COMP 3059 – Capstone Project I

Software Requirements Analysis and Design Assignment

This assignment is an overview to gather the software needs with requirements analysis and help to proceed with the design.

The requirements analysis helps to break down functional and non-functional requirements to a basic design view to provide a clear system development process framework. It involves various entities, including business, stakeholders and technology requirements.

The design is the activity following requirements specification and before programming. Software design usually involves problem solving and planning a software solution.

To work on this assignment you could use the references and a sample template given below. The sample template can be customised to suit the nature of your project.

Reference Readings/Example:
http://www.uacg.bg/filebank/acadstaff/userfiles/publ_bg_397_SDP_activities_and_steps.pdf

www.cse.msu.edu/~chengb/RE-491/Papers/SRSExample-webapp.doc

Reference template:
www.tricity.wsu.edu/~mckinnon/cpts322/cpts322-srs-v1.doc

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1.0 Introduction

1.1 Purpose

The purpose of this document is to outline the high-level software requirements for the EcoTrack App, a web application focused on promoting environmental sustainability. This document serves as a guide to understanding what the system will do without delving into the technical implementation details. It is intended for the project team, stakeholders, and development personnel.

1.2 Scope

The EcoTrack App aims to empower individuals to lead more sustainable lives by providing a user-friendly platform to calculate their carbon footprint, engage in eco-friendly challenges, discover local eco-friendly businesses, and stay informed about environmental news. This scope aligns with the Project Plan, emphasizing a commitment to fostering a sense of community and connection among environmentally-conscious individuals.

2.0 System Overview

The EcoTrack App is designed to be a one-stop solution for individuals looking to reduce their carbon footprint and actively engage in sustainable living. By offering features such as a carbon footprint calculator, green lifestyle challenges, a local sustainability map, and an environmental news feed, the app aims to educate and motivate users. It fosters a sense of community and encourages the support of local eco-friendly businesses.

2.1 Project Perspective

The EcoTrack App is a new self-contained system, created to address the growing need for accessible tools and information that can educate and engage people in sustainable living.

2.2 System Context

The EcoTrack App operates within the context of environmental sustainability, connecting users with eco-friendly businesses and encouraging them to take meaningful actions to reduce their carbon footprint. It addresses environmental issues and provides a platform for users to actively participate in environmental advocacy.

2.3 General Constraints

- The app should be accessible on a variety of devices and browsers to ensure a broad user base.
- Data security and user privacy must be maintained to build trust among users.

2.4 Assumptions and Dependencies

Assumptions:

- Users are motivated to actively participate in eco-friendly challenges and take action.

Dependencies:

- Successful app usage depends on the availability of an internet connection.

3.0 Functional Requirement

3.1 The Four Features

3.1.1 Carbon Footprint Calculator:

Introduction

The Carbon Footprint Calculator is a core feature of the EcoTrack App, designed to enable users to measure their individual carbon footprints based on their daily activities and lifestyle choices. This feature aims to provide users with a clear understanding of their environmental impact and suggest actionable ways to reduce it.

Inputs

- User Input: Users will provide data about their daily activities, including transportation, energy consumption, and dietary choices.
- Environmental Data: The app will access environmental data sources to calculate the carbon emissions associated with various activities.

Processing

- Activity Analysis: The app will process user inputs by analyzing the environmental impact of each activity and calculating its associated carbon emissions.
- Calculation Algorithms: Complex algorithms will be employed to determine the carbon footprint for each user based on their activities.
- Recommendations: The app will process the calculated data to provide personalized recommendations for reducing the user's carbon footprint.

Outputs

- Carbon Footprint Report: The app will generate a report displaying the user's estimated carbon footprint, categorized by activity type.
- Suggestions: Users will receive actionable suggestions for reducing their carbon footprint, such as using public transport, reducing energy consumption, or making eco-friendly dietary choices.
- Progress Tracking: The app will allow users to track their carbon footprint reduction progress over time.

3.1.2 Green Lifestyle Challenges:

Introduction

The Green Lifestyle Challenges feature of the EcoTrack App is designed to motivate users to adopt eco-friendly habits and lifestyles through engaging challenges. Users can actively participate in these challenges, track their progress, and earn rewards for making sustainable choices. This feature fosters

a sense of community and competition among users while promoting sustainable living.

