Welcome to Build On, ASEAN 2021

Country	Singapore
Category	Institute
Challenge Statement	Carbon footprint insights for Innovative Green Fintech / Food Delivery Carbon Footprint
Team Name	CarbonEconomy

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Content Outline

Significance of Problem

Encouraging Greener actions can be difficult because driving eco-friendly change is usually at odds with existing business models. For example, if a delivery service chooses a slower, more environmentally friendly mode of transport to deliver a package/food, the service might have to sacrifice on the rate at which deliveries can be made, hence their revenue and the customer might expect longer delivery times as well. The **central requirement for businesses** is that incentivising these green actions needs to be done in a way that **doesn't conflict with existing business models**.

In the case of consumers, the various types of delivery choices (parcel delivery, food delivery etc.) and inability to visualise the carbon footprint of their choice makes it **difficult to have a common metric of comparison**. Consumers who are aware of the environmental impact are also not incentivised to make more environmentally conscious environmental purchasing decisions. For example, given the choice between various delivery types consumers will often pick the option with the best price and delivery time, but are unlikely to consider the environmental impact of their choices because doing so serves **no direct benefit to them**.

For both consumers and delivery service providers, the impact of individual and deliberate environmentally friendly actions can be difficult to visualise and therefore it is **easy to prioritise self-interest over the minimisation of such negative externalities**.

Solutions Introduction

The solution is to have a **fair and open system of calculating emissions**, based on which green-consumerism can be **incentivised with a green-credit system** that consumers may use across multiple delivery services and types. Further encouraging these green habits requires both **facilitating individual efforts** and a way to **visualise the combined impact that individual actions** have so that social pressure can encourage this green habit-formation.

A Fair and Open System: Carbon Footprint Estimation API for Businesses

This API provides delivery service providers a fair, transparent and open way to calculate carbon footprints for trips made when providing their service. It will consider factors such as mode of transport, travel duration and available footprint statistics of the product being purchased to give an estimate of carbon emissions. For example, Trip A emits 5000 units of CO2 and Trip B emits 2500 units of CO2, our API returns that by selecting Trip B, they stand to earn 100 **green credits** if they choose the greener alternative (which might have cons such as slower delivery time). Businesses display this information within the listings that they provide to their consumers to make greener behaviour part of the decision-making process when choosing to purchase an item from a listing.
In the spirit of openness, this API can be used by our front-end visualisation tool for consumers to explore these alternatives as well.

Incentivising Green Consumerism: Green Credits

These virtual credits are awarded in the event where a consumer deliberately **chooses to make green decisions**. For consumers, these credits shall be transferable across multiple delivery services and across multiple delivery types to promote green actions for delivery service as a whole and not just for a particular service. For businesses, the cost of paying out green credits **can be offset by the savings in carbon credits** they would otherwise have to pay for. Governments may play a part in offsetting these costs in the spirit of promoting green consumerism. Other economic phenomena such as **pay-it-forward systems** where users/businesses share green credits are also exciting areas to explore and facilitate.

Facilitating Individual Efforts: Consumers' Mobile Application (Appendix)

The application **encourages the habit of making green consumer decisions** by having features that aid habit-formation, such as a virtual tree growing (similar to the Focus and Productivity app, Forest) that represents the rate at which one accumulates green credits and is a **symbol of consumers' sustained green-habits**. Leaderboard/Group features will **tap into competitiveness** and make this habit-formation process a team endeavour if users choose to do so.

A centralised store for green credits attained by a particular user, this application is the main way for consumers to **keep track of the green credits** earned **across multiple delivery services** and view how the green credits can be converted to service specific vouchers. For example, one may have earned 100 Green credits from choosing more eco-friendly delivery options from Qoo10 and this can be exchanged for a $5 Grab food voucher or a $2 delivery. This incentivises consumers to seek out more eco-friendly alternatives. Consumers will also be more aware of eco-friendly alternatives and how their decisions impact their carbon footprint. For businesses, the responsibility to make eco-friendly decisions can now be partially shared with consumers.

