SOFTWARE REQUIREMENTS SPECIFICATION

KINGO COFFEE

KINGO COFFEE

Introduction to Software Engineering_SWE3002_41

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1. INTRODUCTION

1.1 PURPOSE

This Software Requirements Specification (SRS) specifies the requirements for KINGO COFFEE application. This service is designed and implemented by Team 10 of Introduction to Software Engineering at Sungkyunkwan University. The requirements for this are summarized, analyzed, and how the system is designed and implemented is described based on the contents followed.

This document attempts to specify all necessary requirements to run an application in the order of contents. Of course, the main reader is Team 10, and Team 10 designs and implements the functions which are needed for the service. Additionally, Professor Eun Seok Lee, TAs and other stakeholders can be readers.

The purpose of this document outlines and publishes the Software Requirements Specification for a new mobile application as a part of Smart Campus Project, which is to inform Sungkyunkwan University's students of several Cafes' current order status and estimated waiting time on Campus. Many brand cafes use this kind of system, but no application has ever provided such services targeting Campus. The expected effect of this is to help tired students buy and enjoy coffee and other beverages in efficient movements for a short time.

1.2 SCOPE

The official name of the application is KINGO COFFEE. KINGO COFFEE basically stores all user information and basic information about Cafés in the database and uses the status of Café updated in real time to provide the estimated waiting time for the Café, and user order's current waiting time. We also utilize the Google map API to provide UI aspects to identify the nearest cafe at a glance based on the current user's location. Also, we use Kakao Pay API to provide simple payment systems to users. If all of these functions are provided, it can provide an environment where tired students can enjoy drinks efficiently in a short time to release stress, and furthermore, it can distribute students to various cafes on campus.

This task will be serviced on Android OS so it requires Android OS devices and it needs at least Android 6 version or higher.

It also requires at least 512MB of free memory to run the app efficiently.

1.3 Definitions, acronyms, and abbreviations

Rules required to read and write this document are as follows:

- Read and write the DOCS online document.
  - Bold text is the style used for the string to be highlighted. For figures, tables.
  - Be sure to use a caption. Fill in the caption on the figure or table.
- Do not delete each chapter. If there is nothing to write, write N/A.
- Rules for marking version and revision of documents are as follows.
  - The state in which the requirements are finalized is referred to as the "baseline. The document version at the time of initial default feature approval is labeled "1.0".
  - The minor version is increased by "1" when the underlying geometry changes and re-approves, or when formal distributions (e.g., RTM, reviews, etc.) take place.
- Label is used to represent the review steps of feature requirements.
  - Labels are denoted using square brackets after feature requirements.
  - [TBD] is a label that displays things that have not yet been determined (TBD). At the time of the declaration of the underlying feature, there should be no [TBD] feature requirements.
  - [Next] is a label that displays the requirements to exclude from the scope of implementation of the project. [Next] requirements will be reviewed again later in the development scope.

For terms and abbreviations frequently used in this paper, see the following table. Since there are too many terms/abbreviations and it is inappropriate to describe all here, separate chapters will be described in the last chapter of this document.

The following table lists the abbreviations used in this document.

TABLE 1 ACRONYMS & ABBREVIATIONS EXPLANATION

Acronyms & Abbreviations	Explanation
OS	operating system
API	Application Programming Interfaces
SRS	Software Requirement Specification
SDS	Software Design Specification
IRS	Interface Requirement Specification
TDS	Test Design Specification
PP	Product Planner
PM	Project Manager
PE	Program Engineer
UX	User Experience
GUI	Graphical user interface
SKKU	SungKyunKwan University
AWS	Amazon Web Services
GPS	Global Positioning System

The following table defines the specific technical terms used in this document.

TABLE 2 TERMS EXPLANATION

Terms	Explanation
User	It means the user who uses this application
Front-end	It refers to the interface used by User, including UI/UX

Back-end	Area that users can not directly use. it includes Database and Server
Algorithm	It refers to a method designed to efficiently perform a particular function
Client	It refers to the device of User or User connected to server
Server	Area where sends a response that corresponds to the request of user
Database	Area where various data needed for functions are organized and stored in a table according to the design
Request	Client's request that send to the server for required features
Response	corresponding answer to Client's request.

1.4 References

- Team 1. "SRS_TEAM1". SKKU, Last Modified: May. 14, 2020. https://github.com/skkuse/2020spring_41class_team1/blob/master/docs/SRS_TEAM1.pdf
- IEEE Std 830-1998 IEEE Recommended Practice for Software Requirements Specifications, In IEEEExplore Digital Library http://www.math.uaa.alaska.edu/~afkjm/cs401/IEEE830.pdf

1.5 Overview

This Requirements Specification Documents consists of four chapters, followed by three chapters. In short, chapter 2 is about the description of the overall service. Chapter 2 briefly defines the interfaces required for the system and also introduces the operation of each actor. It also introduces the characteristics and constraints of the actors, and finally basic Assumptions and Dependencies of the project.

The parts briefly introduced in Chapter 3 are specified in detail, leading to interfaces, performance requirements, logical database requirements, design constraints, and finally software system attributes. In Chapter 4, it consists of the tables used in the documents and the appendices about index.

2. OVERALL DESCRIPTION

2.1 PRODUCT PERSPECTIVE

2.1.1 SYSTEM INTERFACES

This product is a native application system. The user's local data like cart information is stored in an Android app. Other data like cafes' information, waiting status and ordering status, the user's account, a selection for an automatic login and points of each cafe is stored in AWS server using mySQL database tool. Also, the system has Google Map API and Kakao Pay API as a subsystem.

2.1.2 USER INTERFACES

The application GUI provides a consistent user interface with a top bar showing the app name and notification, and a bottom navigation bar. The navigation bar lists buttons of the map, points, a main button, profile, and settings that move to the page in order from the left. The content of the main button changes on each page; It appears as a "recommended cafe" on the map page, an "ordering" on the cafe information page, a "shopping cart" on the order page, a "payment" on the shopping cart page, and a "cancel ordering" on the ordering status page.

2.1.3 HARDWARE INTERFACES

The system is intended for Android mobile phones. Devices should be enabled with the Internet and GPS.

2.1.4 SOFTWARE INTERFACES

The system is intended for Android OS version at least Android 6.0 (API 23) and targeting Android 10 (API 29).

2.1.5 COMMUNICATIONS INTERFACES

User device and server communicate with HTTP protocol in JSON format. Also, it uses a real-time system that sends and receives data in real time from mobile apps using a server that communicates with websockets.

2.1.6 MEMORY

The system should run on mobile devices with at least 1GB RAM for primary memory. It requires at least 512MB of free memory to run the app efficiently.

