UTM

UNIVERSITI TEKNOLOGI MALAYSIA

UNIVERSITI PENYELIDIKAN

GROUP PROJECT COVER PAGE

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SECTION : 06

LECTURER'S NAME : DR IZYAN IZZATI BINTI KAMSANI

SESSION/SEMESTER : 2023-2024/1

ASSIGNMENT TITLE : PROJECT PHASE 1 - PROPOSAL & DATABASE REQUIREMENT

MEMBER DETAILS :

NAME	MATRIC NUMBER
TAM JIA HAO	A22EC0106
PUA ZHI YING	A22EC0103
TAN YOU CHUN	A22EC0108
TRINAATH A/L ATHINARAYANARAO	A22EC0289
PUJJAA JANANI A/P SEGAR	A22EC0260

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1.0 Introduction

Malaysia has implemented several initiatives of the Low Carbon Cities Framework (LCCF) after knowing the importance of the efforts to reduce carbon emissions. The Iskandar Puteri City Council (MBIP), who promotes a Low Carbon Society (LCS) through its Iskandar Puteri Low Carbon (IPRK) initiative, is one of the major contributors for this initiative.It is essential to always monitor and track the existing levels of carbon dioxide (CO2) emissions to guide the reduction efforts to combat global warming and climate change.

The case study is about the larger background of Malaysia's sustainable development commitment, which can be seen by the initiatives such as the Low Carbon Blueprint for Iskandar Malaysia 2025. This plan has shown the seriousness of the country's commitment to the environment by setting a goal to achieve a 58 percent reduction in carbon intensity by 2025. However, to achieve the goals, the complex monitoring systems and comprehensive policies that can evaluate and put efforts to reduce the carbon dioxide (CO2) emissions are also necessary.

2.0 Background Study

MBIP is a significant stakeholder with a keen interest in promoting the Low Carbon Society (LCS), particularly through its Iskandar Puteri Low Carbon (IPRK) initiative. The IPRK initiative's aim is to gather data on energy-saving efforts within various communities. One of the initiatives include Iskandar Puteri Low Carbon Calendar Competition. However, MBIP faced issues throughout conducting this competition. MBIP decided to handle data collection through Google Form. However, the current method is not an efficient way. This is because many challenges were encountered by MBIP. Some of them are troublesome data entry processes, extensive participant information requirements, manual carbon reduction calculations and reporting, and a lack of data analysis capabilities. Varied user profiles and participants' unfamiliarity with Google Forms. Therefore, to tackle this issue MBIP wants to come up with a system such as e-Lestari. This new platform will target different community categories, including residents in multi-story and landed houses, institutions, MBIP divisions, and MBIP staff. The expected data and analysis requirements for MBIP encompass mapping the carbon footprint within the MBIP region, calculating carbon reductions for electricity, water, waste, and recycled cooking oil consumption, identifying communities with high CO2 emissions, and creating a self-monitoring dashboard for carbon emissions among users.

3.0 Problem Statement

1. A time consuming and user-unfriendly data entry process, with an added challenge of participants' unfamiliarity with Google Form. The current method of data collection involves the community filling up a Google Form with various information such as identification, electricity bill, water bill, waste, and cooking oil consumption. This is a long and tedious process, especially for a certain subset in the community like the elderly who are not so skilled in handling such technical processes.

2. Manual carbon reduction calculations and reporting. Currently, MBIP has to manually calculate the carbon emissions and reductions using the data entered by the community. This is a highly inefficient process considering the massive amount of data that has to be calculated and analyzed before reporting can be done on the carbon reduction.

3. Absence of self-monitoring functionality. Through the current process, as the calculations are done manually by MBIP after data collection from the participants, there is no way for the participants to monitor themselves on their carbon footprint and their progress in reducing carbon emissions. This is a setback as the awareness of contribution and self-critical aspects is highly required to drive the participants to work harder towards their goal.

4. Manual data validation. Currently, MBIP is manually validating the data given by the participants to evaluate the authenticity. This process is highly inefficient considering the large amount of data and the time constraint. It is also ineffective as the participants have to re-enter the information which they have incorrectly filled previously, only after the manual validation process by MBIP. This is a highly tedious process for the participants.

4.0 Proposed Solutions

The Iskandar Puteri Rendah Karbon (IPRK) system is our new proposed application that allows more people to participate with ease in the IPRK initiative. This application will mitigate the problems undergone by the previous method of data collection by the MBIP which is through Google Forms.

Through this application, the users, who are residents and institutions in the MBIP region, can experience a more user-friendly data entry process, where the amount of information needed to be manually input by the user is significantly reduced. In this application, users only need to input thorough information about themselves after creating a user profile with username and password in the system. The data related to the Electric bill, Water bill and Recycling Items collection will no longer be needed to be entered manually like the current method, instead, users will only need to upload photos of their bills across the months which will allow the Artificial Intelligence (AI) embedded in the application to automatically identify and extract the values needed to compute the carbon footprint of the user. This saves so much time on the users' behalf and proves to be an effective and efficient solution. This also makes it easier for community members from all ages to participate including the elderly.

