mHealth App integrated with Eat, Sleep, and Exercise Data Analysis

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Today's Agenda

1. Recap Problem
2. Demo
3. Design
4. Experiment

1

Recap Problem

Problem

Many people living in urban areas are having a **lifestyle** that can be defined as unhealthy.

Factors

- Eat
- Sleep
- Exercise

Constraints

- Money
- Time
- Knowledge

Why Important?

“A healthy lifestyle is a way of living that lowers the risk of being seriously ill or dying early. Not all diseases are preventable, but a large proportion of deaths, particularly those from coronary heart disease and lung cancer, can be avoided.”

World Health Organization

2

Demo

3

Design

Design Requirement

There are 2 sources that lead to our design requirement.

1. Literature Review
2. Interview

Design Requirement

There are 2 sources that lead to our design requirement.

1. **Literature Review**
2. Interview

01

02

03

Literature Review

- **Gamification**: This refers to applying competence and autonomy.
- **Personalization**: This refers to providing an individual's result and suggestions.
- **Association**: This refers to communicating with other people.

Design Requirement

There are 2 sources that lead to our design requirement.

1. Literature Review
2. **Interview**

Interview

01

- **Incompatible:** Interviewees have problems on complying to the suggestion of other health applications.

02

- **Engaging:** Interviewees find that other health applications lack engaging elements.

Design Requirement	Source	Problem Address
Functional Requirement		
Personalized Analysis	Literature, Interview	Personalization, Engaging
Location Awareness	Interview	Incompatible, Engaging
Community	Literature, Interview	Association, Engaging
Challenges	Literature	Gamification, Engaging
Non-Functional Requirement		
Availability	-	-
Performance	-	-

Design Description

In this section, the whole process will be described from the *high-level to low-level*. There are 2 main sections.

1. Overview
2. Detailed Description

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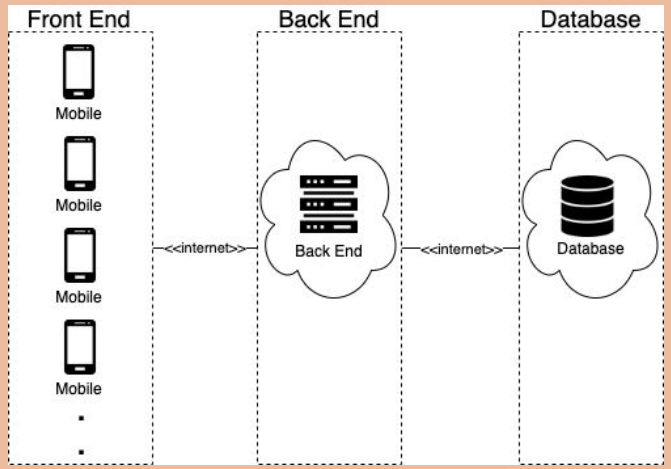
1. **Overview**
2. Detailed Description

Overview - Logsy System



Logsy is a mobile application that has 3 main parts in the system architecture, which are ***back-end, front-end, and database parts***.

The system that Logsy used to implement the system is called ***client-server architecture***.

This system shall be able to serve the main features in the application, which are Dashboard, Recommendation, Record, Community, and Notification.

Design Description

In this section, the whole process will be described from the *high-level to low-level*. There are 2 main sections.

1. Overview
2. **Detailed Description**

Detailed Description

There are many activities and features that users could access in the application, which means that **each scenario should be categorized based on those activities**.

This section will be separated into 3 parts.

1. Features Implementations
2. Algorithm Implementations
3. Database Implementations

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Features Implementations

As stated, Logsy application shall have **5 main features** for users; therefore, the technical description in this section will be divided according to those features.

However, there is one feature that could not be missed to explain the whole implementation which is the **Login feature**; therefore, the login feature is discussed as well.

1. Login Feature
2. Dashboard Feature
3. Recommendation Feature
4. Record Feature
5. Community Feature
6. Notification Feature

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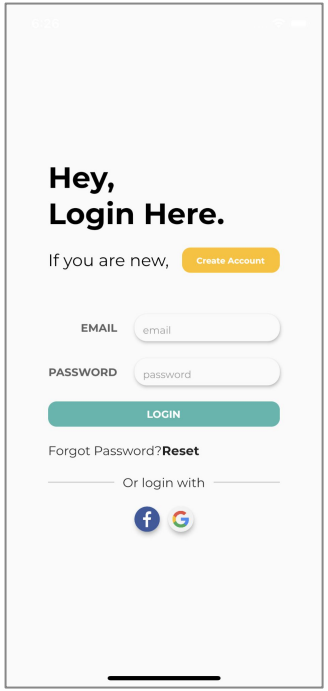
Login

In this part, there are 2 possible ways for users to continue.