Visualising Combined Efforts & Displaying Open, Transparent Data: Visualisation Website

Individual and anonymous virtual actions can actually be structured and tap into our instinct to collaborate in social groups. Drawing inspiration from one such spectacular display of structured online collaboration (*r/place* social experiment by Reddit), the website provides a **heatmap of green activity (see Figure 1).** Users can hover over individual locations on a map to view more details on **how these credits were earned and emissions saved.** This acts as **community-driven suggestions**. Visualising such combined green activity encourages individuals to band around their communities and even pit their communities against others'. The website also provides options for individuals to simulate various consumer actions to see how they affect the heatmap in the long run.

Businesses can use the same aggregated data to try and **evaluate different pricing and marketing strategies** based on how willing consumers in a particular region are to choose more eco-friendly alternatives.

Impact of Solution

Current Solutions

Current solutions such as Capture, Earth Rewards and Kilma rewards users with points that can be spent on **verified carbon offsetting programs**. These programs rely mainly on intrinsic motivation factors and there is little extrinsic incentive to use these apps because it does not tap onto existing business models in the same way that actual monetary discounts would.

Our Solution

Our solution combats this problem by implementing a **universal credit-rewards** scheme in the form of *Green Credits*, which acts as a form of monetary incentive for consumers.

Consumers earn green credits simply by making the eco-friendlier choice, these green credits can later be redeemed for rewards. Green credits are transferable across all our partner services. In other words, points earned from Shopee deliveries can be used to claim Grab rewards! This empowers consumers to collectively take action for the environment from the comfort of their own homes.

Consumers also get to watch their own virtual tree grow in accordance with their total emissions saved, thus motivating them to choose the eco-friendlier option.

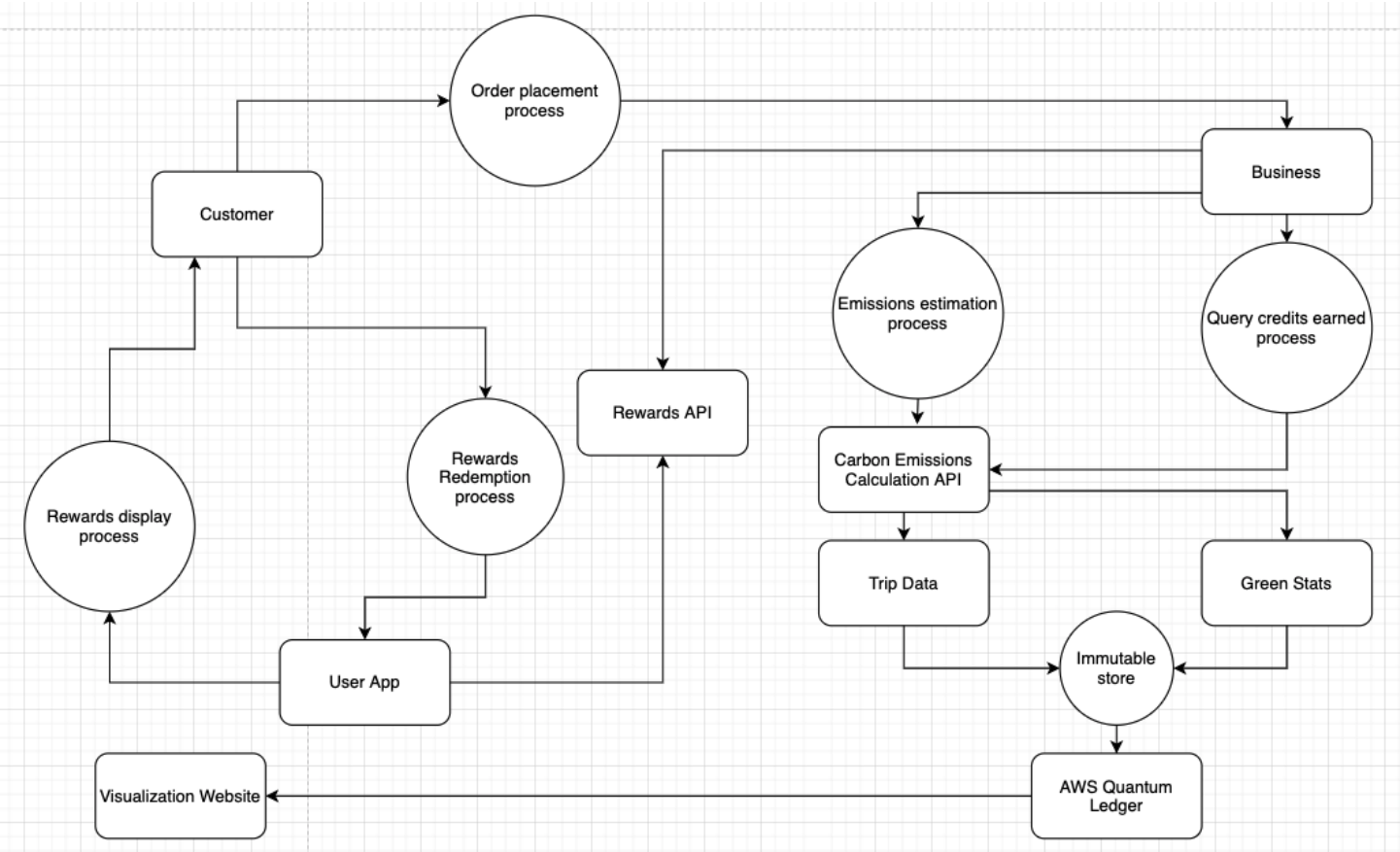
In addition, Businesses are empowered and incentivised to target more environmentally aware consumers by providing greater choice in product delivery. This will increase their outreach to a significant portion of the market, especially younger consumers. The need to save on carbon credits will also no longer conflict with their business module because the choice can be left to consumers.