This application will also grant MBIP a major upgrade from their current system and will significantly increase the efficiency and effectiveness in terms of data collection, validation and also calculation. Through this app, all the data input by users will be automatically validated for error based on constraints initially set by the administrator. Consequently, the collected data will be calculated based on the preset algorithm and formulas to determine the carbon footprints of users. Through real-time automatic data validation, users do not need to experience the hassle of waiting for MBIP staffs to manually validate their data which usually leads to data re-entry.

The IPRK application also introduces a brand new functionality for the users, which is the self-monitoring dashboard. Using this feature, users can view their personal milestone, achievements and performance in contributing to carbon reduction. This feature allows the users to self-evaluate themselves and continuously reduce their carbon footprint.

This application has a database system with entities and attributes as its core that will be used to record all the values and inputs from users. The calculated data as well as the final carbon footprint and reduction values will also be stored in this database.

Feasibility Study

Technical Feasibility:

The Iskandar Puteri Rendah Karbon (IPRK) is an application that requires a database system. The database system is needed to store information of the users as well as the information provided such as water bill, electricity bill and also receipt collected after recycling. Besides that, the technical feasibility of this project also includes the automated calculations and analytics software tools. The purpose of these software is to calculate the carbon emission by the user that will aid in analysing as well. Additionally, this system should map the carbon footprint. This is about merging geographic information system data with computerized mapping methods for viewing carbon emissions in the MBIP region.

Operational Feasibility:

The operational feasibility of the application includes the accessibility and inclusivity. System is made sure to be accessible to a diverse user base, considering different technological capabilities and levels of familiarity. Besides that, with the current method of conducting data gathering and analysis, MBIP staff does the calculations and data validations manually. Our proposed system ensures data accuracy and reliability by executing calculations and analysis in the system itself which does not require manpower. The self monitoring dashboard introduced in the system also benefits the user in terms of tracking their own contribution to carbon emission in their daily life.

Economical Feasibility:

Below is the cost-benefit analysis (CBA):

Assumptions	
Discount rate	10%
Sensitivity factor (costs)	1.1
Sensitivity factor (benefits)	0.9
Annual change in production costs	0.05
Annual change in benefits	0.03

Estimated costs	
Hardware	RM18000
Software	RM15000
Training	RM3000
Salary	RM40000 per year
IS support	RM12000 per year
Maintenance	RM8000 per year

Estimated Benefits	
Reduced Electricity Consumption	RM 3000 per month
Reduced Water Consumption	RM 2000 per month
Waste Management Efficiency	RM 1500 per month
Reduced Healthcare Costs	RM 2500 per month

Costs	Year 0	Year 1	Year 2	Year 3	Year 4
Development cost					
Hardware	19800				
Software	16500				
Training	3300				
Total	39600				
Production Cost					
Salary		44000	46200	48510	50936
IS support		13200	13860	14553	15281
Maintenance		8800	9240	9702	10187
Annual Production Cost (Present Value)		66000 60000	69300 57273	72765 54669	76403 52184
Accumulated Cost		99600	156873	211542	263727

Benefits	Year 0	Year 1	Year 2	Year 3	Year 4
Reduced Electricity Consumption		32400	33372	34373	35404
Reduced Water Consumption		21600	22248	22915	23603
Waste Management Efficiency		16200	16686	17187	17702
Reduced Healthcare Costs		27000	27810	28644	29504
Annual Benefit (Present Value)		97200 88364	100116 82740	103119 77475	106213 72545
Accumulated Benefits		88364	171104	248579	321124
Gain or Loss		(11236)	14231	37037	57398
Profitability Index (PI)	1.45				

From the table above, the profitability index is 1.45, this shows that it is a good investment because its index is greater than 1. From the table above, we know that the client will lose around RM11236 in the first year but will start to gain from the second year. They will gain RM14231 from the second year and it will increase year by year. In the 4th year they will gain around RM57398. Thus, this application will give a good profit.

5.0 Objectives

The upgrade in terms of an efficient and simpler data entry process is intended to address the issues faced by the previous users of the system. The upgraded system would reduce the amount of time required to fill in the required information, which would ease and provide a hassle-free experience for the users, thus garnering attention from more people from a wider age group as potential participants for the initiative in the near future. Besides that, the proposed user dashboard would raise their awareness of their continuous contributions to the low carbon initiative which would allow them to manage their daily consumption and waste if required or maintain their current efforts in order to reach the goal.

MBIP will also have their current need for manpower reduced due to the significant reduction in manual data validation and processing. This will allow them to completely prevent human error in the data analysis process which would lead to more reliable data while reducing the time taken to process the raw data at the same time. This would significantly increase the efficiency compared to the current system's processes.

6.0 Project Scope and System Boundaries

Scope

System

Mobile application

- Allow the user to register and login to an account.
- Allow the residents and institutions to input data, upload photo of bills and view self-dashboard.
- Allow MBIP admin to collect the validated and calculated data.
- Help MBIP to validate and calculate collected data as well as data analysis.
- Provide final analyzed data of carbon footprint and reductions in different areas under MBIP region and as a whole in depth.

User

Resident

- Allow residents to create an account with username and password.
- Allow residents to input their personal and house occupants' information besides the details of collected recycling items across the months.
- Allow residents to upload pictures of their water and electricity bills across the months.
- Allow residents to view their generated personal dashboard to see their progress and personal milestones achieved through the data analysis of their carbon footprint and carbon reduction.