Inputs
- User Preferences: Users will input their preferences and interests to personalize challenge recommendations.
- Challenge Selection: Users can select challenges they wish to participate in from a list of available options.

Processing
- Challenge Recommendation: The app will process user preferences and provide tailored challenge recommendations based on their interests.
- Progress Tracking: The app will track user progress within each challenge, monitoring completion of tasks and activities.
- Points System: The app will implement a points system to award users for successfully completing challenges.

Outputs
- Recommended Challenges: Users will receive a list of recommended challenges tailored to their preferences.
- Challenge Progress Tracking: Users can track their progress and completion of challenge tasks through a visual interface.
- Rewards and Achievements: Upon successful completion of challenges, users will earn points and achievements.
- Community Engagement: Users will be able to engage with the app's community by sharing their challenge progress and achievements.

3.1.3 Local Sustainability Map:

Introduction

The Local Sustainability Map is a pivotal feature of the EcoTrack App that allows users to explore and support local eco-friendly businesses and resources in their area. It provides a convenient way to find zero-waste stores, electric vehicle charging stations, farmers' markets, and other sustainable options, along with community-driven reviews and ratings.

Inputs
- User Location: Users' current or specified location is used as an input to customize the map and display nearby eco-friendly businesses and resources.
- User Preferences: Users can specify their preferences to filter and find specific types of eco-friendly businesses and resources.

Processing
- Data Retrieval: The app will access a database of eco-friendly businesses and resources to retrieve relevant information.
- Location-Based Filtering: The app will process user location data to display businesses and resources in proximity to the user.

- User Preferences Filtering: The app will apply user-specified preferences to filter and display businesses and resources that match the user's interests.

Outputs
- Interactive Map: Users will be presented with an interactive map displaying eco-friendly businesses and resources in their area.
- Business/Resource Listings: The app will provide detailed listings for each business or resource, including descriptions, contact information, reviews, and ratings.
- Reviews and Ratings: Users can view and contribute to community-driven reviews and ratings for each listed business or resource.
- Navigation Tools: The map will include navigation tools to help users find directions to their chosen business or resource.

3.1.4 Environmental News Feed

Introduction

The Environmental News Feed feature of the EcoTrack App is designed to keep users informed about pressing environmental issues, climate change, and sustainability. Users can access a curated selection of news articles, share insights with their network, and actively participate in discussions to encourage advocacy for positive change.

Inputs
- User Preferences: Users can define their areas of interest and preferences, which will influence the types of news articles displayed.
- Content Sources: The app will aggregate content from various reputable news sources focused on environmental issues.

Processing
- Content Aggregation: The app will aggregate environmental news articles from diverse sources, ensuring a comprehensive selection.
- Personalization: User preferences will be used to personalize the news feed, emphasizing articles aligned with the user's interests.
- Social Sharing Integration: The app will integrate social sharing features to allow users to share articles and insights with their network.

Outputs
- Curated News Feed: Users will have access to a curated news feed displaying articles related to environmental issues, climate change, and sustainability.
- Article Details: Users can access detailed information on each article, including the source, publication date, and a brief summary.
- Social Sharing: Users can easily share articles and insights with their network through integrated social sharing options.
- Discussion and Comments: Users can engage in discussions and leave comments on articles, promoting active participation and advocacy.

3.2 Use Cases

3.2.1 Use Case 1: User Registration

Purpose: This use case describes the process by which a user registers for an account on the EcoTrack App.

Primary Actor: User

Stakeholders and Interests:
- User: Wants to create an account to access app features.
- EcoTrack Development Team: Interested in capturing user information for user management and interaction tracking.

Preconditions:
- The user has downloaded and installed the EcoTrack App.
- The user has launched the app for the first time.

Main Flow:
1. The user opens the EcoTrack App and selects the "Register" option.
2. The app prompts the user to provide registration information, including a unique username, email address, and password.
3. The user enters the required information.
4. The app validates the entered information, ensuring the email address format is correct, the username is unique, and the password meets security criteria.
5. If the information is valid, the app creates a new user account and stores the user's registration details.
6. The user receives a confirmation email to verify their account.
7. The user clicks on the verification link provided in the email, confirming their registration.
8. The app confirms the user's account, and the user is now registered and logged in.