Competitive Advantage

As aforementioned in the solutions introduction, our unique selling points would be:

1. Fair and open system for calculating carbon emissions.
2. Incentivising Green Consumerism via Green Credits that are transferable across different types of delivery services.
3. Facilitating and sustaining individual efforts via an interactive mobile application with better user experience. Trees will grow progressively with points earned and gives users a sense of satisfaction because it is a symbol of their sustained habits.

Deep Dive into Solution



Carbon Emissions API

1. A large database of different vehicles and their emission rates is needed for us to accurately estimate the amount of emission a trip can take
    a. These can be obtained through car information listed on the respective brands' websites and whitepapers
    b. Information can be scraped from other sources such as research studies and government whitepapers to corroborate
2. Businesses only have to hit our API with the car model along with the start and end point. We will populate the response with the carbon emission estimate for that trip

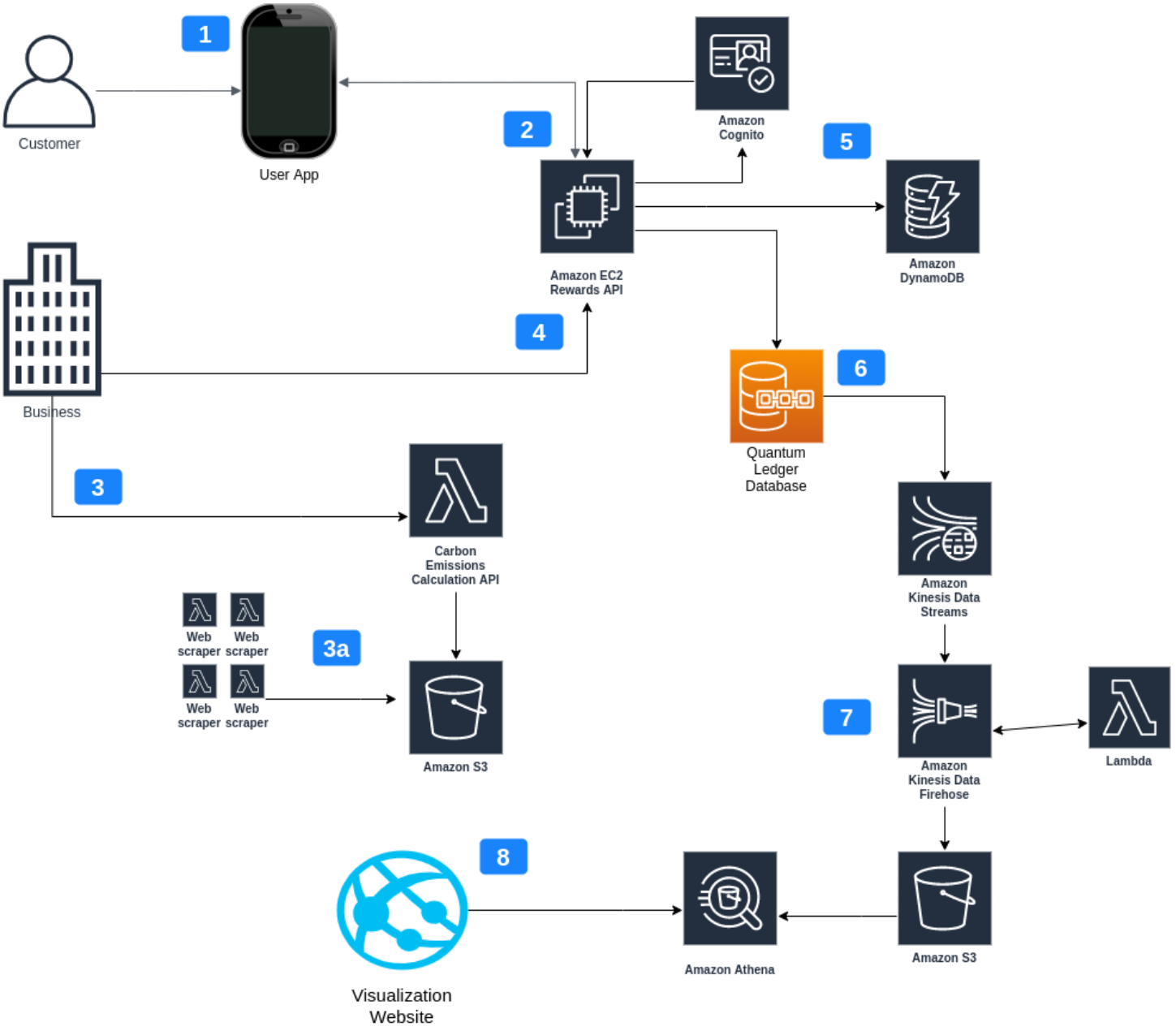
Examples of usage by businesses:

1. Food delivery
    a. Businesses hit our API with a start and endpoint along with mode of transport
    b. The current services in the market have yet to allow people to prioritise their delivery option. ⇒ An eco-friendly version that gives bicycle rider delivery priority but in turn delays transport timing. However, it can also be assigned to others if there are limited riders.
2. Parcel delivery
    a. Businesses provide a gauge of starting and end point which will be estimated based on fix rates on our end
        i. China ⇒ SG air shipping is estimated to emit X amount
    b. Businesses provide different delivery options to our API with an estimate amount that they will be able to bulk deliver for us to calculate potential savings

Rewards Tracking Dataflow

1. User registers with us to obtain an account and a token
2. A private token is stored on the user's side while we keep track of a public token
3. Companies register with us to obtain the same set of tokens
4. Companies will allow users to register a signed hash to be used with purchases
5. Whenever users purchase something (like food delivery), the company will send a transaction log that minimally consist of the following information, signed with their private token
    a. Start and end destination
    b. Carbon footprint saved
    c. User's signed hash
    d. Credits awarded
6. We use the company's public token to verify that this transaction is legitimate before storing it
    a. At the end of the month, we run through all transactions logged by the company (we can verify through the key) and charge them for the credits awarded to the user
7. On the user side, they will be able to "unlock" their credits since they have their private key and we have their public key