Institution

- Allow institutions to create an account with username and password.
- Allow institutions to input the details of their institution (school, workplace, shops, etc) and the occupancy besides the details of collected recycling items across the months.
- Allow institutions to upload pictures of their water and electricity bills across the months.
- Allow institutions to view their generated personal dashboard to see their progress and personal milestones achieved through the data analysis of their carbon footprint and carbon reduction.

MBIP admin

- Allow MBIP admin to set a username and password before launch of the application
- Allow MBIP admin to view the raw and also the calculated and analysed user data to see the state of carbon footprint and reduction in the MBIP region.
- Provide special access to MBIP admin and allow to download the raw and also the processed user data for other purposes.

System Boundaries

Our IPRK system provides various functionalities to the users. In this context, the system boundaries of our IPRK system will include security and privacy. This measure is taken to secure and protect data provided by users. Besides that, a smoother data entry process is included into the system. The application simplifies the data entry process for users by reducing the manual input required. Moreover, tedious data entry processes like the current method, which relies on manual input of information related to electric bills, water bills, and recycling items will not be included. Geographic focus of the app is also one of the included boundaries. The system focuses on the MBIP region for data collection and analysis. However, the system limitations here is that areas outside MBIP regions will not be included into the system functionalities as the system is tailored to address the specific needs of this MBIP community only. In terms of user inclusion, the app includes one user to register for each institution and house. The limitation here is that more than 1 user is not allowed to register for the same house or institution. Moreover, users out of MBIP regions will not be able to register into the system as well.

7.0 Project Planning

7.1 Human Resource

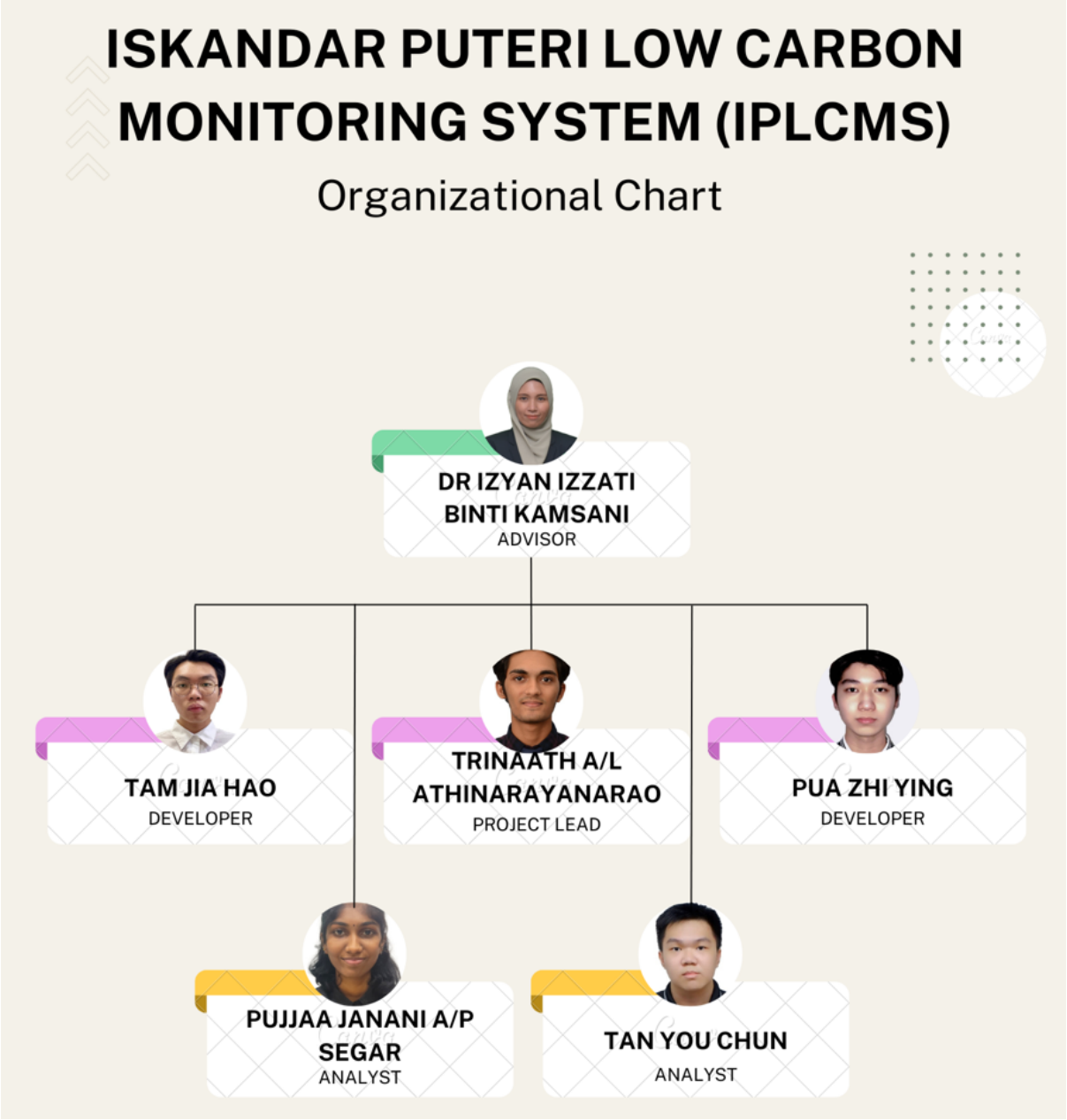

Figure 7.1: Human Resource

Human Resource Link:
https://www.canva.com/design/DAFz3vaol1U/aFWUhyLJGqbNQnMwOKS2-g/edit?utm_content=DAFz3vaol1U&utm_campaign=designshare&utm_medium=link2&utm_source=sharebutton