Postconditions:
- The user has a registered account and can log in to the app to access its features.

Alternate Flows:
- If the user provides invalid registration information (e.g., an existing email address or an insufficiently strong password), the app will prompt the user to correct the information.

3.2.2 Use Case 2: Tracking Eco-Challenge Progress

Purpose: This use case describes how a user can track their progress in completing an eco-challenge.

Primary Actor: User

Stakeholders and Interests:
- User: Wants to track their progress in an eco-challenge and earn rewards.
- EcoTrack Development Team: Interested in recording user progress and updating challenge status.

Preconditions:
- The user is registered and logged in to the EcoTrack App.
- The user has selected an eco-challenge they wish to participate in.

Main Flow:
1. The user logs in to the EcoTrack App.
2. The app displays the user's dashboard, where ongoing eco-challenges are listed.
3. The user selects the eco-challenge they wish to track.
4. The app provides detailed information about the selected challenge, including the challenge description, tasks, and rewards.
5. The user marks the tasks they have completed.
6. The app updates the challenge progress, tracking completed tasks and calculating any earned rewards.
7. The user receives points or rewards for completing tasks.

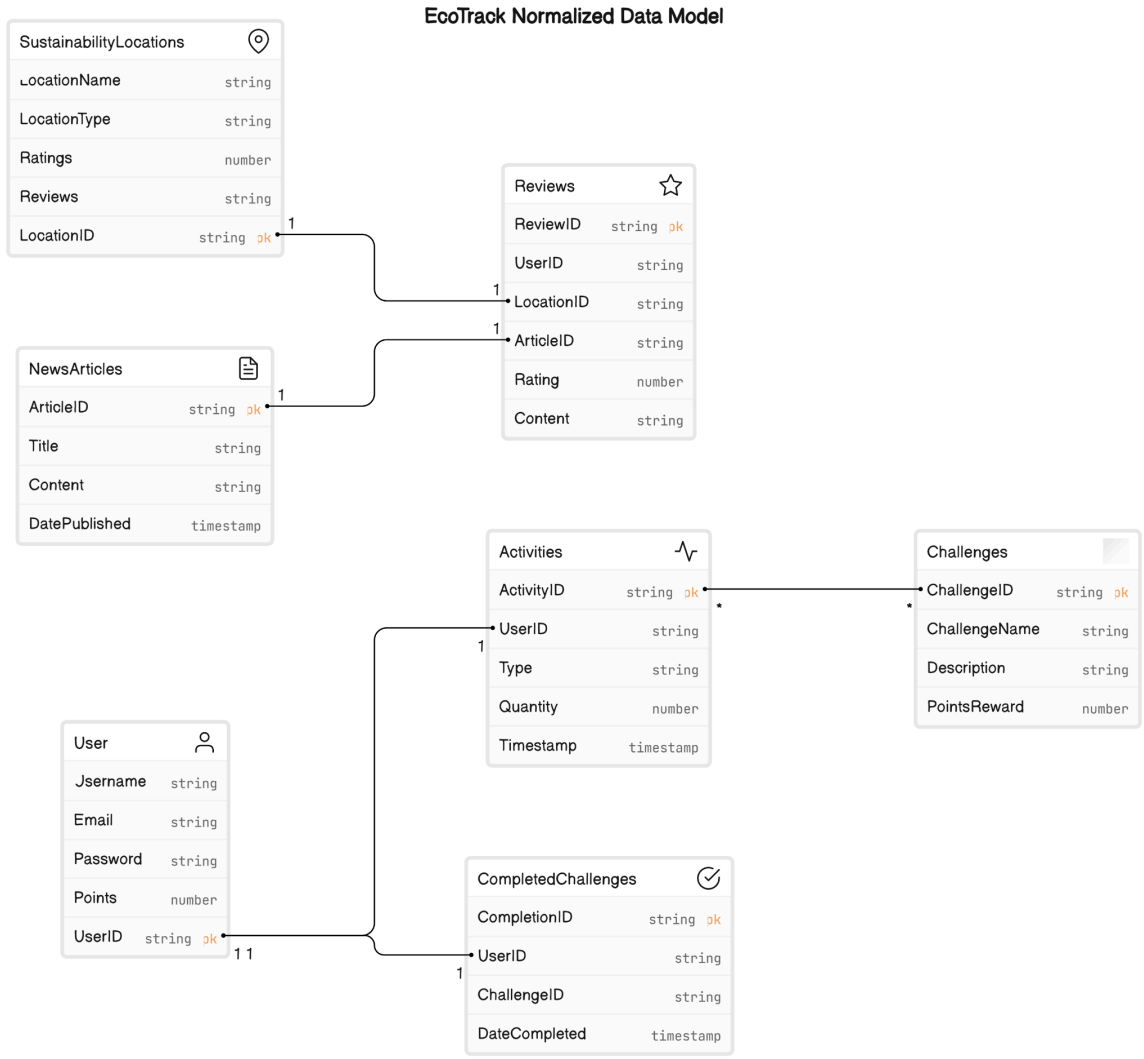
Postconditions:
- The user's progress in the selected eco-challenge is updated, and any earned rewards are added to their account.