Architecture of Solution



1. Users will register through our mobile application
2. The mobile application hits our rewards API hosted on Amazon **EC2** which will return them relevant information on their account like their total points and rewards available to them
3. Businesses will obtain carbon emission information through a call to our stateless application running on **Lambda**
    a. We use several other lambdas that run periodically as web scrapers to scrape various websites on CO2 emissions for different types of motors. This data is loaded by our API.
4. When a user has placed an order with the business, businesses will upload this transaction onto our rewards API where it will be saved
5. We leverage AWS **Cognito** to handle the process of authentication and authorizing users or businesses to make API calls. Additional information will be stored in an instance of AWS **DynamoDB**
6. We use **Quantum Ledger** to store all our transactions that ensures only verifiable changes are logged and that our transactions will be immutable. A simple traversal through the logs is done to aggregate information that we need for calculating reward points.
7. We also stream these transactions through a data pipeline with **Kinesis Data Streams** which leverages **Firehose** (with a **Lambda** for necessary processing like removing potentially sensitive data) that will dump all the data into AWS **S3.**
8. Our final data visualization website will make use of **Athena** to query the transaction information dump

Going further

Scalability

On a technical level, the **append-only nature** of our transaction storage also allows us to scale confidently **without concurrency issues**. AWS provides the rest that we will require to scale our compute and storage needs.

On a business level, our solution is self-sustainable as it draws on the **recirculation of carbon credits savings** from businesses to the community and this is enforced through our rewards verification process that allows us to identify and charge the businesses involved.

Future Features

With ample time, resources and opportunity, we would like to implement features that **encourage group green-consumerism.** Events like the aforementioned *r/place* social experiment give promise on implementing virtual interactions that are initially completely uncoordinated and which organically grow into **structured collaborated activity**. Green credits have **economic phenomena** that should be explored based on how our users use it. Such solutions explore the intangibles that will similarly drive consumers to play their part in saving the environment.

Commercialisation

The current commercialisation includes **controlled ad revenue accrued from partner delivery services** that may want greater visibility for their vouchers that green credits can be used to claim. There is some reliance on the government for **kickstarting green credits** and encouraging businesses to partake. Our solutions shoulder some of the Government's responsibility in **tackling economic externalities**, which incentivised the Government to play this role.

In the future, when there is enough data accumulated, older archived data may be exposed to businesses/other orgs for a small access fee for their use in analysing users' behaviours. Regardless, the s**pirit of our solution is in free and open information** (APIs, data collection etc.) to ensure fairness and accountability in accumulation and issuing of green credits.

Appendix

Figure 1: r/place as a social experiment to demonstrate collaborative online behaviour