7.2 Work Breakdown Structure (WBS)

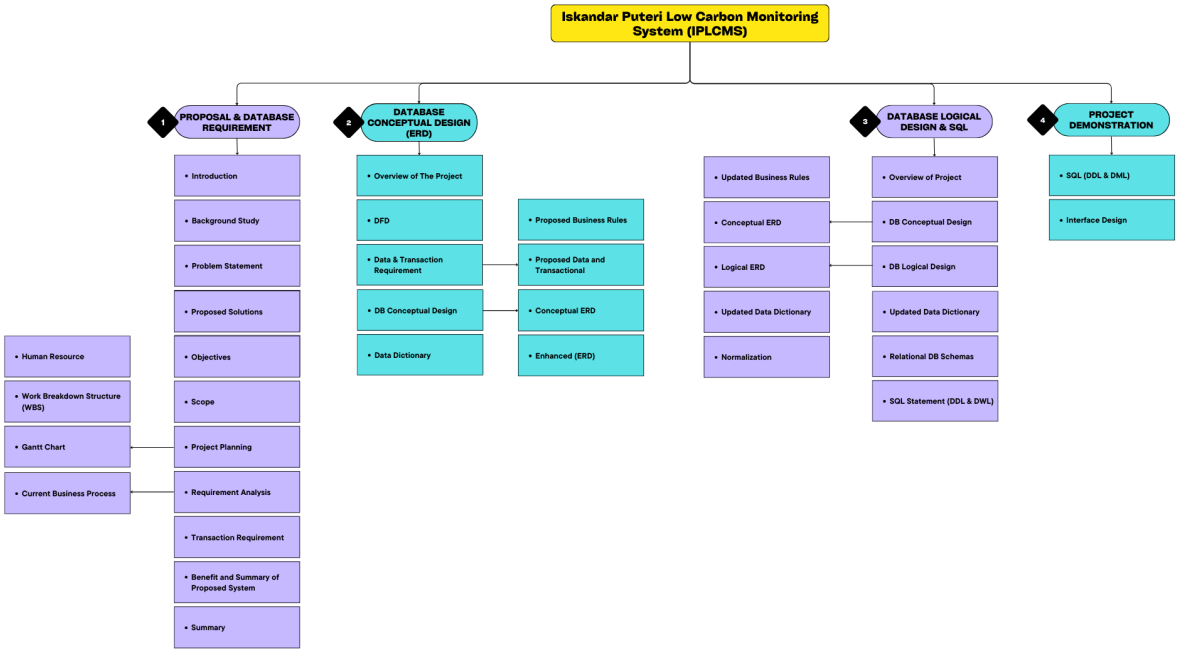

Figure 7.2: WBS

WBS Link:
https://www.canva.com/design/DAF0Wpc2lsg/q8BSf23XmYdiSq3W23ooJA/edit?utm_content=DAF0Wpc2lsg&utm_campaign=designshare&utm_medium=link2&utm_source=sharebutton

7.3 Gantt Chart

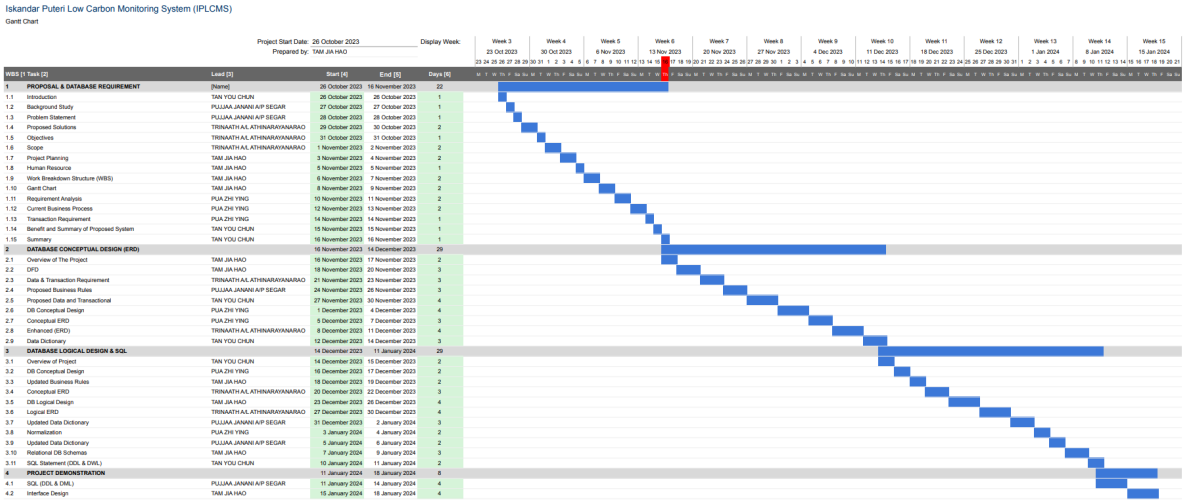

Figure 7.3: Gantt Chart

Gantt Chart Link:

https://docs.google.com/spreadsheets/d/1T0BpzIpo5Plnfe4j70AxaJBfIBk450Xwm7DgTj18zOw/edit?usp=sharing

1. PROPOSAL & DATABASE REQUIREMENT

1.1 Introduction

The introduction phase, led by Tan You Chun, began on October 26, 2023, and concluded on October 26, 2023. This one-day task involved setting the groundwork for the entire project.