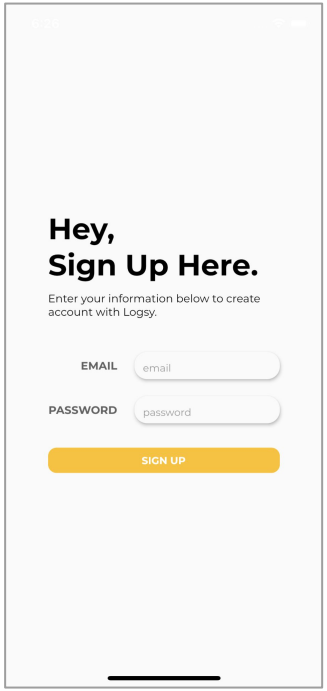
- For the user that uses the application for the **first time**, the user must provide their basic information about themselves and their lifestyle.
- The user that **already signed up** with Logsy could login using their own credential.

Goal

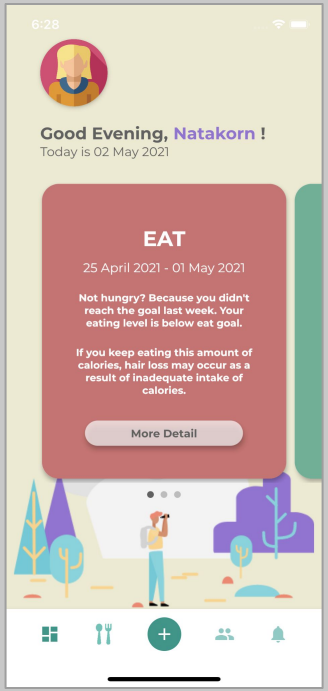
retrieve user's information



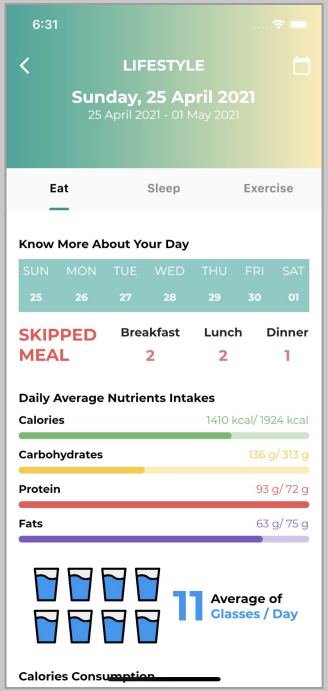
Login Page



Sign Up Page



Dashboard 1



Dashboard 2

Dashboard

The data can be changed to view in different weeks. The content in this feature is separated into 2 parts.

- **Personalized Analysis:** The first part contains informative text that analyzes the user's lifestyle.
- **Color Indicator:** The other part represents the condition in colors.

However, there is detailed information for users to access as well.

Goal

present the performance of the user's lifestyle as simply as possible

Features Implementations

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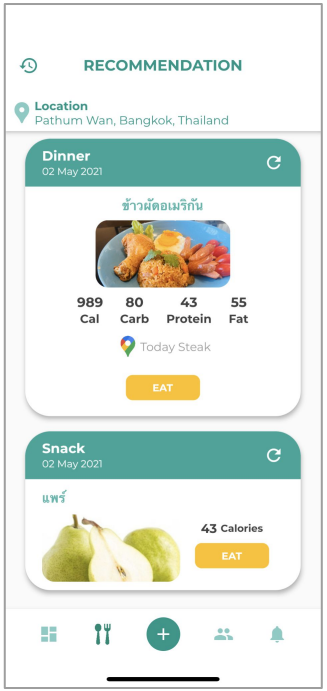
Recommendation

This feature concerns the user's location. The recommended meal shall be calculated from the nearest restaurant first. In this page, users can view 3 types of recommendation.