2.1.7 OPERATIONS

2.1.7.1 USER

- Register, Login, Logout
  - User can register with some data like name, phone number, ID, password and campus selection.
  - User can login using his/her account and check for an automatic login option for later.
  - User can logout.
- Recommendation
  - User can get a recommendation for the best optimal cafe considering waiting status of each cafe and the user's current location.
- Map View
  - User can view the current location and the locations of nearby cafes.
  - User can switch the campus.
  - User can select a cafe and view its name, location, expected moving time and expected waiting time.
- Waiting Status
  - User can view the real-time waiting status like current order status and expected waiting time.
  - User can refresh the waiting status manually while it is reflected in real time automatically.
- Ordering

  - User can view the cafe's menus and place an order.
  - User can pay for the order using Kakao Pay.
  - User can use points in the payment process.
- Ordering Status
  - User can view his/her current ordering status.
  - User can cancel the order.
- Point
  - User can view the point status of each cafe.
- Profile
  - User can view and edit his/her profile.

2.1.7.2 Cafe

- Waiting Status
  - Cafe delivers real-time waiting status data.
- Ordering
  - Cafe delivers data for menus.
  - Cafe accepts the user's order which has been paid for in advance.
- Ordering Status
  - Cafe delivers the order's real-time progress data.
- Point
  - Cafe delivers data for the user's earned and used points.

2.1.7.3 Google Map API

- Map View
  - Google Map API provides a map according to the user's current location and the locations of cafes.
  - If the other campus is selected, Google Map API provides a map of the corresponding campus regardless of the user's current location.

2.1.7.4 Kakao Pay API

- Ordering

- Kakao Pay API provides a function to pay with Kakao Pay during the payment process.

2.2 PRODUCT FUNCTIONS

2.2.1 REGISTER & LOGIN

When the user starts the application, a login window appears. There will be a register button in the login page and the user can click the button and move to the register page. Fields of name, phone number, ID, password, and preferred campus selection are required and especially the user must inevitably get a phone number verification for payment. After filling all required fields and getting a phone number verification, the user can go to the login page again and try to login using ID and password. If the user previously checked the “automatic login” option, then he/she can skip this process. If login is successful, the map view window appears.

2.2.2 MAP VIEW

Basically, a map of the campus according to the user's current location and the locations of nearby cafes are displayed. If the user manually changes the campus through the campus selection button, the map of the campus and the location of the cafes are displayed regardless of the user’s current location. If the user selects a cafe on the map, the cafe’s name, location, estimated moving time and expected waiting time, and buttons to go to the waiting status page and to the menu page are displayed.

2.2.3 RECOMMENDATION

The locations of cafes on the campus are displayed in the map view window, and the "Recommended Cafe" phrase is displayed on the main button on the navigation bar below. When the "Recommended Cafe" button is clicked, the optimal cafe calculated by the algorithm in consideration of the current user's location and the waiting status of each cafe appears. Also, buttons to go to the waiting status page and to the menu page are displayed, same as when the user directly selects a cafe in 2.2.2 function.

2.2.4 WAITING STATUS

Waiting Status function informs the current order status of the cafe by the number of cases and the estimated waiting time. It is reflected in real time, but the user can click the refresh button to directly read the real-time waiting status.

2.2.5 ORDERING

If the user clicks the main button of "Order" on the waiting status page, he/she can see the menus of the cafe. If the user pushes the menu to the left, it is added to the shopping cart. If the user clicks the "Shopping Cart" main button, he/she can check the current order. The user can enter the points to use and click the "Payment" main button to confirm the final payment.

2.2.6 ORDERING STATUS

Ordering Status function informs the progress of the user's order of the cafe by the waiting number and the estimated waiting time. It is reflected in real time, but the user can click the refresh button to directly read the real-time ordering status. Also, the user can cancel the order by clicking the "Cancel Ordering" main button on the bottom navigation bar.

2.2.7 POINT

The user can check the status of points earned at each cafe on campus and points to be expired. The user can check the point usage details by clicking on the point box of each cafe.

2.2.8 PROFILE

The user can view and edit the basic information like name, phone number, ID, password and a preferred campus selection. Also, the user can logout in this profile page.

2.3 USER CHARACTERISTICS

2.3.1 USERS

Users include anyone who can verify phone numbers with Kakaotalk application.

2.3.2 CAFE

Cafes include all cafes on campus of Sungkyunkwan University. On the Humanities and Social Sciences Campus, there are “Sarangbang”, “ttt”, “Pandorothy”, and “Reve”. On the Natural Sciences Campus, there are “Coffee Bean Korea”, “Cafe Namu”, “Pandorothy”, and “Cafe NU”.

2.4 CONSTRAINTS

2.4.1 REGULATORY POLICIES

- There will be relevant school regulations. Must obtain permission to use information and develop applications for facilities in the school.
- In-app cafe menu display, in case of prepayment, the cafe's consent is required.
- In the case of the integrated payment system and point system, consent and participation from all cafe companies and schools are required.
- In the case of simple payment systems such as KAKAO-Pay, the relevant regulations must be followed.

2.4.2 CRITICALITY FOR APPLICATION

- The Internet connection is a constraint for the application. Since the application fetches data from the database over the Internet, it is crucial that there is an Internet connection for the application to function.
- The GPS is also a constraint for the application. For the recommendation system and to find cafes, the GPS is required and should be working.
- The capacity of the database should be considered. Since the database is shared between both applications it may be forced to queue incoming requests and therefore increase the time it takes to fetch data.

2.4.3 RELIABILITY REQUIREMENTS

- The response time in store recommendation should be short.
- Real-time information such as the number of waiting orders and the estimated time of the cafe should be updated every second without delay.

- For reliability, real-time information such as the current number of people-waiting and expected waiting time must not exceed the error range (+-1 minute).
- The security for payment should be reliable.

2.4.4 ETC

- The cost for using AWS server which is for the database should be considered.
- Future scalability and availability of the system should be considered when adding new stores or menus.
- For memory and time efficiency, optimizing source code is inevitable.
- Android applications should be developed with minimum Android version 6 and target Android version 10.

2.5 ASSUMPTIONS AND DEPENDENCIES

Due to the nature of the application, participation in cafes within the school is a basic premise. It can be implemented only through cooperation with cafes because of such as menu information for cafes, real-time waiting information, and prepayment orders.

First of all, it is also the initial version, and for easy payment, prepayment is possible only with Kakao Pay. In addition, after pre-order, post-payment at the store is not possible. Because, for example, in the case of store payment, there may be a no-look that does not appear, that is, does not pay for an order, so it is inevitable to strengthen authentication when registering as a member. Therefore, it was decided not to support store payment.

