements (DDL & DML)

Proposed SQL statements mapped to functions, optimized for performance

Rubric

- Exceptional mapping of SQL statements to functions
- Added at least 20 records to the database
- Included appropriate queries with at least five DML skills
- Demonstrated an appropriate report structure

```
CREATE TABLE AdministrativeUsers(
AdminID VARCHAR2(20),
AdminName VARCHAR2(20),
AccessControl VARCHAR2(20),
CONSTRAINT admin_pk PRIMARY KEY (AdminID)
);

CREATE TABLE Organizations(
AdminID VARCHAR2 (20),
CONSTRAINT admin_fk FOREIGN KEY (AdminID) REFERENCES
AdministrativeUsers(Admin ID)
);

CREATE TABLE Institutions(
InstitutionID VARCHAR2 (20),
EnergyConsumption NUMBER (15),
ResourceConsumption NUMBER (15),
DataFeasibility NUMBER (15),
CONSTRAINT ins_pk PRIMARY KEY (InstitutionID),
);

CREATE TABLE DivisionsMBIP(
DivisionID VARCHAR2 (20),
DataContribution VARCHAR2 (20),
```

```
DigitalCarbonFootprint NUMBER (20),
CONSTRAINT div_pk PRIMARY KEY (DivisionID)
);

CREATE TABLE StaffMBIP(
StaffID VARCHAR2 (20) NOT NULL,
DivisionID VARCHAR2 (20) NOT NULL,
PersonalCarbonFootprint NUMBER (12),
CorporateCarbonFootprint NUMBER (12),
CONSTRAINT Staff_pk PRIMARY KEY (StaffID),
CONSTRAINT Staff_fk FOREIGN KEY (DivisionID) REFERENCES DivisionsMBIP
(DivisionID)
);

CREATE TABLE ResidentialUsers(
UserID VARCHAR2 (20) NOT NULL,
TypeOfHouse VARCHAR2 (20),
ElectricityConsumption NUMBER (12),
WaterConsumption NUMBER (12),
RecycledCookingOilConsumption NUMBER (12),
CONSTRAINT resident_pk PRIMARY KEY (UserID)
);

ALTER TABLE Institutions
ADD CONSTRAINT check_data CHECK (EnergyConsumption >= 0);


—--------- Administrative User
INSERT INTO AdministrativeUsers
VALUES ('001','Fahim','System Admin');

INSERT INTO AdministrativeUsers
VALUES ('010','Ali','Database Admin');

INSERT INTO AdministrativeUsers
VALUES ('100','Eden','Network Admin');
```

```
INSERT INTO AdministrativeUsers
VALUES ('002','Liv','Security Admin');

INSERT INTO AdministrativeUsers
VALUES ('090','Charles','System Admin');

INSERT INTO AdministrativeUsers
VALUES ('023','Daniel','Network Admin');

INSERT INTO AdministrativeUsers
VALUES ('012','Robert','System Admin');

INSERT INTO AdministrativeUsers
VALUES ('006','Leo','Database Admin');

INSERT INTO AdministrativeUsers
VALUES ('021','Izz','Network Admin');

INSERT INTO AdministrativeUsers
VALUES ('019','Wan','Database Admin');

—--------- Institutions
INSERT INTO Institutions
VALUES ('A22',20,30,45);

INSERT INTO Institutions
VALUES ('A21',14,30,35);

INSERT INTO Institutions
VALUES ('A24',14,30,34);

INSERT INTO Institutions
VALUES ('A42',10,67,35);

INSERT INTO Institutions
```

```
VALUES ('A52',36,26,99);

INSERT INTO Institutions
VALUES ('A62',37,22,68);

INSERT INTO Institutions
VALUES ('A29',83,43,24);

INSERT INTO Institutions
VALUES ('A34',37,38,32);

INSERT INTO Institutions
VALUES ('A65',24,24,23);

INSERT INTO Institutions
VALUES ('A25',25,25,12);

INSERT INTO Institutions
VALUES ('A20',45,41,11);

—--------- DivisionsMBIP
INSERT INTO DivisionsMBIP
VALUES ('D1','Low',122);

INSERT INTO DivisionsMBIP
VALUES ('D4','High',142);

INSERT INTO DivisionsMBIP
VALUES ('D2','Too low',123);

INSERT INTO DivisionsMBIP
VALUES ('D5','Moderate',542);

INSERT INTO DivisionsMBIP
VALUES ('D7','Low','213')
```

```
INSERT INTO DivisionsMBIP
VALUES ('D9','High',325);

INSERT INTO DivisionsMBIP
VALUES ('D10','Moderate',335);

INSERT INTO DivisionsMBIP
VALUES ('D3','Low',245);

INSERT INTO DivisionsMBIP
VALUES ('D8','High',100);

INSERT INTO DivisionsMBIP
VALUES ('D6','Low',89);

INSERT INTO DivisionsMBIP
VALUES ('D11','Moderate',78);

—--------- Staff MBIP
INSERT INTO StaffMBIP
VALUES ('S2','D11',23,12);

INSERT INTO StaffMBIP
VALUES ('S4','D6',45,70);

INSERT INTO StaffMBIP
VALUES ('S3','D2',33,22);

INSERT INTO StaffMBIP
VALUES ('S5','D11',12,45);

INSERT INTO StaffMBIP
VALUES ('S6','D3',24,64);

INSERT INTO StaffMBIP
VALUES ('S9','D10',55,16);
```

```
INSERT INTO StaffMBIP
VALUES ('S7','D7',45,10);

INSERT INTO StaffMBIP
VALUES ('S1','D9',31,40);

INSERT INTO StaffMBIP
VALUES ('S9','D8',34,22);

INSERT INTO StaffMBIP
VALUES ('S8','D6',65,29);

—--------- Residential Users
INSERT INTO ResidentialUsers
VALUES ('U1','Bungalow',23,46,78);

INSERT INTO ResidentialUsers
VALUES ('U4','Terrace',34,67,43);

INSERT INTO ResidentialUsers
VALUES ('U5','Apartment',35,23,32);

INSERT INTO ResidentialUsers
VALUES ('U7','Terrace',26,26,28);

INSERT INTO ResidentialUsers
VALUES ('U2','Terrace',34,65,99);

INSERT INTO ResidentialUsers
VALUES ('U3','Bungalow',35,43,54);

INSERT INTO ResidentialUsers
VALUES ('U6','Terrace',21,66,43);

INSERT INTO ResidentialUsers
```

```
VALUES ('U9','Apartment',56,76,65);

INSERT INTO ResidentialUsers
VALUES ('U10','Bungalow',56,74,89);
INSERT INTO ResidentialUsers
VALUES ('U8','Apartment',45,46,76);

UPDATE StaffMBIP
SET CorporateCarbonFootprint = 45
WHERE StaffID = 'S2';

SELECT *
FROM StaffMBIP;
```

```
1 row updated.


STAFFID              DIVISIONID           PERSONALCARBONFOOTPRINT CORPORATECARBONFOOTPRINT
-------------------- -------------------- ----------------------- -------------------------
S2                   D11                                      23                        45
S4                   D6                                       45                        70
S3                   D2                                       33                        22
S5                   D11                                      12                        45
S6                   D3                                       24                        64
S9                   D10                                      55                        16
S8                   D6                                       65                        29

7 rows selected.
```

```
SELECT *
FROM AdministrativeUsers;
```