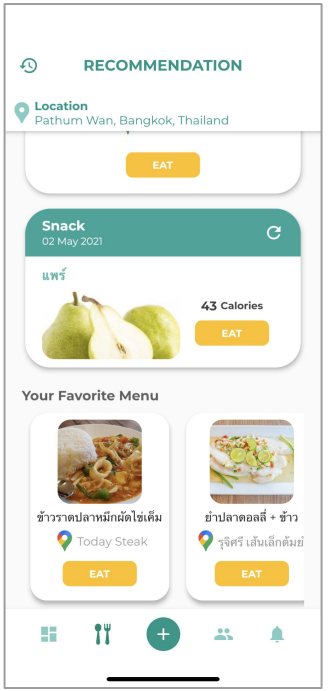
- **Recommend meals based on daily intakes**
- **Snack**
- **Recommend meals based on interest**

Goal

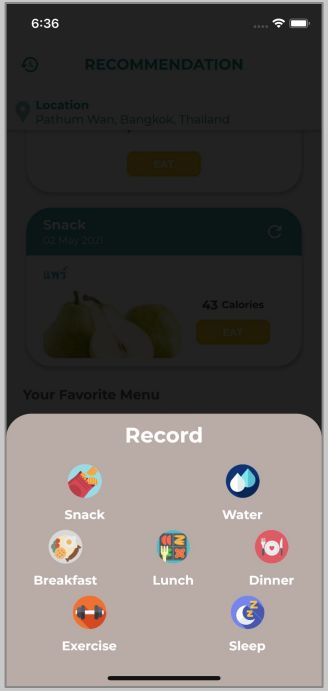
Recommend the meal the user could find and eat in their area.



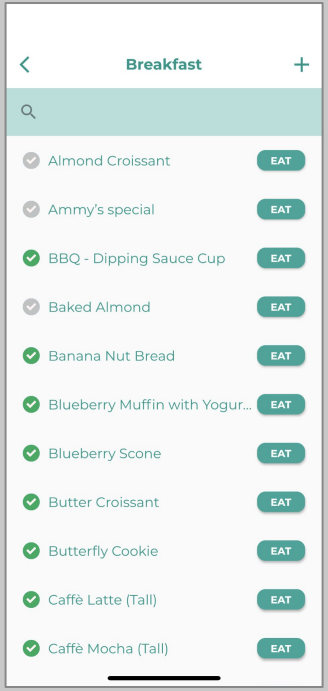
Recommend Meal & Snack



Recommend Meal on Interest



Record Modal



Food List

Record

There are 3 main types of record in this section.

- **Eat**: snacks, breakfast, lunch, dinner, and water
- **Sleep**
- **Exercise**

Goal

Record all types of lifestyle for the algorithm to calculate the analysis in the dashboard section.

Features Implementations

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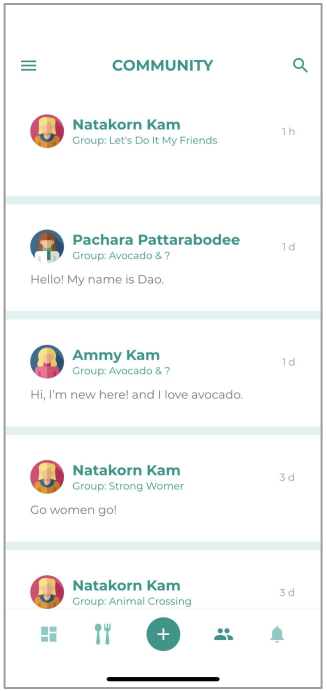
Community

This is where users can come to communicate with other users. There are 4 types of activity in the community section

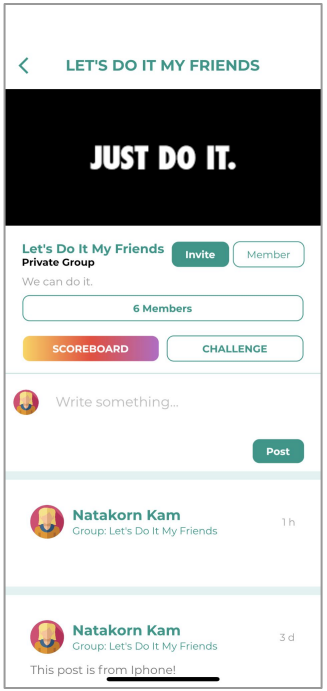
- Friend: add, delete, accept, and cancel friend requests
- Group: public and private
- Challenge: points, scoreboard
- User Management: edit information

Goal

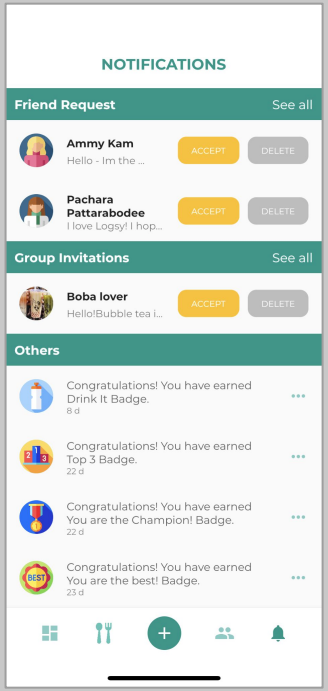
- allows users to meet with other users with the same interest
- allows users an opportunity to have friends experiencing the same journey for lifestyle goals.