Alternate Flows:
- If the user tries to mark a task that has not yet started or has already been completed, the app will display an error message.
- If the user completes all tasks in the challenge, the challenge status is updated to "Completed."

3.3 Data Modelling and Analysis

Data modeling and analysis are essential for understanding how data is structured, processed, and utilized within the EcoTrack App. Here are the components of this section:

3.3.1 Normalized Data Model Diagram

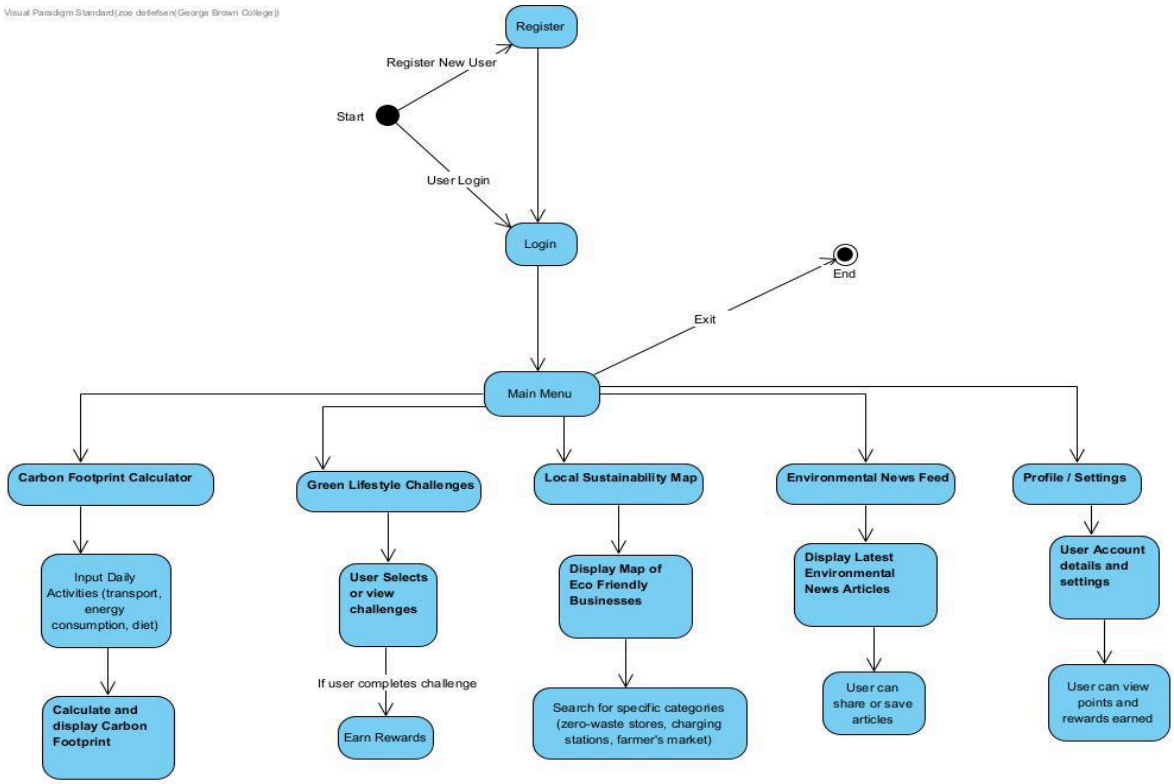


***Purpose*:** A normalized data model diagram is created to represent the structure of the database that stores app-related information. It helps ensure data integrity, reduce redundancy, and improve database efficiency.