ADMINID	ADMINNAME	ACCESSCONTROL
001	Fahim	System Admin
010	Ali	Database Admin
100	Eden	Network Admin
002	Liv	Security Admin
090	Charles	System Admin
023	Daniel	Network Admin
012	Robert	System Admin
006	Leo	Database Admin
021	Izz	Network Admin
019	Wan	Database Admin

SELECT *

FROM DivisionsMBIP;

	DIVISIONID	DATACONTRIBUTION	DIGITALCARBONFOOTPRINT
1	D1	Low	122
2	D4	High	142
3	D2	Too low	123
4	D5	Moderate	542
5	D10	Moderate	335
6	D3	Low	245
7	D8	High	100
8	D6	Low	89
9	D11	Moderate	78

SELECT *

FROM Institutions;

	INSTITUTIONID	ENERGYCONSUMPTION	RESOURCECONSUMPTION	DATAFEASIBILITY
1	A22	20	30	45
2	A21	14	30	35
3	A24	14	30	34
4	A42	10	67	35
5	A52	36	26	99
6	A62	37	22	68
7	A29	83	43	24
8	A34	37	38	32
9	A65	24	24	23
10	A25	25	25	12
11	A20	45	41	11

```
SELECT UserID,TypeOfHouse,ElectricityConsumption
FROM ResidentialUsers
WHERE ElectricityConsumption BETWEEN 30 AND 45;
```