1.2 Background Study

Pujjaa Janani A/P Segar conducted the background study from October 27, 2023, to October 27, 2023, spanning one day. This phase laid the foundation by researching relevant information.

1.3 Problem Statement

Under the guidance of Pujjaa Janani A/P Segar, the problem statement was formulated on October 28, 2023. This one-day task aimed to clearly articulate the challenges that the project seeks to address.

1.4 Proposed Solutions

Trinaath A/L Athinarayanarao proposed solutions between October 29, 2023, and October 30, 2023, spanning two days. This phase explored potential strategies to address the identified problems.

1.5 Objectives

Trinaath A/L Athinarayanarao outlined the project objectives on October 31, 2023, in a one-day task. This step clarified the intended outcomes of the project.

1.6 Scope

Defining the project's scope was carried out by Trinaath A/L Athinarayanarao from November 1, 2023, to November 2, 2023, spanning two days. This phase established the boundaries and limitations of the project.

1.7 Project Planning

Tam Jia Hao took charge of project planning from November 3, 2023, to November 4, 2023, taking two days to develop an effective plan for the entire project.

1.8 Human Resource

Tam Jia Hao managed human resource considerations on November 5, 2023, in a one-day task, focusing on assembling the necessary team members.

1.9 Work Breakdown Structure (WBS)

Tam Jia Hao developed the Work Breakdown Structure from November 6, 2023, to November 7, 2023, spanning two days. This step involved breaking down the project into manageable components.

1.10 Gantt Chart

The Gantt Chart, illustrating the project timeline, was created by Tam Jia Hao from November 8, 2023, to November 9, 2023, over two days.

1.11 Requirement Analysis

Pua Zhi Ying conducted the requirement analysis from November 10, 2023, to November 11, 2023, in a two-day task, defining the functional and non-functional requirements.

1.12 Current Business Process

Pua Zhi Ying examined the current business process from November 12, 2023, to November 13, 2023, spanning two days, to understand existing workflows.

1.13 Transaction Requirement

Pua Zhi Ying outlined transaction requirements on November 14, 2023, in a one-day task, specifying the necessary interactions within the system.

1.14 Benefit and Summary of Proposed System

Tan You Chun summarized the benefits of the proposed system on November 15, 2023, in a one-day task, providing a concise overview of the advantages.

1.15 Summary

Tan You Chun concluded the proposal phase on November 16, 2023, with a one-day summary, encapsulating the key aspects of the proposal.

2. DATABASE CONCEPTUAL DESIGN (ERD)

2.1 Overview of The Project

Tam Jia Hao presented an overview of the project from November 16, 2023, to November 17, 2023, over two days, setting the stage for the database conceptual design.

2.2 DFD

Tam Jia Hao developed the Data Flow Diagram (DFD) from November 18, 2023, to November 20, 2023, spanning three days. This diagram illustrated the flow of data within the system.

2.3 Data & Transaction Requirement

Trinaath A/L Athinarayanarao specified data and transaction requirements from November 21, 2023, to November 23, 2023, in a three-day task, identifying the data entities and interactions.

2.4 Proposed Business Rules

Pujjaa Janani A/P Segar formulated proposed business rules from November 24, 2023, to November 26, 2023, taking three days to establish guidelines for the system.

2.5 Proposed Data and Transactional

Tan You Chun detailed proposed data and transactional aspects from November 27, 2023, to November 30, 2023, spanning four days.

2.6 DB Conceptual Design

Pua Zhi Ying conducted the conceptual design of the database from December 1, 2023, to December 4, 2023, taking four days to define the structure.

2.7 Conceptual ERD

Pua Zhi Ying developed the Conceptual Entity-Relationship Diagram (ERD) from December 5, 2023, to December 7, 2023, over three days.

2.8 Enhanced (ERD)

Trinaath A/L Athinarayanarao enhanced the ERD from December 8, 2023, to December 11, 2023, spanning four days, refining the conceptual design.

2.9 Data Dictionary

Tan You Chun compiled the Data Dictionary from December 12, 2023, to December 14, 2023, in a three-day task, providing a detailed description of data elements.

3. DATABASE LOGICAL DESIGN & SQL

3.1 Overview of Project
Tan You Chun provided an overview of the database logical design and SQL phase on December 14, 2023, and December 15, 2023, taking two days.

3.2 DB Conceptual Design
Pua Zhi Ying revisited the database conceptual design from December 16, 2023, to December 17, 2023, in a two-day task, aligning it with the project's evolving needs.