Community Feed



Group



Notification

Notification

This is where the user comes to see their friend and group requests that the user can either accept or refuse. This section also contains earned badge.

Goal

Notifies users with request and badge

Detailed Description

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Algorithm Implementations

In Logsy, there are **2 main complex algorithms** that require critical analysis to create an algorithm in both mathematical and correctness in the health aspect

1. **Food Recommendation Calculation**
2. **Lifestyle Analysis Calculation**

Algorithm Implementations

In Logsy, there are **2 main complex algorithms** that require critical analysis to create an algorithm in both mathematical and correctness in the health aspect

1. **Food Recommendation Calculation**
2. **Lifestyle Analysis Calculation**

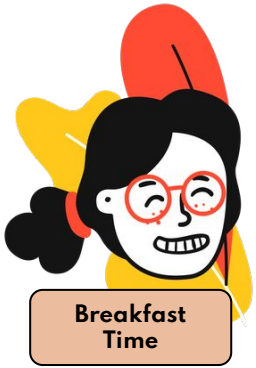
Food Recommendation

There are 2 types of recommendations which based on different aspects.

- **Daily Intakes**
- **Favorite Food**

1 Daily Intakes

It means that the application shall recommend the meal based on **time of the day, nearest restaurants list, and remaining ratio of daily intakes.**



Name	Jessica
Age	22 year
Height	162 cm
Weight	55 kg
Role	ICE student at Chulalongkorn University

Calculates BMR and TDEE

Daily Intakes = 1550 kcal

Allow -20%

Daily Intakes 1240-1550 kcal

Gender	BMR Formula
Female	(10*weight in kg) + (6.25*height in cm) - (5*age) - 161
Male	(10*weight in kg) + (6.25*height in cm) - (5*age) + 5

lvl	Physical Activity Description	TDEE Formula
1	Little or no exercise	BMR * 1.2
2	Exercise 1-3 times/ week	BMR * 1.375
3	Exercise 4-5 times/ week	BMR * 1.465
4	Daily exercise or intense exercise 3-4 times/ week	BMR * 1.55
5	Intense exercise 6-7 times/ week	BMR * 1.725
6	Very intense exercise daily, or physical job	BMR * 1.9

Note:
BMR = Basal Metabolic Rate
TDEE = Total Daily Energy Expenditure

Location Retrieval

iCanteen, *Chulalongkorn University*

Sorting nearest restaurant by *lat, long*

Send to Server

Server calculates meal

Nutrients Criteria

1 meal = 30% of daily intakes

Recommended Nutrition for Thais. Note the table is referenced from DIETARY REFERENCE INTAKE FOR THAIS 2020

Nutrition	Calories Comparison	Age Range	Daily Intakes Percentage
Carbohy-drates	1 g/ 4 kcal	all	45-65%
Protein	1 g/ 4 kcal	all	10-15%
Fat	1 g/ 9 kcal	9-18 years	25-35%
		More than 18 year	20-35%

Find meal proportion

Nutrition	Meal Proportion
Calories	372-465 kcal
Carbohydrates	52.5-75 g
Protein	11.7-17.4 g
Fat	10.2-18 g

Query Food

1. Meal Proportion
2. Nearest Restaurant

Top 5 restaurant

< 10?

Top 10 restaurant

< 10?

Calories only

One Random Meal

There are other cases...

One Random Meal

Find meal proportion

Query Food

1. Meal Proportion
2. Nearest Restaurant

>700 Calories

<300 Calories

Food Recommendation

There are 2 types of recommendations which based on different aspects.

- **Daily Intakes**
- **Favorite Food**

2 Favorite Food

The favorite food means that the application shall recommend based on the user's interest. The algorithm works similarly to the prior one

The information required to generate results are **the user's interest and nearest restaurants list.**

Location Retrieval

iCanteen, *Chulalongkorn University*

Sorting nearest restaurant by *lat, long*

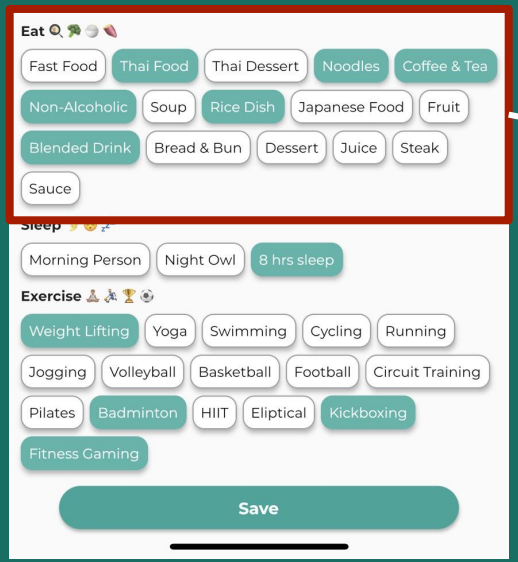
Send to Server

Query Food

1. Eat Interest
2. Nearest Restaurant

Send to Server

Eat Interest List



Set of Meals

Algorithm Implementations

In Logsy, there are **2 main complex algorithms** that require critical analysis to create an algorithm in both mathematical and correctness in the health aspect