2.6 APPORTIONING OF REQUIREMENTS

- Reviews by cafe
- Reviews by cafe menu
- Better recommendation system

3. SPECIFIC REQUIREMENTS

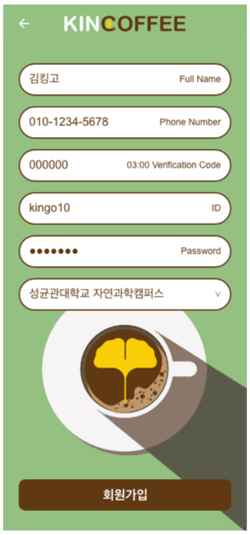
3.1 External interface requirements

3.1.1 User interfaces

Table 3 User interface of basic user interaction

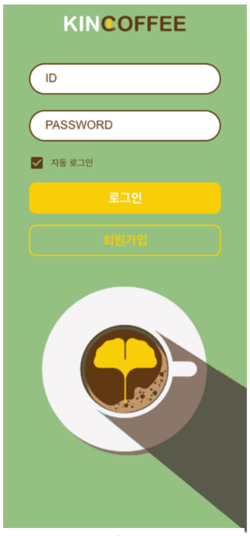
Name	Basic User Interaction
Purpose/Description	Users exchange data and acquire information through the touchscreen of their device.
Input source/ Output destination	User / User's device
Range/ Accuracy/ Margin of error	The number of buttons on the screen / The accuracy of touch according to performance of touchscreen / The Margin of error of touch sensitiveness
Unit	A click
Time/ Velocity	Unregular user input / Immediately perform user instruction depend on the user device's processing time.
Relationship with other input/outputs	Processed by client or interacted with server based on input
Format and configuration of screen	Screen exists for each interface Users are to click a desired button to interact with the Application
Format and configuration of window	N/A
Data type	According to function in application
Instruction type	According to function in application
Exit message	N/A

TABLE 4 USER INTERFACE OF REGISTER

Name	Authentication Interface1 – Register
Purpose/Description	Users need to register to use the application. Users can be identified through registers and data such as coupons/points can be managed on a per-user basis.
Input source/ Output destination	Client / Server
Range/ Accuracy/ Margin of error	N/A
Unit	Screen
Time/ Velocity	User wants to use application for the first time Communication time between the server and the client
Relationship with other input/outputs	User data save in Server (DB)
Format and configuration of screen	Several input slots that can fill in user information. Button to complete register  김킹고 Full Name 010-1234-5678 Phone Number 000000 03:00 Verification Code kingo10 ID ••••••• Password 성균관대학교 자연과학캠퍼스 v FIGURE 1 USER INTERFACE OF REGISTER
Format and configuration of window	N/A
Data type	String, Integer, Query

Instruction type	Query for save user data Instruction mapped to the button
Exit message	Message to notify register success

TABLE 5 USER INTERFACE OF LOGIN

Name	Authentication Interface2 – Login
Purpose/Description	Identify the user through login
Input source/ Output destination	Client / Server
Range/ Accuracy/ Margin of error	N/A
Unit	Screen
Time/ Velocity	User need to use the application / Communication time between the server and the client
Relationship with other input/outputs	Check User information in Server (DB)
Format and configuration of screen	Input slots for filling in user id and user password. Button to complete login Check button to determine whether to login automatically  KINCOFFEE ID PASSWORD ☑ 자동 로그인 로그인 회원가입 FIGURE 2 USER INTERFACE OF LOGIN

Format and configuration of window	N/A
Data type	String, Query
Instruction type	Query for check user information Instruction mapped to the button
Exit message	Message to notify Login success or fail

TABLE 6 USER INTERFACE OF MAIN INTERFACE

Name	Main Interface
Purpose/Description	The default interface that the user can interact with can select coffee based on a map. Also access other interfaces through a navigation bar.
Input source/ Output destination	User / Client Client / Server
Range/ Accuracy/ Margin of error	N/A
Unit	Screen
Time/ Velocity	Unregular user input / Immediately perform user instruction depend on the user device's processing time, Velocity of map API
Relationship with other input/outputs	This is associated with input and output from other interfaces as it acts as the main conduit

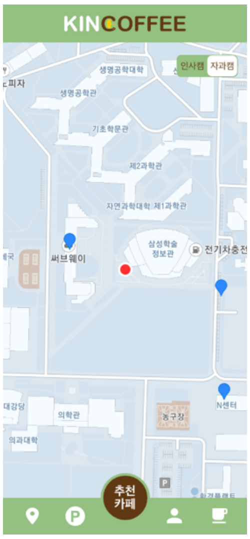
Format and configuration of screen	Show a map based on user locations or canvas selection Each café on the map has a Button for select Provide estimated waiting time and estimated arrival time near the cafe's buttons Access to other interfaces is possible through the navigation bar at the bottom of the screen. Navigation bar remains visible on other interfaces Navigation bar has 4 buttons (Reset the map, Enter to the point interface, Enter to the profile interface, Enter to the ordering status interface)  KINCOFFEE 인사캠 자과캠 생명공학대학 생명공학관 기초학문관 제2과학관 자연과학대학 제1과학관 삼성학술 정보관 전기차충전 써브웨이 대강당 의학관 의과대학 농구장 N센터 추천 카페 FIGURE 3 USER INTERFACE OF MAIN INTERFACE Button to enter the Cafe recommendation interface
Format and configuration of window	N/A
Data type	N/A
Instruction type	Http request for payment API Instruction mapped to buttons
Exit message	Exit Program

TABLE 7 USER INTERFACE OF CAFÉ RECOMMENDATION

Name	Cafe selection Interface1 – Cafe recommendation
Purpose/Description	Based on the user's current location and status of cafés, recommended café is provided to user
Input source/ Output destination	Client / Server
Range/ Accuracy/ Margin of error	N/A / The accuracy depends on Whether the User use recommended café /

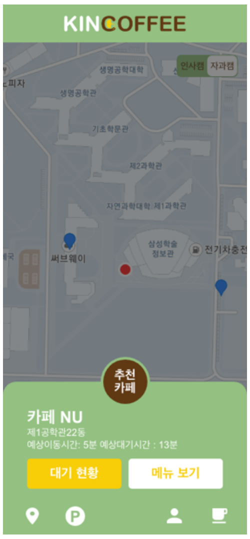
	The Margin of error according to Differences in weights on data
Unit	Screen
Time/ Velocity	Unregular user input / Process time for recommendation, Communication time between the server and the client
Relationship with other input/outputs	Recommend is Based on the user's current location and status of cafés
Format and configuration of screen	Provide minimal information about recommended café Button to enter the café menu checking interface Button to enter the café status checking interface  카페 NU 제1공학관22동 예상이동시간: 5분 예상대기시간 : 13분 KINCOFFEE 인사캠 자과캠 피자 생명공학대학 생명공학관 기초학문관 제2과학관 자연과학대학 제1과학관 써브웨이 삼성학술정보관 전기차충전 추천 카페 대기 현황 메뉴 보기 FIGURE 4 USER INTERFACE OF CAFÉ RECOMMENDATION
Format and configuration of window	N/A
Data type	Json, string
Instruction type	Instruction to recommendation Instruction mapped to the button
Exit message	N/A