3.3 Updated Business Rules
Tam Jia Hao updated business rules on December 18, 2023, and December 19, 2023, taking two days to ensure alignment with the revised design.

3.4 Conceptual ERD
Trinaath A/L Athinarayanarao adjusted the Conceptual ERD from December 20, 2023, to December 22, 2023, over three days, reflecting changes in the project requirements.

3.5 DB Logical Design
Tam Jia Hao developed the Database Logical Design from December 23, 2023, to December 26, 2023, spanning four days, translating the conceptual design into a structured database.

3.6 Logical ERD
Trinaath A/L Athinarayanarao created the Logical ERD from December 27, 2023, to December 30, 2023, in a four-day task, refining the logical structure of the database.

3.7 Updated Data Dictionary
Pujjaa Janani A/P Segar updated the Data Dictionary from December 31, 2023, to January 2, 2024, taking three days to incorporate changes.

3.8 Normalization
Pua Zhi Ying carried out normalization from January 3, 2024, to January 4, 2024, spanning two days, optimizing the database structure.

3.9 Updated Data Dictionary
Pujjaa Janani A/P Segar further updated the Data Dictionary from January 5, 2024, to January 6, 2024, in a two-day task, ensuring completeness and accuracy.

3.10 Relational DB Schemas
Tam Jia Hao developed Relational Database Schemas from January 7, 2024, to January 9, 2024, taking three days to finalize the structure.

3.11 SQL Statement (DDL & DWL)
Tan You Chun formulated SQL statements for Data Definition Language (DDL) and Data Manipulation Language (DML) on January 10, 2024, and January 11, 2024, over two days.

4. PROJECT DEMONSTRATION

4.1 SQL (DDL & DML)
Pujjaa Janani A/P Segar executed SQL (DDL & DML) statements from January 11, 2024, to January 14, 2024, spanning four days, implementing the designed database structure.

4.2 Interface Design
Tam Jia Hao designed the project interface from January 15, 2024, to January 18, 2024, taking four days to create a user-friendly interface for the system.

8.0 Requirement Analysis (based from AS-IS Analysis)

8.1 Current business process (scenarios, workflow)

Requirement analysis based on the AS-IS Analysis is important to understand the use case scenarios and workflow of the current business process for the Low Carbon Emission Calculation System by MBIP. This analysis is a fundamental step in system development because it allows the development team to understand the process, stakeholder involvement, and identify inefficiencies in data collection of the current business process. To perform this requirement analysis, we have gone through the Google registration form created by MBIP as well as the AS-IS process chart for the Low Carbon Emission Calculation.

AS-IS process for Low Carbon Emission Calculation

Based on the AS-IS process for Low Carbon Emission Calculation, the system starts with the scenario of registration of users. There are three types of users, namely technical admin, participant and MBIP. Upon registration, users will need to provide their full name, phone number, address, number of people living in the house or building and type of building.

After registration, the user will be able to choose the type of data to be inserted based on the following categories: electricity consumption, water consumption, waste consumption, recycle cooking oil consumption. After selecting one of the categories, guidelines will be given to users on inserting data by months. Users will be prompted to fill in the following information, number of days, prorate factor, usage value (unit in kWh for electricity, m3 for others).

After filling in the data, the system will perform calculations and display the analysis result at Dashboard. The result will have colour identification on the highest and lowest usage. Carbon calculation will be conducted manually as well and a mapping of carbon reduction will be produced. The system will auto-submit after the user has completed the form and the next category will need to be chosen to be filled until all categories are filled. After all categories form has been filled, MBIP admin will need to validate the submission for Final Competition. Finally, a survey of lifestyle for carbon footprint will be conducted and a declaration form will need to be filled. A reminder will be given at last to the participant to keep the receipts.

Google Registration Form

Based on the Google registration form, we are prompted to input user details, thus, we have identified a user entity with attributes email, fullname, noIC, noTel, occupationStatus, buildingName, sector, buildingCategory, buildingAddress, numPersonInBuilding, actionProofLink, socialMediaLink. A user can be either from a home, public institution, private company, or school, as long as the building is situated in an administration area of MBIP. After detailed attributes analysis, the sector attribute can be either Sektor Awam, Sektor Swasta, the buildingCategory can be chosen from A1: Perumahan Bertingkat di MBIP, A2: Perumahan Bertanah di MBIP, B1: Institusi di MBIP (<2000 populasi) and B2: Institusi di MBIP (>2000).

Next, after inputting user details, users are prompted to input the total water consumption in m^3 and RM for each month, ranging from January 2022 to June 2022. Thus, an entity WaterConsumption can be identified here, that keeps records of water consumption inputted by all users. The attributes are, month, totalDays, prorateFactor, waterConsumptionVolume and waterConsumptionPrice. The unit for waterConsumptionVolume is m3 and the unit for waterConsumptionPrice is RM.

After inputting all the water consumption data, users are then prompted to input the total electric consumption in kWh and RM for each month, ranging from January 2022 to June 2022. Thus, an entity ElectricConsumption can be identified here, that keeps records of electric consumption inputted by all users. The attributes are, month, totalDays, prorateFactor, electricConsumptionKiloWatt and electricConsumptionPrice. The unit for waterConsumptionVolume is kWh and the unit for electricConsumptionPrice is RM.