***Components*:** This diagram will consist of entities, attributes, and their relationships. Key entities may include User, Eco-Challenge, Business Listing, News Article, and others. Each entity's attributes and relationships between entities are represented.

***Example*:** In the User entity, attributes like User ID, Username, Email, and Password are included. Relationships might indicate that a user can participate in multiple eco-challenges or write reviews for business listings.

3.3.2 Activity Diagrams

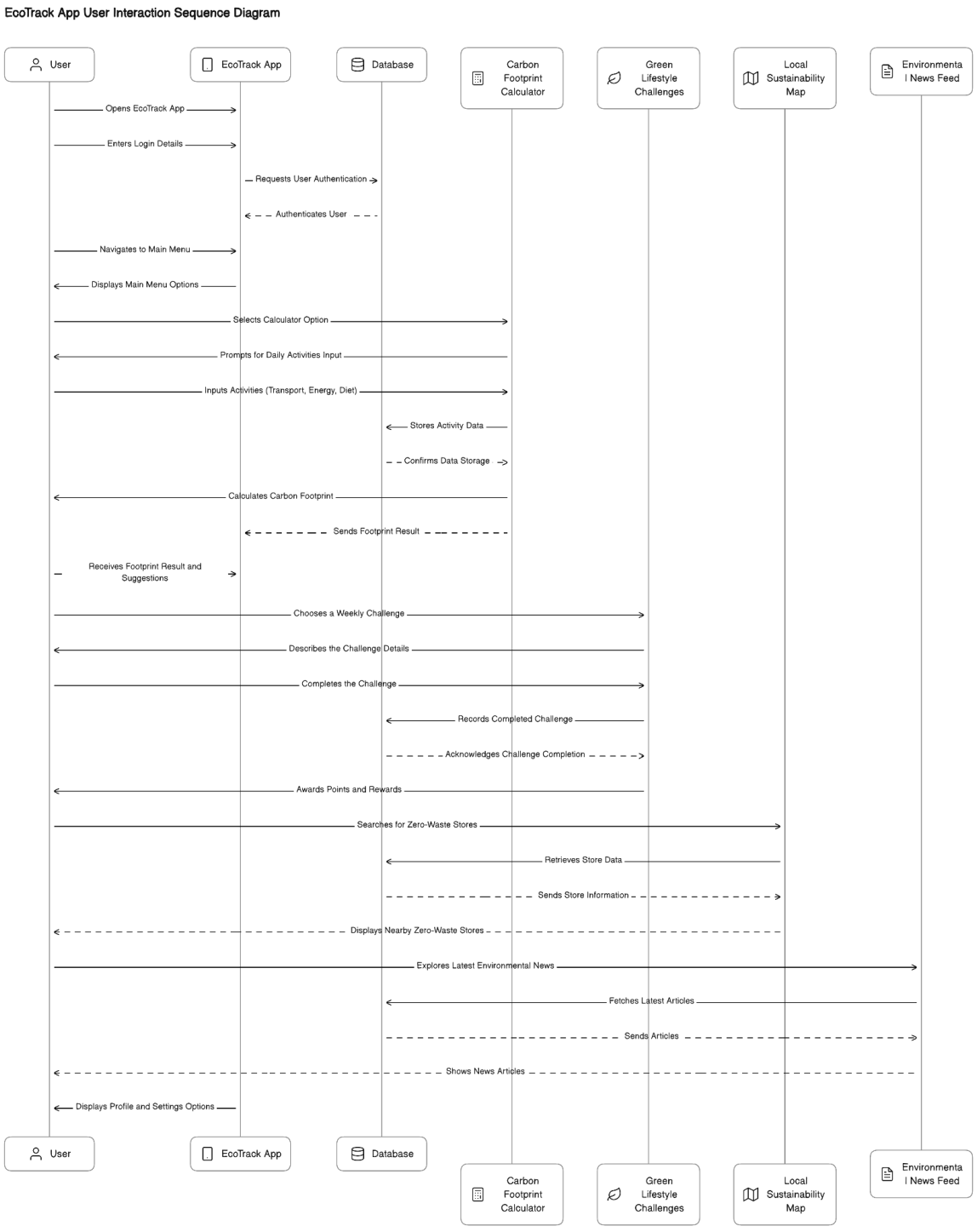


***Purpose*:** Activity diagrams depict the flow of activities or processes within the app. They help visualize how users interact with the system, providing a high-level overview of app functionality.