TABLE 8 USER INTERFACE OF SELECTED CAFE

Name	Cafe selection Interface2 – Selected Cafe

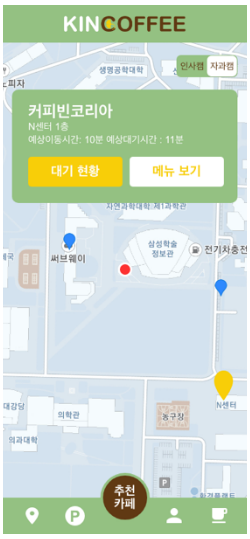
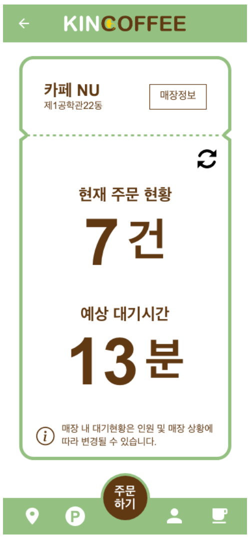
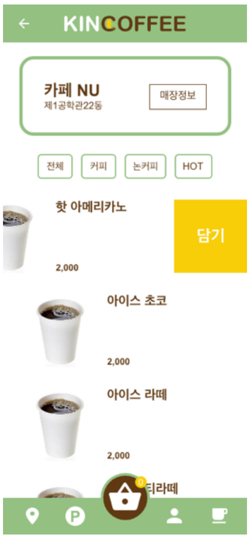
Purpose/Description	User select the café on the map
Input source/ Output destination	User / Client
Range/ Accuracy/ Margin of error	N/A
Unit	Screen
Time/ Velocity	Unregular user input / Immediately perform user instruction depend on the user device's processing time.
Relationship with other input/outputs	N/A
Format and configuration of screen	Provide minimal information about recommended café Button to enter the café menu checking interface Button to enter the café status checking interface  커피빈코리아 N센터 1층 예상이동시간: 10분 예상대기시간 : 11분 KINCOFFEE 인사캠 자과캠 대기 현황 메뉴 보기 생명공학대학 피자 자연과학대학 제1과학관 써브웨이 삼성학술정보관 전기차충전 대강당 의학관 의과대학 농구장 N센터 추천 카페 FIGURE 5 USER INTERFACE OF SELECTED CAFE
Format and configuration of window	N/A
Data type	Json, string
Instruction type	Instruction mapped to the button
Exit message	N/A

TABLE 9 USER INTERFACE OF WAITING STATUS CHECKING

Name	Café Interface1 – Waiting status checking
Purpose/Description	Check the status of café in real time
Input source/ Output destination	Server / Client
Range/ Accuracy/ Margin of error	N/A / The accuracy according to Missing order / N/A
Unit	Screen
Time/ Velocity	Periodic status update / Communication time between the server and the client
Relationship with other input/outputs	N/A
Format and configuration of screen	Provide current order volume status Provide estimated waiting time Write warning statement that it may be different from what it really is Button to enter the cafe menu checking interface Button to update status to the latest  KINCOFFEE 카페 NU 제1공학관22동 매장정보 현재 주문 현황 7건 예상 대기시간 13분 주문 하기 매장 내 대기현황은 인원 및 매장 상황에 따라 변경될 수 있습니다. FIGURE 6 USER INTERFACE OF WAITING STATUS CHECKING
Format and configuration of window	N/A
Data type	Json, string, Int, Query

Instruction type	Query for get café status on DB
Exit message	N/A

TABLE 10 USER INTERFACE OF CAFÉ MENU CHECKING

Name	Café Interface2 – Café menu checking
Purpose/Description	Check the menu of the café and add the item in the cart for the order.
Input source/ Output destination	Server / User
Range/ Accuracy/ Margin of error	N/A
Unit	Screen
Time/ Velocity	Unregular user input / Communication time between the server and the client
Relationship with other input/outputs	Database changes due to café menu and price changes
Format and configuration of screen	Provides information on all menus in the café Display pictures of menus Button for adding menu to Cart button to enter the Cart interface  KINCOFFEE 카페 NU 제1공학관22동 매장정보 전체 커피 논커피 HOT 핫 아메리카노 2,000 담기 아이스 초코 2,000 아이스 라떼 2,000 0 티라떼 FIGURE 7 USER INTERFACE OF CAFÉ MENU CHECKING

Format and configuration of window	N/A
Data type	Json, Image, string, Query
Instruction type	Instruction mapped to the button Query for get café menus on DB
Exit message	N/A

TABLE 11 USER INTERFACE OF CART

Name	Order Interface1 – Cart
Purpose/Description	Show the items of the user's cart
Input source/ Output destination	User / Client
Range/ Accuracy/ Margin of error	N/A
Unit	Screen
Time/ Velocity	Unregular user input / Immediately perform user instruction depend on the user device's processing time.
Relationship with other input/outputs	N/A
Format and configuration of screen	Provide list of menus in the cart

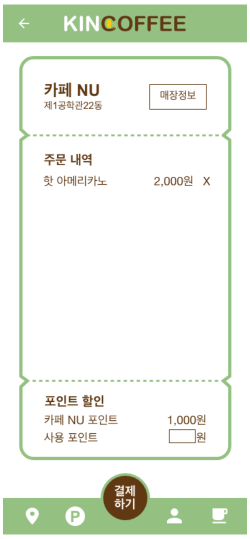
	Display picture of menus in the cart Provide total price information Button for order and payment  KINCOFFEE 카페 NU 제1공학관22동 매장정보 주문 내역 핫 아메리카노 2,000원 X 포인트 할인 카페 NU 포인트 1,000원 사용 포인트 원 결제 하기 FIGURE 8 USER INTERFACE OF CART
Format and configuration of window	N/A
Data type	String, Image
Instruction type	Instruction mapped to the button
Exit message	N/A

TABLE 12 USER INTERFACE OF PAYMENT

Name	Order Interface2 – Payment
Purpose/Description	Pay for the items of the user's cart
Input source/ Output destination	User / Server
Range/ Accuracy/ Margin of error	Items of the user's cart / N/A / N/A
Unit	Screen
Time/ Velocity	Unregular user input / Communication time between the server and the client, Velocity of payment API

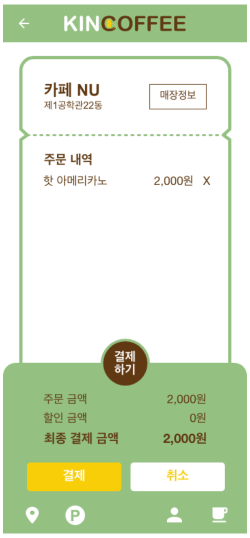
Relationship with other input/outputs	Changing the status of the café by adding the order
Format and configuration of screen	Provide order information Button to connect with payment API  KINCOFFEE 카페 NU 제1공학관22동 매장정보 주문 내역 핫 아메리카노 2,000원 X 결제 하기 주문 금액 2,000원 할인 금액 0원 최종 결제 금액 2,000원 결제 취소 FIGURE 9 USER INTERFACE OF PAYMENT
Format and configuration of window	N/A
Data type	String, json, Query
Instruction type	Http request for payment API Query to communication between the server and the client Instruction mapped to the button
Exit message	Message to notify order success or fail