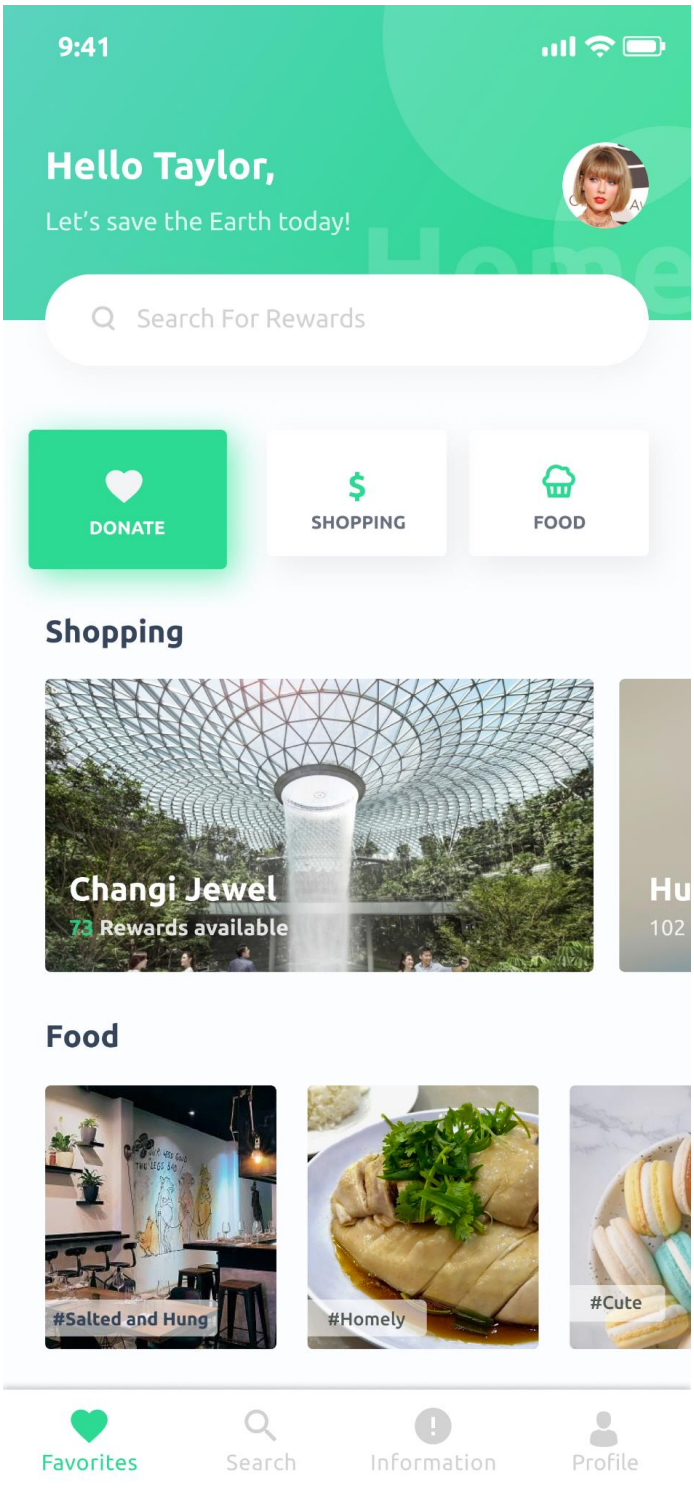


Figure 2: Home page of user app

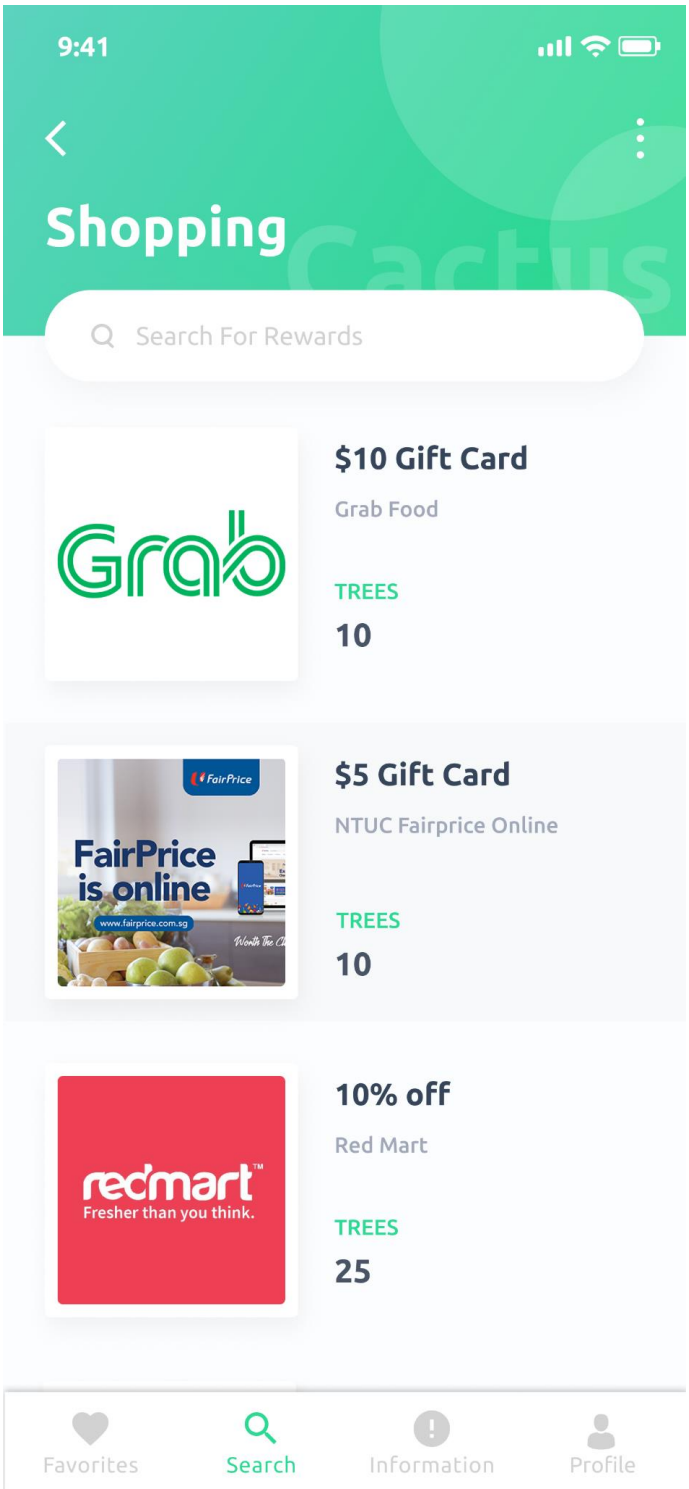