***Components*:** These diagrams include activities (represented as ovals or rectangles), decision points (diamonds), and arrows indicating the flow between activities. Activities can represent processes like user registration, challenge completion, or data retrieval.

***Example*:** An activity diagram may illustrate the user journey from registration to challenge participation, showing decision points where users choose challenges and indicating the flow to challenge tracking and reward collection.

3.3.3 Sequence Diagrams

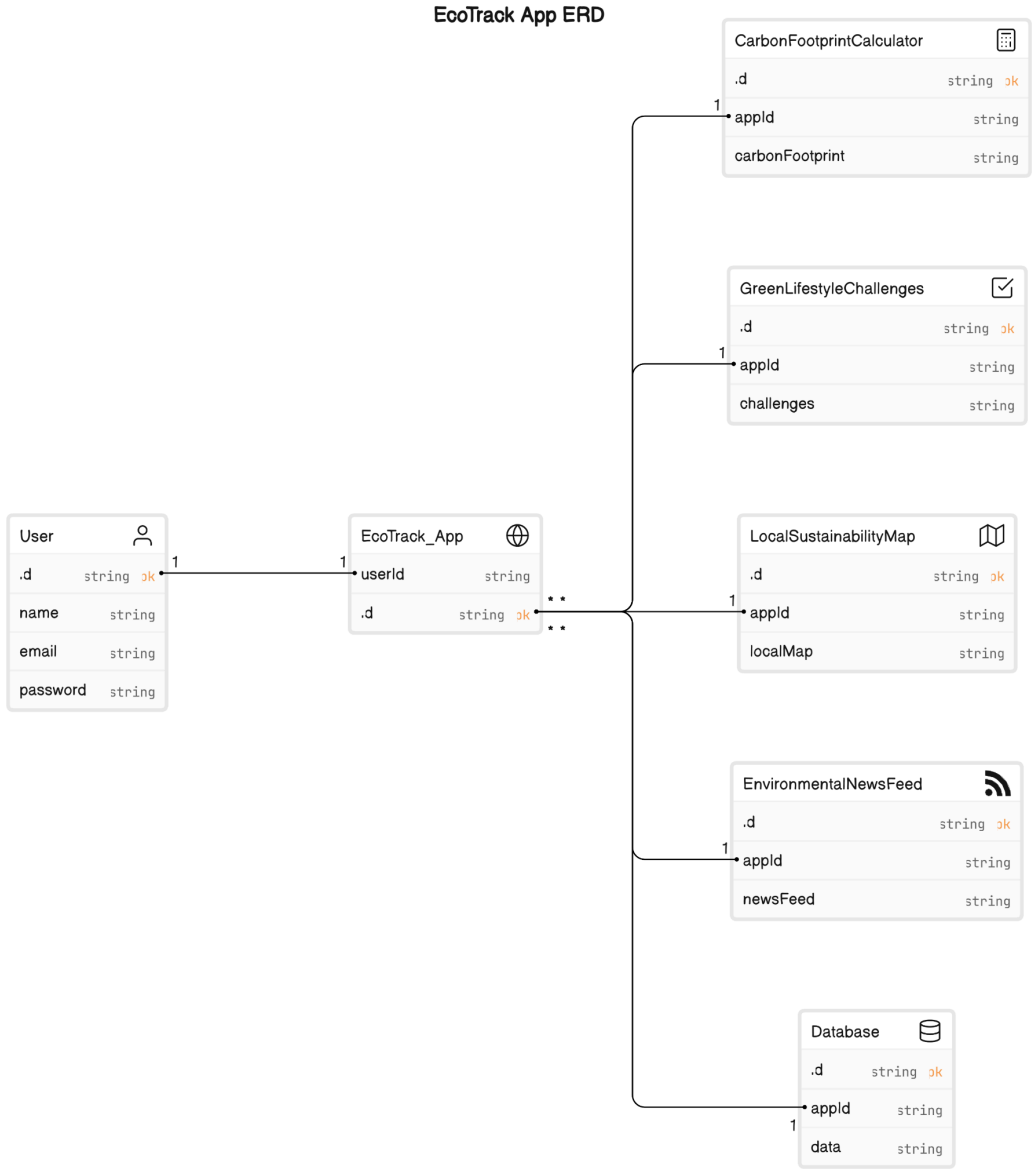


***Purpose*:** Sequence diagrams depict the interactions between different components or objects within the app. They are used to visualize the sequence of messages exchanged during a specific scenario.

***Components*:** Sequence diagrams include lifelines (vertical lines representing objects or actors), messages (horizontal arrows indicating interactions), and activation bars to show the duration of an interaction.