1. **Food Recommendation Calculation**
2. **Lifestyle Analysis Calculation**

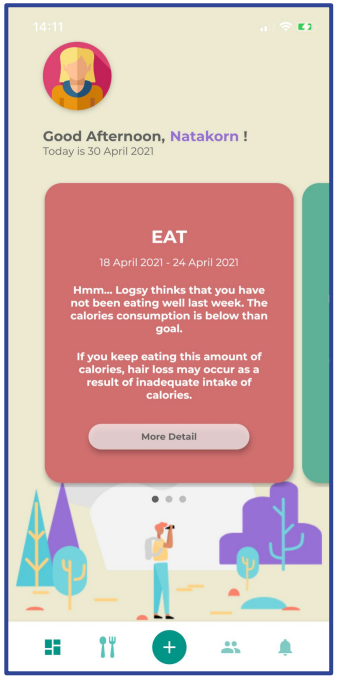
Lifestyle

Health Aspect	Color	Percentage
Eat	Red	>120% or < 80%
	Green	80%-120%
Exercise	Green	>80%
	Yellow	>=50%
	Red	<50%

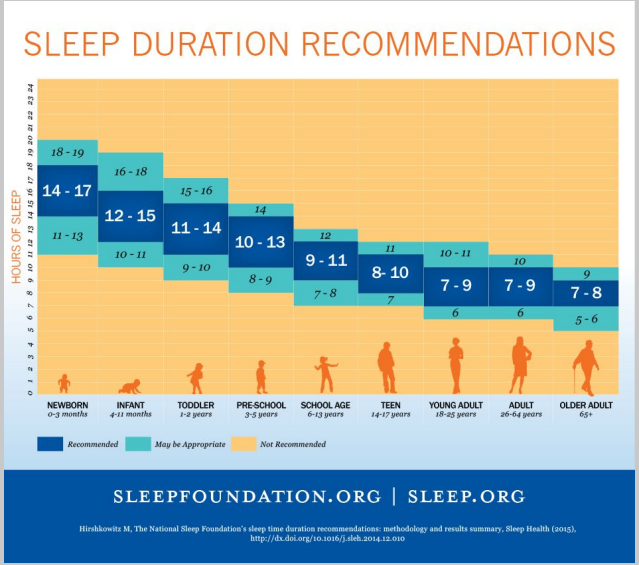
There are 2 types of algorithm:

- **Personalized Messages**
- **Color Indicators**

These algorithms are used with the dashboard feature, where it shows the analysis result. In total, there are 3 sub-section in each type: **eat, sleep, and exercise**.



Lifestyle



***Sleep Standard Table**. Note the table is referenced from the National Sleep Foundation*

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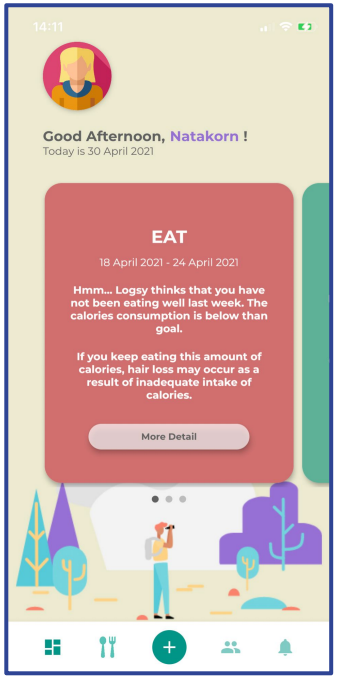

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Restaurant Menu

Restaurant
Name: Today Steak

Restaurant Branch
Name: Today Steak at iCanteen
Location: iCanteen
Latitude: 13.73694287
Longitude: 100.53411270

Menu
Food: ข้าวผัดกระเพราหมูกรอบ ไข่ดาว
Restaurant: Today Steak

Food
Name: ข้าวผัดกระเพราหมูกรอบ ไข่ดาว
Calories: 762
Carb: 60
Protein: 16
Fat: 59

4

Experiment

01

02

03

User Testing

- Method
- Result & Discussion

01

02

03

User Testing

- **Method**
- Result & Discussion

Method

Test Scenario

10 Scenarios

"You want to have breakfast, so you open Logsy to see what is the recommended menu for your breakfast in the restaurant nearby."