	USERID	TYPEOFHOUSE	ELECTRICITYCONSUMPTION
1	U4	Terrace	34
2	U5	Apartment	35
3	U2	Terrace	34
4	U3	Bungalow	35
5	U8	Apartment	45

```
SELECT UserID "User ID",TypeOfHouse "Type of House"
FROM ResidentialUsers
WHERE TypeOfHouse = 'Apartment';
```

	User ID	Type of House
1	U5	Apartment
2	U9	Apartment
3	U8	Apartment

```
SELECT AdminID "Admin ID",AdminName "AdminName",AccessControl "Role"
FROM AdministrativeUsers
ORDER BY AdminName DESC;
```

Admin ID	AdminName	Role
019	Wan	Database Admin
012	Robert	System Admin
002	Liv	Security Admin
006	Leo	Database Admin
021	Izz	Network Admin
001	Fahim	System Admin
100	Eden	Network Admin
023	Daniel	Network Admin
090	Charles	System Admin
010	Ali	Database Admin

```
SELECT UserID "Resident User",TypeOfHouse "Type Of
House",ElectricityConsumption,WaterConsumption,RecycledCookingOilConsumption
```

```
FROM ResidentialUsers
WHERE TypeOfHouse = 'Terrace' OR TypeOfHouse = 'Bungalow'
ORDER BY TypeOfHouse ASC;
```

	Resident User	Type Of House	ELECTRICITYCONSUMPTION	WATERCONSUMPTION	RECYCLEDCOOKINGOILCONSUMPTION
1	U1	Bungalow	23	46	78
2	U3	Bungalow	35	43	54
3	U10	Bungalow	56	74	89
4	U6	Terrace	21	66	43
5	U7	Terrace	26	26	28
6	U4	Terrace	34	67	43
7	U2	Terrace	34	65	99

```
SELECT ROWNUM AS "Admin Number",AdminName "Admin Name"
FROM (SELECT AdminName FROM AdministrativeUsers)
WHERE ROWNUM <= 10;
```

Admin Number	Admin Name
1	Fahim
2	Ali
3	Eden
4	Liv
5	Charles
6	Daniel
7	Robert
8	Leo
9	Izz
10	Wan

```
SELECT d.DivisionID,d.DataContribution,d.DigitalCarbonFootprint,
      s.StaffID,s.PersonalCarbonFootprint
FROM DivisionsMBIP d JOIN StaffMBIP s
ON d.DivisionID = s.DivisionID;
```

	DIVISIONID	DATACONTRIBUTION	DIGITALCARBONFOOTPRINT	STAFFID	PERSONALCARBONFOOTPRINT
1	D11	Moderate	78	S2	23
2	D6	Low	89	S4	45
3	D2	Too low	123	S3	33
4	D11	Moderate	78	S5	12
5	D3	Low	245	S6	24
6	D10	Moderate	335	S9	55
7	D6	Low	89	S8	65

7.0 Summary

Concluding remarks summarizing the key design decisions and outcomes

Last but not least, the logical ERD serves as the foundation for the creation of the MBIP's Carbon Reduction and Sustainability Engagement System for this specific phase. The conceptual ERD (EERD) from the earlier phase serves as the basis for the logical ERD.

The entities proceed through the normalization process from the logical ERD, starting with the First Normal Form (1NF) and ending with the Boyce-Codd Normal Form (BCNF). In addition to detecting update anomalies and data redundancy, the normalizing process supports the database design. In addition, this will allow the system to manage the data more effectively without compromising the integrity of the data.

Aside from that, the data dictionary is kept up to date with the normalized relations. This is a critical stage in the phase since it captures information about all entities, properties, and relationships. The system's SQL code statements are then defined using Oracle Developer, and the code is thoroughly documented to clarify its purpose. A prototype is also constructed to clearly demonstrate the system's flow and database functionality.

In a nutshell, we hope that at the end of the phase and project, the system will fulfill its objectives while complying with the MBIP standards. We also hope that our system will make people happy while using it. Other than that, we hope that our stakeholders will be satisfied with the system as it will be more user friendly than the previous system.