TABLE 13 USER INTERFACE OF ORDER STATUS CHECKING

Name	Order Interface3 – Order status checking
Purpose/Description	User can check current order status
Input source/ Output destination	Client / Server
Range/ Accuracy/ Margin of error	User's order / N/A / N/A

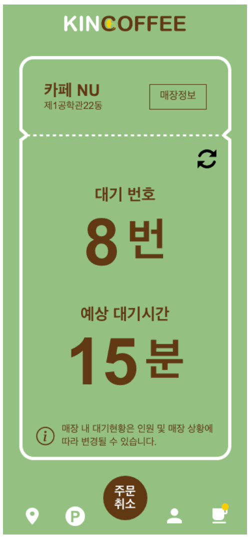
Unit	Screen
Time/ Velocity	After successful order, When the user approaches through the navigation bar / Communication time between the server and the client
Relationship with other input/outputs	N/A
Format and configuration of screen	Provide current waiting number Provide estimated waiting time Write warning statement that it may be different from what it really is Button to cancel payment  KINCOFFEE 카페 NU 제1공학관22동 매장정보 대기 번호 8번 예상 대기시간 15분 주문 취소 매장 내 대기현황은 인원 및 매장 상황에 따라 변경될 수 있습니다. FIGURE 10 USER INTERFACE OF ORDER STATUS CHECKING
Format and configuration of window	N/A
Data type	Json, String, Int, Query
Instruction type	Query for get café status on DB
Exit message	N/A

TABLE 14 USER INTERFACE OF USER PROFILE

Name	Information Interface1 – User profile
Purpose/Description	View user's information
Input source/ Output destination	Client / Server

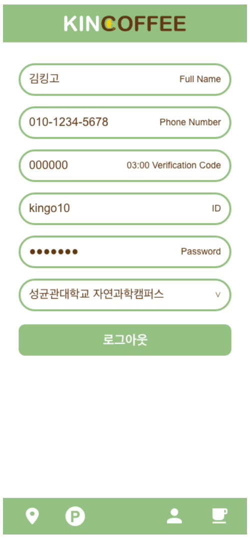
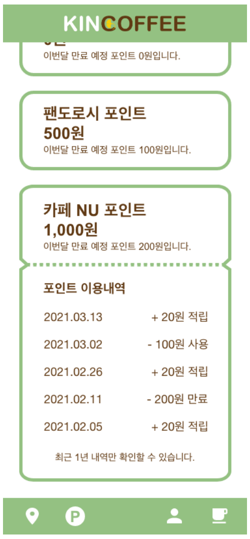
Range/ Accuracy/ Margin of error	N/A
Unit	Screen
Time/ Velocity	Unregular user input / Communication time between the server and the client
Relationship with other input/outputs	N/A
Format and configuration of screen	Provide user's information through DB Button for logging out  김킹고 Full Name 010-1234-5678 Phone Number 000000 03:00 Verification Code kingo10 ID ••••••• Password 성균관대학교 자연과학캠퍼스 FIGURE 11 USER INTERFACE OF USER PROFILE
Format and configuration of window	N/A
Data type	Json, String, Query
Instruction type	Query for get café status on DB Instruction mapped to the button
Exit message	N/A

TABLE 15 USER INTERFACE OF POINT CHECKING

Name	Information interface2 – Point checking

Purpose/Description	User can check the current status of points for each cafe.
Input source/ Output destination	Client / Server
Range/ Accuracy/ Margin of error	N/A
Unit	Screen
Time/ Velocity	Unregular user input / Communication time between the server and the client
Relationship with other input/outputs	Change the value for the point as the order completes
Format and configuration of screen	Provides information about points currently held by users in each cafe  KINCOFFEE 이번달 만료 예정 포인트 0원입니다. 팬도로시 포인트 500원 이번달 만료 예정 포인트 100원입니다. 카페 NU 포인트 1,000원 이번달 만료 예정 포인트 200원입니다. 포인트 이용내역 2021.03.13 + 20원 적립 2021.03.02 - 100원 사용 2021.02.26 + 20원 적립 2021.02.11 - 200원 만료 2021.02.05 + 20원 적립 최근 1년 내역만 확인할 수 있습니다. FIGURE 12 USER INTERFACE OF POINT CHECKING
Format and configuration of window	N/A
Data type	Json, String, Int, Query
Instruction type	Query for get Point va status on DB
Exit message	N/A

3.1.2 Hardware interfaces

Table 16 Hardware interface of applicable device

Name	Applicable device
Purpose/Description	Device that user needs to use the application. The system is intended for Android OS version at least Android 6.0 (API 23) and targeting Android 10 (API 29).
Input source/ Output destination	User / Device
Range/ Accuracy/ Margin of error	Follow device specifications
Unit	User's input
Time/ Velocity	Unregular user input / Immediately perform user instruction
Relationship with other input/outputs	Related to all I/O of the client
Format and configuration of screen	N/A
Format and configuration of window	N/A
Data type	N/A
Instruction type	N/A
Exit message	N/A

3.1.3 Software interfaces

Table 17 Software interface of Amazon web services

Name	Amazon web services

Purpose/Description	Provides online services for client-side application
Input source/ Output destination	Client / Server
Range/ Accuracy/ Margin of error	Depends on the performance of the AWS
Unit	Query
Time/ Velocity	Instant reaction
Relationship with other input/outputs	Related to all I/O of the server
Format and configuration of screen	N/A
Format and configuration of window	N/A
Data type	Query
Instruction type	Query for communicate with server
Exit message	N/A

3.1.4 Communication interfaces

Table 18 Communication interface of client and server

Name	Client and Server
Purpose/Description	Client requests the connection to the server and requests multiple data to provide application functionality. The Server provides data appropriate for each client's requests
Input source/ Output destination	Client / Server

Range/ Accuracy/ Margin of error	Depends on the performance of communicate between client and server
Unit	Packet
Time/ Velocity	At least 10Mbps
Relationship with other input/outputs	Related to all I/O of the server
Format and configuration of screen	N/A
Format and configuration of window	N/A
Data type	Json, Query
Instruction type	Socket programming
Exit message	N/A

TABLE 19 COMMUNICATION INTERFACE OF SERVER AND CAFÉ SYSTEM

Name	Server and Café system
Purpose/Description	Server requests and receives café data to provide clients. Café system receives data on orders from the server.
Input source/ Output destination	Server / Cafe system
Range/ Accuracy/ Margin of error	Depends on the performance of communicate between cafe and server
Unit	Packet
Time/ Velocity	At least 10Mbps
Relationship with other input/outputs	Related to cafe status and orders.

Format and configuration of screen	N/A
Format and configuration of window	N/A
Data type	Json
Instruction type	Socket programming
Exit message	N/A

3.2 Functional requirements

3.2.1 Register & Login

Table 20 Function of Register & Login

Function	Register & Login
Description	The ability to enter your own information and load the screen to use the application.
Input	User information
Sequence	1.1 Select Registration Button 1.2 Enter personal information such as your name, phone number, ID, PW, and campus. 1.3 Successful subscription once authenticated after receiving the authentication number through the user's phone number 1.4 Registered information is stored in the User DB. 1.5 After signing up, the user enters ID/PW. 1.6 If it matches the ID/PW stored in the DB, login successfully goes to the map view screen.
Output	– If ID/PW does not match the information stored in User DB, output an error message. – If it matches, print out the main screen.
Consideration	– If you fail to authenticate yourself in the subscription process, you will not be able to sign up.