Figure 3: Rewards page of user app

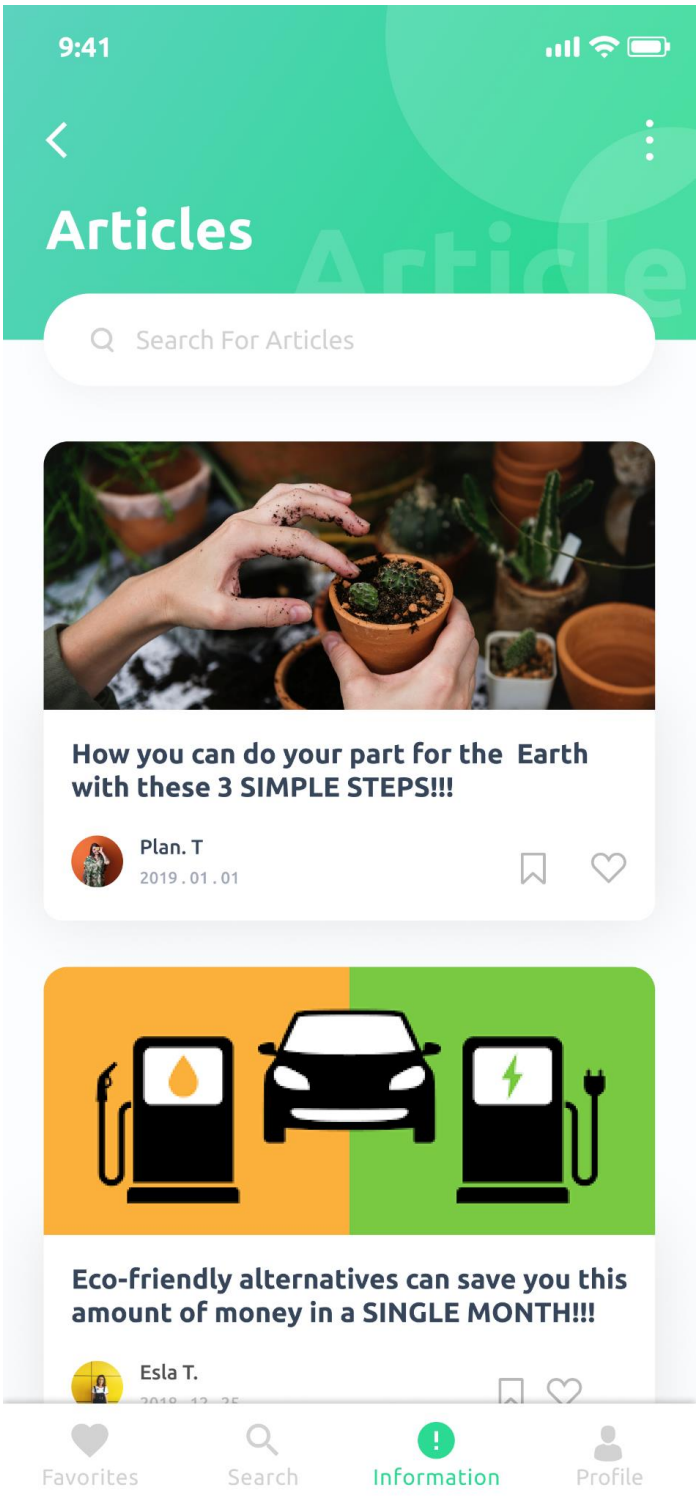