After inputting electric consumption data, users are now prompted to enter the number of wastes accumulated in terms of KG and RM as well as the amount of oil accumulated in terms of KG and RM. These accumulations are measured only after six months, ranging from January 2022 to June 2022. To accommodate these data, two entities, WasteAccumulation and OilAccumulation are identified. WasteAccumulation has the attributes, wasteKG and wasteRM. OilAccumulation has the attributes, oilKG, oilRM.

Entities and Attributes

The database schema is as follows:

- User(email, fullName, noIC, noTel, occupationStatus, buildingName, workPlace, buildingCategory, buildingAddress, numPersonInBuilding, actionProofLink, socialMediaLink)
- WaterConsumption(month, totalDays, prorateFactor, waterConsumptionVolume, waterConsumptionPrice)
- ElectricConsumption(month, totalDays, prorateFactor, electricConsumptionKiloWatt, electricConsumptionPrice)
- WasteAccumulation (wasteKG, wasteRM)
- OilAccumulation (oilKG, oilRM)

Relationships

Based on the Google registration form, a User has a one-to-many relationship with WaterConsumption because a user is required to enter the data of water consumption for six months, ranging from January 2022 to June 2022. Next, a User has a one-to-many relationship with ElectricConsumption as well because the user is required to enter data of electric consumption for those six months as well. A User has a one-to-one relationship with WasteAccumulation and a one-to-one relationship with OilAccumulation because a User only has one record for each of the entities.

Business Rules

The current business rules of the Low Carbon Emission Calculation System are that each user must have an address of building in the administration area of MBIP. Each user must provide water consumption, electric consumption, waste and oil accumulation and low carbon action proof link, all data in the duration of January 2022 to June 2022. Each user is required to provide documents such as identification number, water and electric bills, receipts and tenancy agreements if needed.

Based on the Google form registration, these business rules can be obtained:

- Each user own one or more water consumption.
- Each user own one or more electric consumption.
- Each user own one waste accumulation record.
- Each user own one oil accumulation record.
- Each water consumption is owned by one user.

- Each electric consumption is owned by one user.
- Each waste accumulation is owned by one user.
- Each oil accumulation is owned by one user.

Data Types

Entity: User

Attributes:

1. email varchar(20
2. fullName varchar(50)
3. noIC varchar(12)
4. noTel varchar(15)
5. workStatus varchar(20)
6. buildingName varchar(20)
7. workPlace varchar(20)
8. buildingCategory varchar(20)
9. buildingAddress varchar(200)
10. numPersonInBuilding int(5)
11. actionProofLink varchar(500)
12. socialMediaLink varchar(500)

Entity: WaterConsumption

Attributes:

1. month varchar(10)
2. totalDays int(2)
3. prorateFactor decimal(5, 4)
4. waterConsumptionVolume int(5)
5. waterConsumptionPrice int(5)

Entity: ElectricConsumption

Attributes:

1. month varchar(10)
2. totalDays int(2)
3. prorateFactor decimal(5, 4)
4. electricConsumptionKiloWatt int(5)

5. electricConsumptionPrice int(5)

Entity: WasteAccumulation

Attributes:

1. wasteKG int(5)
2. wasteRM int(5)

Entity: OilAccumulation

Attributes:

1. oilKG int(5)
2. oilRM int(5)

Workflow

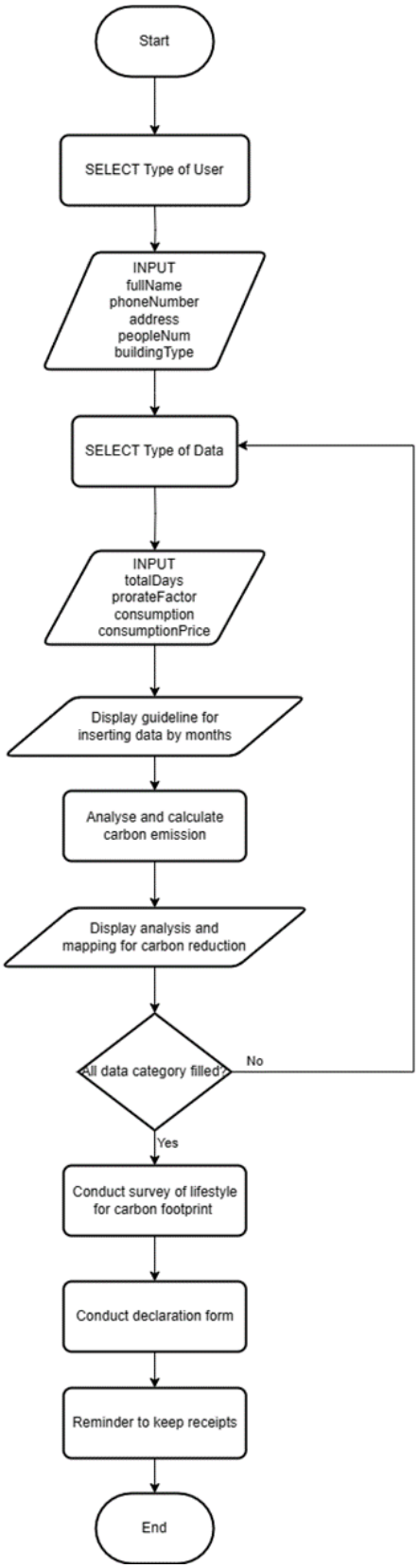

Figure 8.1: Current Business Workflow

9.0 Transaction requirement (data entry, data update/delete, data queries)

9.1 Data Entry

Insert user data such as email, fullName, noIC, noTel, workStatus, buildingName, buildingCategory, buildingAddress, numPersonInBuilding, actionProofLink, socialMediaLink into User table to complete the registration of a user for the competition. Only one insert statement is required for one user from one house/institution/company/school.