Usability System Scale

9 Questions

1 (Strongly Disagree) to 5 (Strongly Agree)

"I think that I would like to use this application frequently."

Test Sheet

Evaluation of Logsy User Testing

The following scenarios are designed to evaluate the Logsy application relative to the test objectives. The scenarios were reviewed and adjusted to best fit the objectives.

Preferred Scenario	Tasks	Estimated Time	Observation Detail	Scoring	User Feedback
Personalized Analysis					
You want to read your weekly analysis in each aspect. You want to see your performance in textual description and know what you can improve.	Read the data analysis text	2 minutes			
Assume you have been logging food, sleep and exercise records in Logsy for a week. You want to see your performance in numerical data.	Review food dashboard Review sleep dashboard Review exercise dashboard	3 minutes			
Location Awareness (assume you are at Faculty of Engineering, Chulalongkorn University)					
You want to have breakfast, so you open Logsy to see what is the recommended menu for your breakfast in your area. You also want to know how far to that restaurant.	Review the menu recommended Record the breakfast eaten Find the map to the restaurant	2 minutes			
You want to have breakfast, but you don't like the recommended menu. Then, you decided to look at the personalized meal instead.	Review the personalized menu Record the breakfast eaten	2 minutes			
Community (think like you are using a social media application)					
You want to find Group "Boba Lover", and you want to join this group as well.	Find group Join group	2 minutes			
You want to create a community space where people who love avocado can discuss it with each other. You also want to invite one of your friends to the group.	Create group Invite friend	3 minutes			
You have just finished a workout and want to write a post in your group to let your friend know.	Find the group you want to post Write a post	4 minutes			
You don't have the same interest anymore, so you want to change that in your profile.	Edit profile	2 minutes			
Challenges					
You decided to not eat sweet for a week and you want friends to join in, so you decided to create a challenge in the group.	Find the group you want to challenge with Create the challenge	5 minutes			
You want to join a challenge in the group.	Search for challenges in the group Join the challenge	2 minutes			

Additional Tasks	Pass
Availability	
Does the application respond with no lost connection?	
Performance	
Does the application provide a response with 1-minute at most delay?	

Remark: Scoring
1 - Very difficult
2 - Somewhat difficult
3 - Neither difficult nor easy
4 - Somewhat easy
5 - Very easy

System Usability Scale

	Strongly Disagree 1	2	3	4	Strongly Agree 5
I think that I would like to use this application frequently					
I found application unnecessarily complex					
I thought the application was easy to use					
I think that I would need the support of a technical person to be able to use the application					
I found the various functions in this application were well integrated					
I thought there was too much inconsistency in this application					
I would imagine that most people would learn to use this application very quickly					
I felt very confident using the application					
I needed to learn a lot of things before I could get going with this application					

01

02

03

User Testing

- Method
- **Result & Discussion**

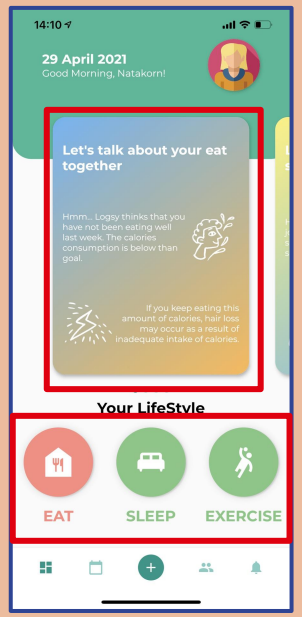
Personalized Analysis

SCENARIO

You want to read your weekly analysis in each aspect. You want to see your performance in textual description and know what you can improve.

PROBLEM

User did not notice the text showing is the analysis of their weekly performance.