Figure 4: Learn page of user app

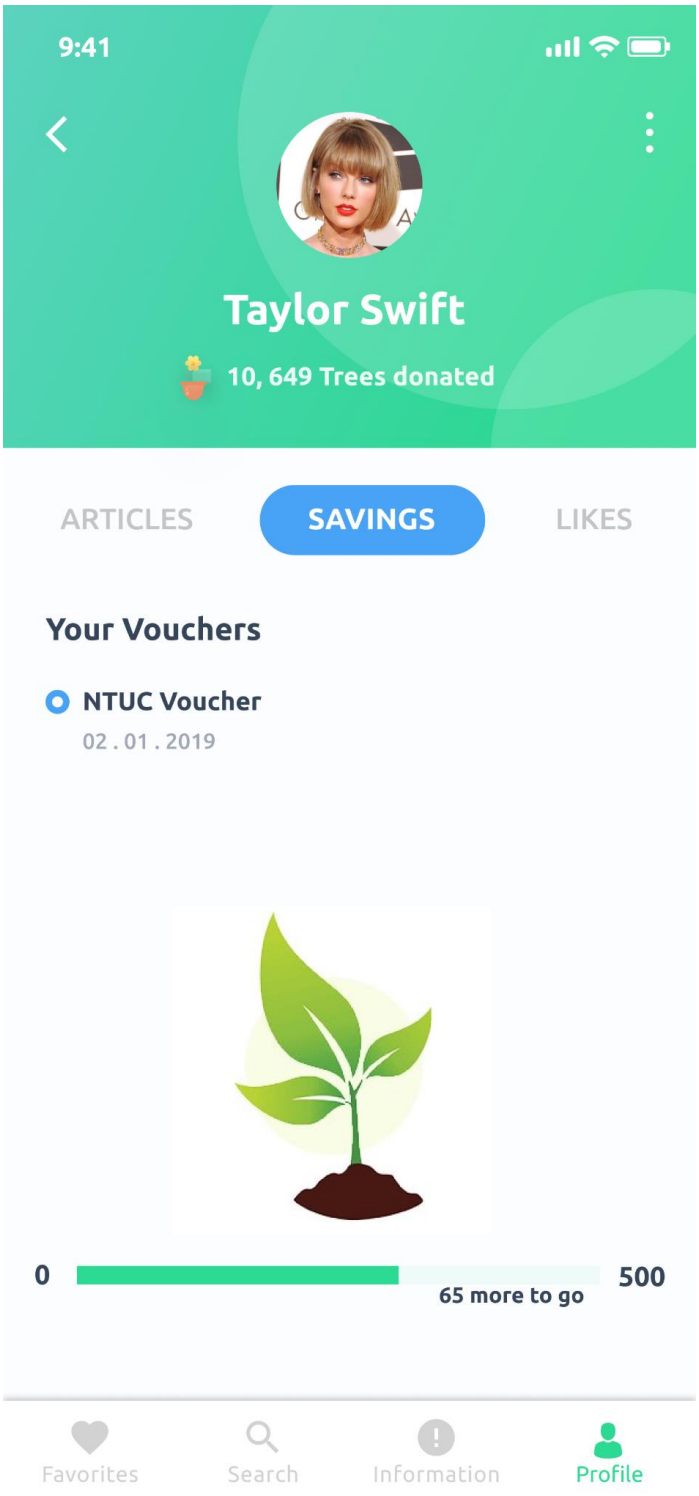


Figure 5: Profile page of user app