Insert water consumption data such as month, totalDays, prorateFactor, waterConsumptionVolume, waterConsumptionPrice to keep a record of water consumption by each user in a month, multiple inserts will be conducted as users submit for the remaining months.

Insert electric consumption data such as month, totalDays, prorateFactor, electricConsumptionKiloWatt, electricConsumptionPrice to keep a record of electric consumption by each user in a month, multiple inserts will be conducted as users submit for the remaining months.

Insert waste accumulation data such as wasteKG and wasteRM to keep a record of waste accumulated in KG and waste accumulated in RM for each user in six months. Only one insert is required for one user because the data is measured in six months, instead of a month.

Insert oil accumulation data such as oilKG and oilRM to keep a record of oil accumulated in KG and oil accumulated in RM for each user in six months. Only one insert is required for one user because the data is measured in six months, instead of a month.

9.2 Data Update/Delete

Update user personal information such as email, fullName, noIC, noTel, workStatus, buildingName, buildingCategory, buildingAddress, numPersonInBuilding, actionProofLink, socialMediaLink can be conducted if user has previously entered the wrong details.

Update water consumption details such as month, totalDays, prorateFactor, waterConsumptionVolume, waterConsumptionPrice can be conducted if the user entered the wrong details.

Update electric consumption details such as month, totalDays, prorateFactor, electricConsumptionKiloWatt, electricConsumptionPrice can be conducted if the user entered the wrong details.

Update waste accumulation data such as wasteKG and wasteRM can be conducted if the user entered the wrong details.

Update oil accumulation data such as oilKG and oilRM can be conducted if the user entered the wrong details.

Deletion of user record can be conducted if a user is disqualified or upon user requests to MBIP admin.

Deletion of water consumption, electric consumption, waste accumulation, oil accumulation can be conducted upon user requests to MBIP admin.

9.3 Data Queries

Query can be conducted by the MBIP admin to list all the records of users, all the records of water consumption, all the records of electric consumption, all the records of waste accumulation and all the records of oil accumulation.

Query can be conducted by MBIP to list users according to categories such as A1, A2, B1, B2.

Query can be conducted by MBIP to list users according to sector such as Sektor Awam, Sektor Swasta.

Query can be conducted by MBIP to list water consumption and electric consumption based on certain criteria such as consumption price more than RM 500.

Query can be conducted by MBIP to identify the water consumption record with the lowest consumption volume and consumption price.

Query can be conducted by MBIP to identify the electric consumption record with the lowest consumption kilowatt and consumption price.

10.0 Benefit and Summary of Proposed System

- Promote the national goals. The proposed system we want to create is in the same direction with the Low Carbon Cities Framework and the Iskandar Malaysia 2025 of Low Carbon Blueprint. These strategies are quite challenging of the national goals to achieve 58 percent reduction in carbon intensity by 2025. It also shows MBIP as a stakeholder involved in the proposed system that is regarding a Low Carbon Society.
- Enhance the efficiency. The stakeholders can reduce their time and effort when they are contributing to the system as there will be an automatic carbon reduction calculation. The improvement of the efficiency of the proposed system is important as it can promote a better involvement in the community.
- Data Analysis and Accuracy. The system can have more accuracy when it is analysing the impact of different projects as it calculates the carbon reduction automatically. The users can also gain some knowledge for developing the accurate decisions and also focused on initiatives,
- Comprehensive monitoring. The proposed system can have data collection, creating a more systematic approach for analysing the carbon footprints. It is much easier to monitor the carbon emissions involved with the use of electricity, water, waste, and recycled cooking oil consumption, giving a general idea of the impact on the environment.
- Self-monitoring dashboard. Users can always keep tracks on their individual or group carbon emission contributions. This function provides real-time feedback that can promote the effort for the friendly environment among the community.

The proposed system is created to reduce the data entry procedures, automates the carbon reduction calculations, and solve the complexity of the carbon emissions across the community. The user-friendly interface ensures a better community involvement. The self-monitoring dashboard that can promote social responsibility and be beneficial to the environment. MBIP as a key stakeholder of the proposed system in promoting the Low Carbon Society (LCS), which helps to achieve the nation's goals and creates a more friendly environment in the future.

11.0 Summary

The proposed system that is effective helps Iskandar Puteri to become a Low Carbon Society. The challenges listed out during the Iskandar Puteri Low Carbon Calendar Competition have made it clear that a user-friendly and efficient system is required. With the use of modern technology and systematic approach to the system, MBIP also wants to promote a better environmental culture. The proposed system is very important for analysis of data and community involvement as Iskandar Puteri is developing into a low-carbon development. The proposed system is not only for data collection, it can do more, pushing the Iskandar Puteri and MBIP to participate in low-carbon development.