	– If you already have an account, you can skip the registration process and log in immediately. – If you select the auto login option, you can skip the login process.

3.2.2 Map View

TABLE 21 FUNCTION OF MAP VIEW

Function	Map View
Description	A feature that shows the location of all cafés on selected campuses on a map and measures the waiting status of each café, estimated waiting time, and estimated distance from the user's current location to the café.
Input	– Login button after entering login information
Sequence	1.1 The Map View screen tracks the user's current location and displays nearby cafés at that location. 1.2 When a user selects a café on a map, the café information, estimated travel time and estimated wait time, the Wait Status page, and the buttons that go to the Menu page are displayed.
Output	– User's current location – Campus change button – Café information on campus maps – Button to go to the page of the selected café
Consideration	– If the user manually changes the campus through the campus change button, the campus map and café location are displayed regardless of the current location.

3.2.3 Recommendation

TABLE 22 FUNCTION OF RECOMMENDATION

Function	Recommendation
Description	The ability to recommend café based on user's location information
Input	– "Recommended café" button

Sequence	1.1 Click the “Recommended café” button on the Map View screen. 1.2 It shows the optimal cafés to users through algorithms that take into account the current location of the user, the distance of each café, and the current status of real-time waiting. 1.3 A button appears that takes users to the Standby page of recommended cafés and a button that takes users to the Menu page. 1.4 Users can select the desired café and press the button to enter the page.
Output	- Café list - A button on the recommended café‘s page and a button on the Menu page.
Consideration	- Recommended café information should also be updated automatically depending on the user’s real-time location.

3.2.4 Waiting Status

Table 23 Function of Waiting Status

Function	Waiting Status
Description	Ability to show real-time standby status for each café
Input	- Café select button
Sequence	1.1 Select a café from the list of recommendations 1.2 Real-time orders for selected café s appear. 1.3 Anticipated wait time appears.
Output	- Waiting status - Estimated time
Consideration	- Users can click the refresh button to directly read the real-time waiting status.

3.2.5 Ordering

TABLE 24 FUNCTION OF ORDERING

Function	Ordering
Description	Order specific product
Input	– Order button, Shopping cart button, Payment button
Sequence	1.1 Users choose a café waiting orders on the page, click the button. 1.2 It shows the full menu of the café. 1.3 Desired menu away from the left side of the menu is added to the shopping cart. 1.4 The user clicks the button on the grocery bag, the current shopping cart can check the status. 1.5 In Cart payments can mount a final confirmation of payment by pressing the button.
Output	– Café's menu – Payment page – Shopping cart information – Order information
Consideration	– The shopping cart DB should be updated according to the user's behavior. – A successful purchasing process requires at least one product. – Users can use points when making a payment.

3.2.6 ORDERING STATUS

TABLE 25 FUNCTION OF ORDERING STATUS

Function	Ordering status
Description	Ability to inform users of café order progress by waiting number and estimated waiting time
Input	– Order information
Sequence	1.1 If the payment is successful in the order window, the progress of the order will be displayed by the waiting order. 1.2 The estimated waiting time of the ordered menu is reflected in real time.

Output	– Waiting Number – Estimated Latency
Consideration	– The user can click the refresh button to read the real-time order status directly. – You can cancel an order by clicking the "Cancel Order" main button.

3.2.7 POINT

TABLE 26 FUNCTION OF POINT

Function	Points earned and used
Description	Ability to earn points/use points during ordering
Input	Order information, point box
Sequence	1.1 When a user places an order, the points of the café are automatically accumulated. 1.2 Users can check the status of points and details of use of each café. 1.3 Users can order by converting the saved points to a discount price during ordering.
Output	– Point information
Consideration	– Automatically accumulate points for orders separately from menu count – Points automatically expire when the period expires.

3.2.8 PROFILE

TABLE 27 FUNCTION OF PROFILE

Function	User's profile function
Description	It shows the user's membership information, order history, shopping cart information, and point information.
Input	Profile button

Sequence	1.1 Pressing the user page button causes the system to display the user page screen with information in the DB. 1.2 The information stored in User DB allows you to see the user's membership information such as name, phone number, ID/PW, a preferred campus selection and how much points have been accumulated. 1.3 Users can modify the information stored in the profile.
Output	- User's page - User's information - Campus Selection Button - Point information
Consideration	- DB information should be updated according to the user's behavior. - Users can log out on this profile page.

3.3 Performance requirements

- All functions included in the system must be completed within 5 seconds.
- The system supports only one concurrent use. The system does not support multiple account connections on a single mobile phone device. Users can use only one account.
- The core service of this system is real-time standby check. As a result, a decrease in accuracy leads to a decrease in the utilization. In addition, atmospheric conditions must be updated in real time, so there must be no problems of accuracy and speed in representing vast amounts of data.

3.4 Logical database requirements

3.4.1 Types of information used by various functions

Table 28 User

Field	Type	Key	Description
ID	Varchar(20)	PK	User Id

Password	Varchar(20)		User Password
Name	Char(20)		User Name
Phone	Varchar(20)		Phone number
Email	Varchar(40)		Email
Location	Varchar(40)		api get origins
Campus	Varchar(40)		Campus divided
Status	Varchar(20)		Login, Logout

TABLE 29 CAFÉ

Field	Type	Key	Description
Code	Varchar(20)	PK	Café own code
name	Varchar(20)		Café name
Phone	Varchar(20)		Phone number
Location	Varchar(20)		Location
time	date		Operating Time
Waiting time	Number		Waiting time
Num_of_order	Number		Current Order Status

TABLE 30 PRODUCT

Field	Type	Key	Description
Code	Varchar(20)	PK	Product Code
Café name	Varchar(20)		Café name
Product name	Varchar(20)		Product Name
Price	Number		Price
Type	Varchar(20)		Type
Left	Number		Remain product number

Sale	Char		Sale or not sale
Description	Varchar(100)		Description
picture	Varchar(50)		Image of product
Option	Varchar(50)		Options like adding more ice, less sugar, shots

TABLE 31 CART

Field	Type	Key	Description
Code	Varchar(20)	PK	Cart Own code
Userid	Varchar(20)	FK	User Id
Product code	Varchar(20)	FK	Product Code
Cafeid	Varchar(20)	FK	Café own Code
Price	Number	FK	Price
buy	Char		Purchase status
count	Number		Number of products

TABLE 32 ORDER

Field	Type	Key	Description
order code	Varchar(20)	PK	Order Code
Userid	Varchar(20)	FK	User Id
Product code	Varchar(20)	FK	Product Code
wait number	number	FK	Waiting Number
Cafeid	Varchar(20)	FK	Café own number
Price	Number	FK	Price
count	Number	FK	Number of products
status	Varchar(20)		Purchase Status