***Example*:** A sequence diagram might show how a user interacts with the app to complete a challenge, including messages between the user, the app, and the challenge database.

3.3.4 UML Class Diagram



***Purpose*:** UML class diagrams represent the classes or objects in the system and their relationships. They provide an overview of the app's object-oriented design.

***Components*:** The diagram includes classes (rectangles), attributes (inside classes), and associations between classes (lines connecting them).

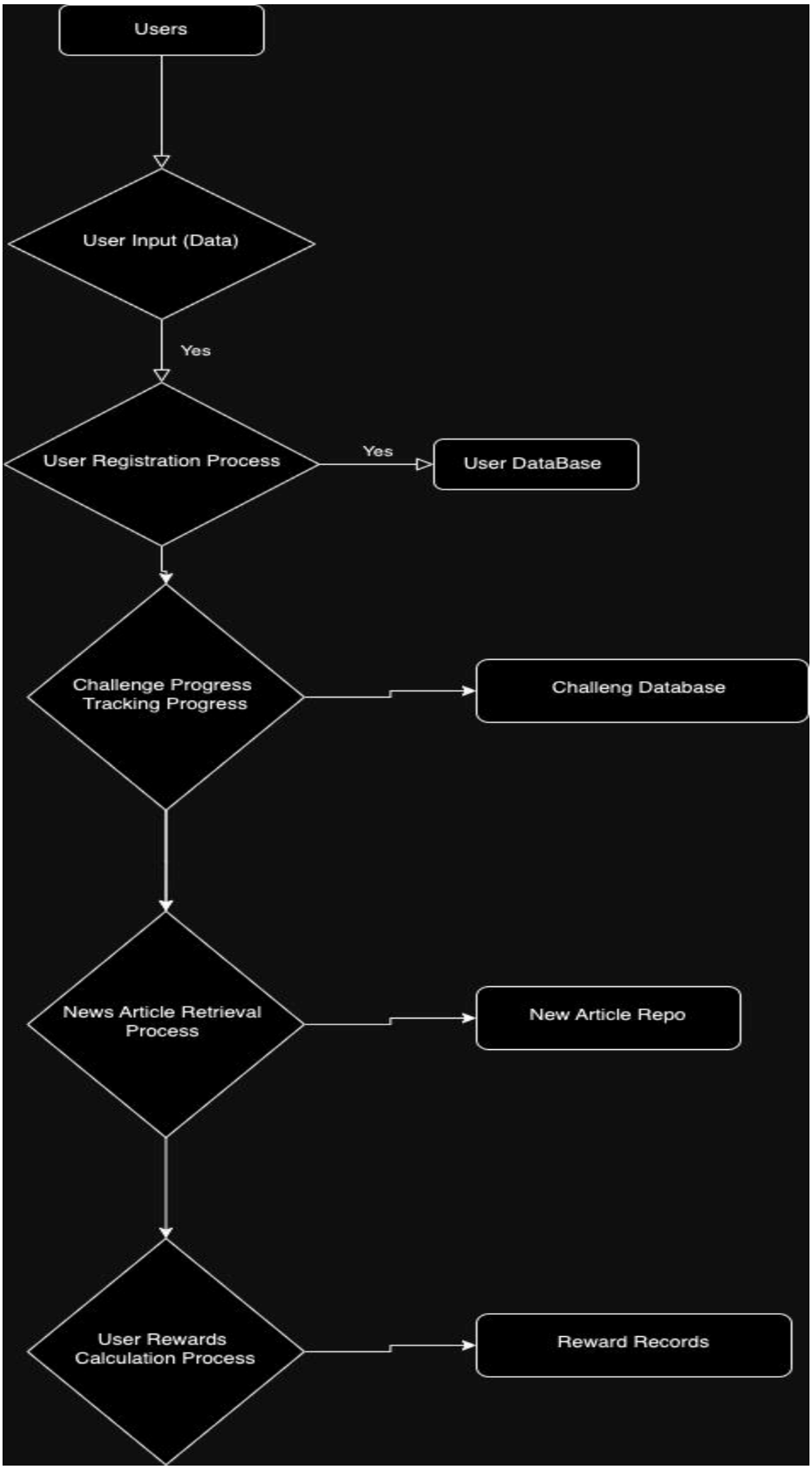
***Example*:** A UML class diagram may illustrate the classes User, EcoChallenge, BusinessListing, and NewsArticle, their attributes, and how they are associated (e.g., a User participating in EcoChallenges or writing Reviews for BusinessListings).