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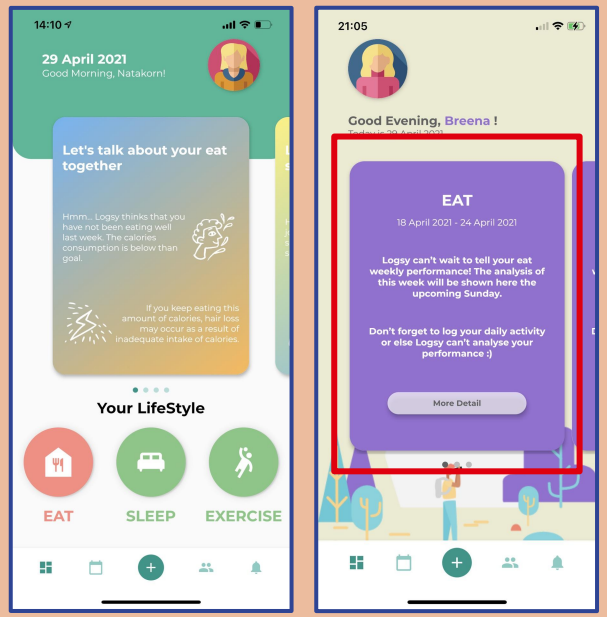

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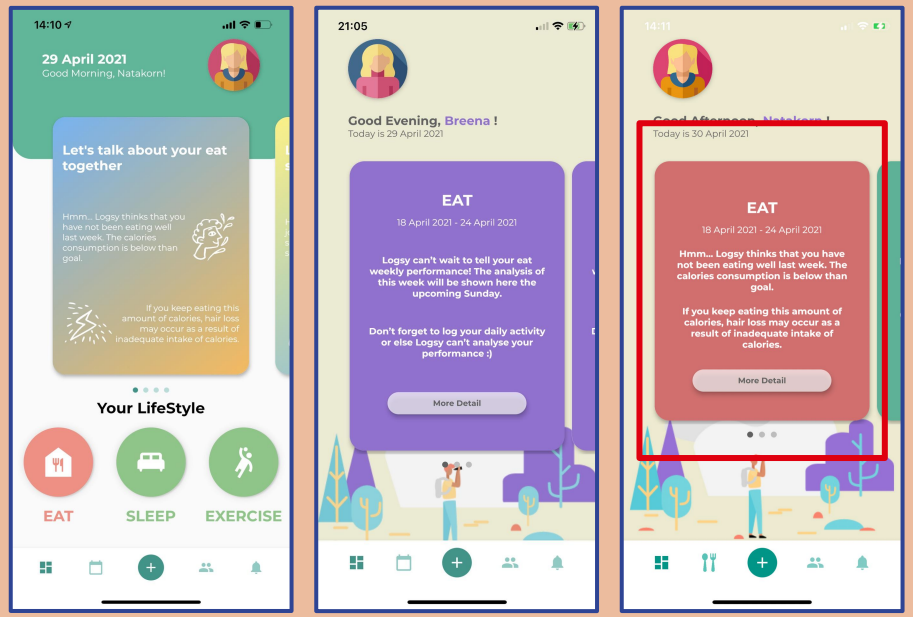


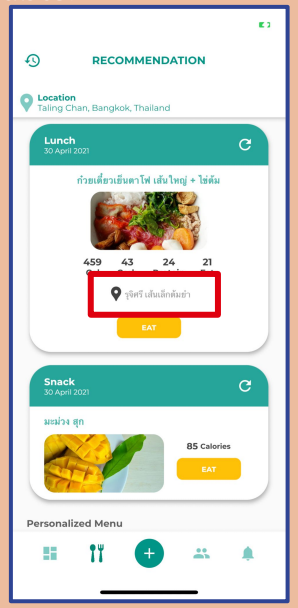
Location Awareness

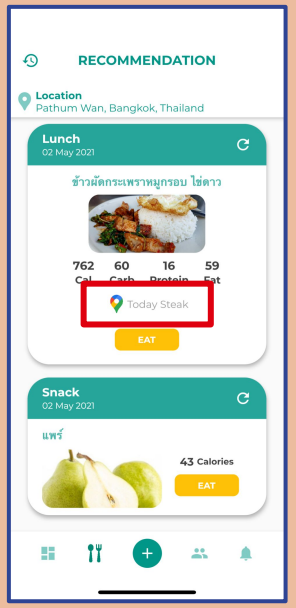
SCENARIO

You want to have breakfast, so you open Logsy to see what is the recommended menu for your breakfast in your area. You also want to know how far to that restaurant.

PROBLEM

Users were able to find the recommended meal and record it, but didn't know that the map button is clickable.