TABLE 33 GOOGLE MAP LOCATION

Field	Type	Key	Description
lat	double		Timestamp
lng	double	PK	key

TABLE 34 KAKAO PAY API

Field	Type	Key	Description
Field	Varchar(10)		Affiliate code, issued through affiliation, payment type and unit definition, 10 digits
TID	Varchar(20)	PK	Unique number for one payment, issued when payment preparation API is successfully called, 20 digits
SID	Varchar(20)		Unique number used for periodic payment, issued when the first periodic payment process is completed, 20 digits Request payment using SID from the 2nd regular payment
AID	Varchar(20)		Unique number for payment, cancellation, and regular payment API calls, issued when each API call is successful, 20 digits

3.4.2 FREQUENCY OF USE

TABLE 35 FREQUENCY OF USE

user	Whenever you log in or log out, the log-in data status should change, and whenever you move through google map location information, you need to update it in real time, and when you select a café on the map, you need to get distance information to the café.

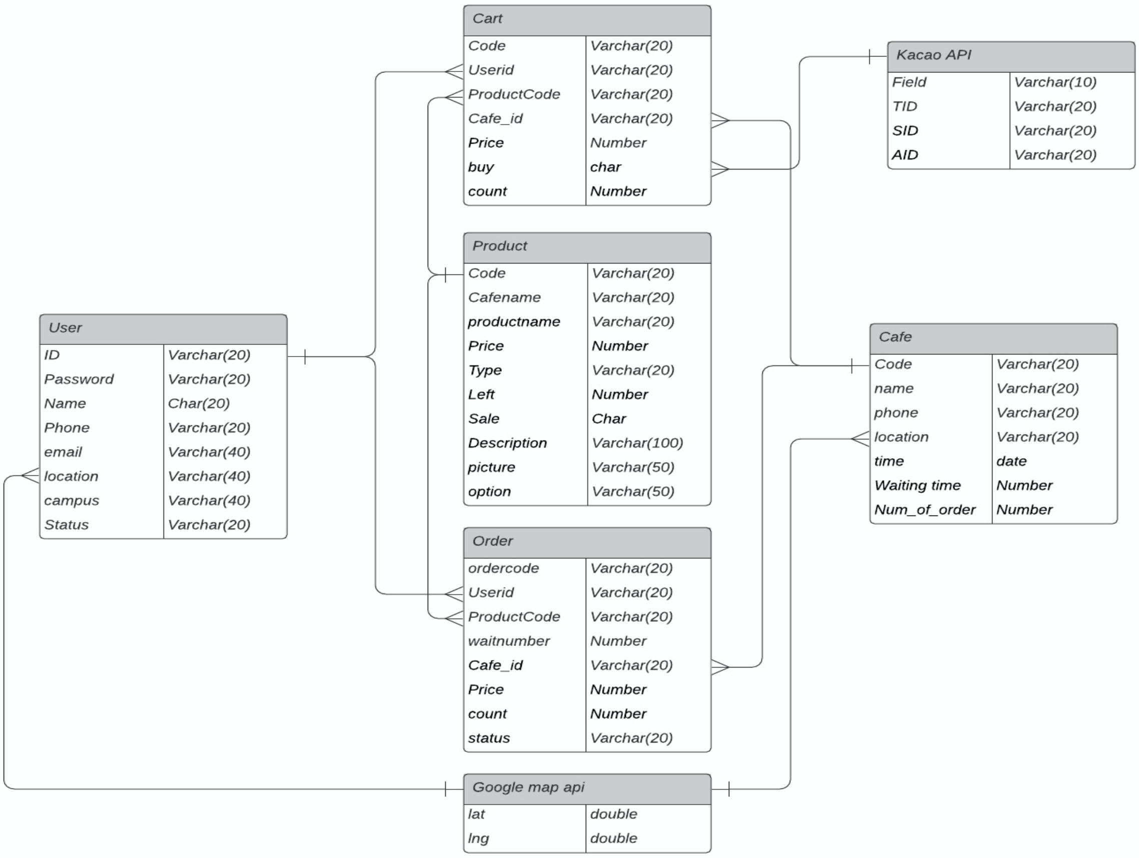
café	According to the business hours, whether it is currently open or not should be displayed on the map UI. The waiting time is updated from time to time according to the order status, and the number of corresponding cafes in the order database becomes the order status, and the waiting time increases in proportion to the number.
product	The remaining quantity value is determined directly in the café, and the quantity of the product decreases each time the user completes the payment. When the remaining quantity reaches 0, the presence or absence of sales changes from ‘yes’ to ‘no’.
cart	When the user puts the product in the shopping cart, it is automatically added, and the payment status is set to n, and when the payment is completed, it is changed to y.
order	This table is created when payment is completed, and the waiting number is set to increase +1 by referring to the waiting status of the café table. The reception status is managed by the café, and when the order is received, it is displayed as “making”, when the drink is finished, it is displayed as “pick up”, and when the user takes the drink, it is displayed as “done”.

3.4.3 Accessing capabilities

The system uses Firebase‘s database library for store user information, café products information, and café information. It also stores location information to calculate distance from user and cafes.

We can access through Firebase database to get target information and manage elements‘ status

3.4.4 Data entities and their relationships



Cart	
Code	Varchar(20)
Userid	Varchar(20)
ProductCode	Varchar(20)
Cafe_id	Varchar(20)
Price	Number
buy	char
count	Number

Kacao API	
Field	Varchar(10)
TID	Varchar(20)
SID	Varchar(20)
AID	Varchar(20)

Product	
Code	Varchar(20)
Cafename	Varchar(20)
productname	Varchar(20)
Price	Number
Type	Varchar(20)
Left	Number
Sale	Char
Description	Varchar(100)
picture	Varchar(50)
option	Varchar(50)

User	
ID	Varchar(20)
Password	Varchar(20)
Name	Char(20)
Phone	Varchar(20)
email	Varchar(40)
location	Varchar(40)
campus	Varchar(40)
Status	Varchar(20)

Cafe	
Code	Varchar(20)
name	Varchar(20)
phone	Varchar(20)
location	Varchar(20)
time	date
Waiting time	Number
Num_of_order	Number

Order	
ordercode	Varchar(20)
Userid	Varchar(20)
ProductCode	Varchar(20)
waitnumber	Number
Cafe_id	Varchar(20)
Price	Number
count	Number
status	Varchar(20)

Google map api	
lat	double
lng	double

FIGURE 13 ER DIAGRAM

3.4.5 Data retention requirements

TABLE 36 DATA RETENTION REQUIREMENTS

User data	User data is disabled upon logout.
Café data	N/A
Product data	For products that are not in stock or are no longer sold and should be excluded from the display on the User UI, the café can directly deactivate the'sale' entity to exclude them.