These modeling and analysis techniques help ensure a clear understanding of the data structures, system processes, and object-oriented design within the EcoTrack App, facilitating effective development and communication among team members.

3.4 Process Modelling

Process modeling is a crucial step in understanding how data and processes flow within the EcoTrack App. The "Data Flow Diagram" (DFD) is a visual representation of the data flow, processes, data stores, and external entities within the system.

3.4.1 Data Flow Diagram (DFD)


Users
User Input (Data)
Yes
User Registration Process
Yes
User DataBase
Challenge Progress Tracking Progress
Challeng Database
News Article Retrieval Process
New Article Repo
User Rewards Calculation Process
Reward Records

***Purpose*:** The Data Flow Diagram is used to model the flow of data through the EcoTrack App, illustrating how information is input, processed, and output. It provides an overview of the system's functional aspects and interactions.

***Components*:**

1. **Processes**: Processes represent specific activities or functions within the app. They are depicted as circles or rectangles. In the context of the EcoTrack App, processes might include user registration, challenge tracking, news article retrieval, and more.
2. **Data Flow**: Data flows are represented as arrows and illustrate the movement of data between processes, data stores, and external entities. For example, the flow of user registration data from the user to the registration process.
3. **Data Stores**: Data stores are depicted as rectangles and represent where data is stored within the system. In the EcoTrack App, these may include user databases, challenge databases, news article repositories, etc.
4. **External Entities**: External entities are entities outside the system that interact with it. In the context of the EcoTrack App, these could be users, external databases, or environmental news sources.

***Example*:** In the Data Flow Diagram for the EcoTrack App, you might have a process called "Challenge Progress Tracking" that receives data flows from "User Input" and interacts with a "Challenge Database." It also sends data flows to update the "User Rewards."

The DFD helps in understanding the app's functionality by illustrating how data enters, moves through, and exits the system. It is an important tool for communication among the project team, stakeholders, and developers, ensuring that everyone has a shared understanding of the system's behavior.

4.0 Non-Functional Requirements

- Performance: 95% of transactions processed in under a second to ensure a responsive user experience.
- Reliability: System downtime may not exceed 1 minute per day to maintain user trust.
- Availability: The app must be available 24/7 to accommodate users across different time zones.
- Security: Data security and user privacy must be maintained to protect sensitive information.
- Maintainability: Updates and maintenance should be conducted seamlessly to minimize disruptions to service.
- Portability: The app should be accessible on various devices and browsers to cater to a broad user base.

5.0 Logical Database Requirements

The EcoTrack App will use a database to store user data, challenge details, business listings, and news content. The database should ensure data integrity, data retention, and efficient data retrieval.

6.0 Other Requirements

No additional requirements have been identified at this time.

7.0 Approval

The signatures below indicate their approval of the contents of this document.

Project Role	Name	Signature	Date
System analysis team	Elnaz Heidari Ghezeljeh	EHG	2023-11-03
System analysis team	Munira Bahmani	MB	2023-11-03
System analysis team	Zoe Detlefsen	ZD	2023-11-03