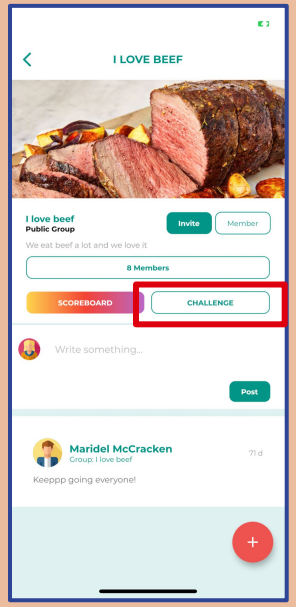
Challenge

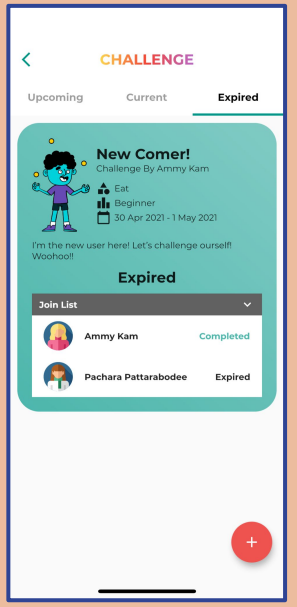
SCENARIO

You decided not to eat sweet for a week and you want friends to join in, so you decided to create a challenge in the group.

PROBLEM

Users were able to create the challenge, but the path they took was unnecessary complex.





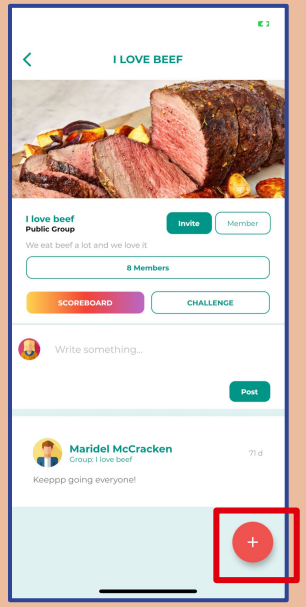
Challenge

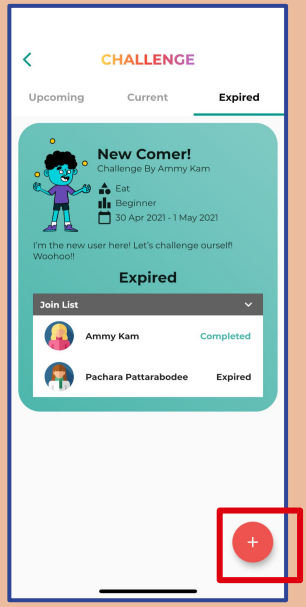
SCENARIO

You decided not to eat sweet for a week and you want friends to join in, so you decided to create a challenge in the group.

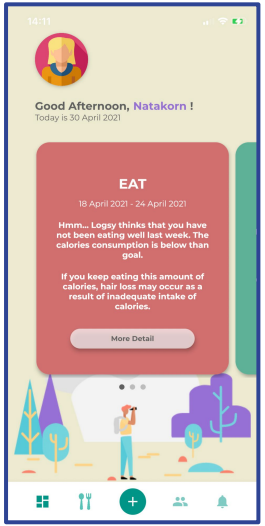
PROBLEM

Users were able to create the challenge, but the path they took was unnecessary complex.





Summary



Key Takeaway

The development of health tracking application, Logsy, was successful according to the requirements and solve problems met in other applications available.

Most of the user said the application was easy to use and they would use it frequently when the application is available in the wider area (currently iCanteen, Faculty of Engineering, Chulalongkorn University).

Appendix

1. Assessment
2. Future Work
3. Tech Stack
4. Challenge
5. API
6. Analysed Message

Assessment

1. The core functionality remains ***unchanged***
2. The avatar function did **not** meet up to the standard mentioned in the pre-project proposal
3. It solves the problem of ***not being able to find the menu***
4. The application also contains ***multiple functions*** that other mHealth apps in the market do not have.

Future Work

1. Improve ***Community*** feature: messaging, likes, and comment
2. Further improvement in ***sleep and exercise analysis***
3. Food Database ***API***
4. Launch application through ***App Store Connect***

Tech Stack

Mobile Development Framework

Flutter

Authentication

Firebase Authentication

Backend

node

Amazon RDS

Database

MySQL

Amazon EC2

Challenge

Implementing Algorithm while collaborating with the nutritionist is difficult as there are multiple constraints in calculating.

The information they required is too detailed for user to record in the application. Finding the balance between ***correctness and usability*** is the most difficult part.

API

Currently, anyone can access the API we created in backend given the right structure, port, and url. However, publishing it through public API website provider would widen our database greatly.

Analysed Message

1. **Warning or Praising Message**
   This part the message will tell the performance of the user like how well they did and what they are lacking.
   “Do you like Koala? Logsy thinks you guys should be best friend in sleeping! You overslept last week.”
   “Healthy sleep habits! Great job. You keep your average sleep hour at the what it should be.”

2. **Educating Message**
   It will give some tip of the issue or tell the consequences of the action.
   “Tips: If you have a habit of oversleeping, an alarm clock is a must.”
   “It can make you very sleepy and tired during the day.”