	Excluded products are stored in the trash database and permanently deleted after 30 days.
cart	When the product is placed in the shopping cart and payment is completed, the database is stored in the cart for about a day and then permanently deleted.
order	When the product order is received, it is all stored in the order database along with the waiting number. When the submission status changes to done, it is deleted from the order database.

3.5 DESIGN CONSTRAINTS

The system should contain only components that can be distributed under the MIT license. The system should be able to access from various mobile devices with Android operating system, and the administrator must be able to access and manage it through a web browser. The system must be designed to run on Firebase and use the Firestore database.

3.6 SOFTWARE SYSTEM ATTRIBUTES

3.6.1 RELIABILITY

Provide accurate information and data on user requests. The café status shown to users should be kept as consistent with the actual status as possible.

3.6.2 AVAILABILITY

Process user requests at any time within acceptable response time. The use of validated server structures is required.

3.6.3 SECURITY

Prevents unauthorized users from causing damage to the application by going through the process of authenticating users before using the application. protect user privacy through encryption. Also, increase security by using a trusted payment API.

3.6.4 MAINTAINABILITY

To maximize the ease of server management and maintenance, the system utilizes already commercialized clouding services.

3.6.5 USABILITY

The system should be easy for anyone to use. The system is configured to minimize user failures. Also, the system should be intuitive to instinctively use all functions without a system manual.

3.6.6 SUSTAINABILITY

The system should be organized to facilitate the addition of new cafes, changes in menus, changes in prices, etc.

4. Supporting Information

4.1 Diagrams

4.1.1 Use case diagram

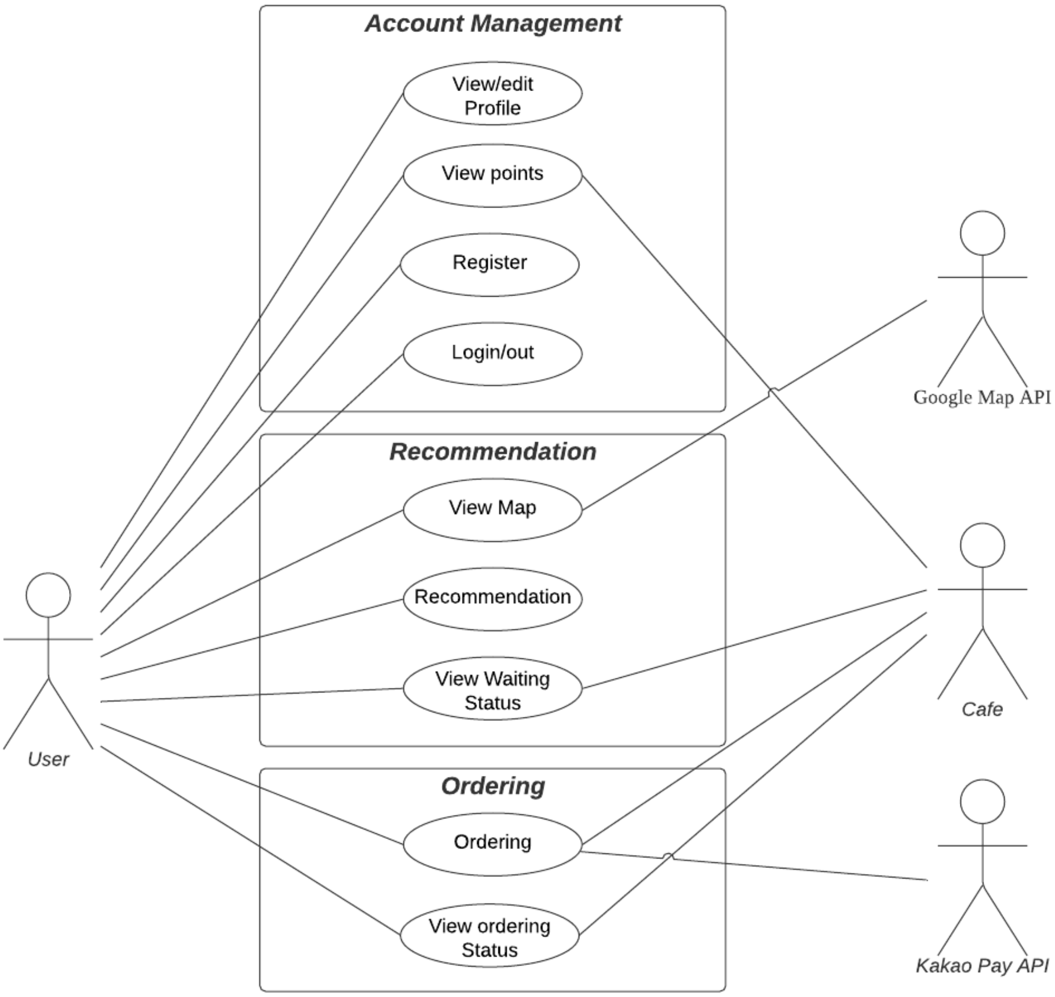


FIGURE 14 USE CASE DIAGRAM

4.1.2 PROCESS DIAGRAM

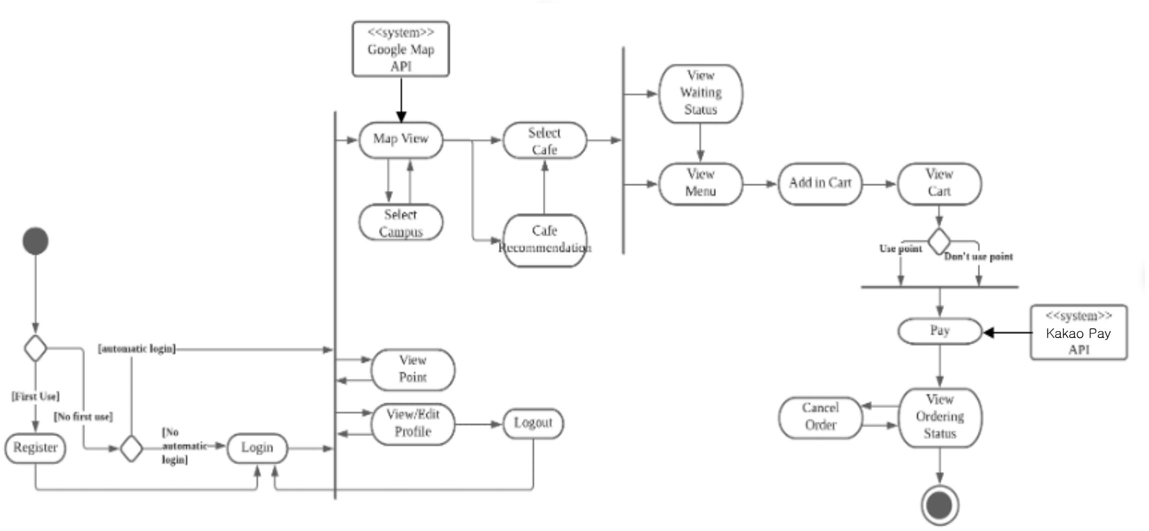


FIGURE 15 PROCESS DIAGRAM