Stakeholder requirements Specification

For

Personal Food Log App

Version 1.0

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1 Introduction

1.1 Stakeholder purpose

The Personal Food Log App scans, analyzes, and records the calories and nutrients of each meal. The user only needs to set the basic personal information according to the navigation requirements and start the Food log immediately. In the user's local reality, visualize information such as calorie and food types, as well as a progress bar for whether the criteria are met. Conduct data collection and provide the resulting data to Digital Health Inc.

1.2 Stakeholder scope

Personal Food Log App, it is a healthy type of software dedicated to helping track users' daily nutrition intake at all three meals. With the improvement of human's living standards, health has been paid more and more attention. The position of health in business can also be reflected. It is mainly based on the user's personal Setting, including height, weight, age, gender, whether there is a certain disease, etc., and uses AI to calculate the intake of each nutrient at each meal every day, including a series of nutrients required by the body, such as carbon, vitamin group and dietary fiber. Based on the user's photos, the nutrient intake is analyzed to check if it meets the criteria. In short, this app is a software developed for people's health. It is widely used in business. Men, women, children, and patients can use this app to track and adjust their diet. And then the collected data will be sent to Digital Health Inc. After that, Digital Health Inc. will sell the data and analysis to external entities like Health Clinic.

1.3 Overview

The core of this app is to visualize the calories of each meal and collect the data analysis. It will analyze the type and nutrition of each food, and then provide the data to users with pictures, texts, and data. Internal divisions are those who want to track their daily meals for energy and nutrition intake. External entities are healthcare providers, diet and health clinics, athletes and individuals who are overweight or just want to stay healthy. Data on food intake is collected from the user, and the energy income and expenditure system it generates can be sold to external entities.

1.4 Definitions

(a) big data:
Sets of information that are too large or too complex to handle, analyze or use with standard methods.

(b) Database:
An organized set of data that is stored in a computer and can be looked at and used in various ways.

(c) dietitian:
A person whose job is to advise people on what kind of food they should eat to keep healthy.

(d) Server:
A computer or computer program which manages access to a centralized resource or service in a network.

(e) Machine Learning:

The use and development of computer systems that are able to learn and adapt by using algorithms and statistical models to analyze and draw inferences from patterns
in data.

(f) AI:
This new technology uses AI to recognize character features in the same way a human brain does.

(g) Algorithm:
A process or set of rules that is followed in calculations or other problem-solving operations, especially by a computer.

(h) Stakeholder:
A person with an interest or concern in the project.

(i) User:
A person who uses or operates the application.

(j) Nutrition:
The process by which living things receive the food necessary for them to group and be healthy.

(k) Calorie:
A unit for measuring how much energy food will produce.

1.5 Stakeholders

- Digital Health Inc.: As a direct beneficiary of Party A's company, the obtained data will be sold to a third-party cooperative organization such as Health Clinic.
- Clients (Users): Larger number of users can have more influence on the Personal Food Log app.
- Third Party: Amazon that can influence how information is stored and processed by Amazon Web Services (AWS).
- Developers: The developer team has a direct impact on the usability of the application and the user experience.

2 References

1. IEEE 29148-2018 Requirements Engineering. (2018, November).

2. *Oxford Learner's dictionaries: Find definitions, translations, and grammar explanations at Oxford Learner's dictionaries*. Oxford Learner's Dictionaries | Find definitions, translations, and grammar explanations at Oxford Learner's Dictionaries. (n.d.). Retrieved March 26, 2022, from https://www.oxfordlearnersdictionaries.com/us/

3 Business management requirements

3.1 Business environment

Health care:

A good and reasonably healthy diet is an important aspect of health care, which enables the body to grow and develop healthily; Bad eating habits will lead to normal physiological disorders of the human body and infection of diseases. On the contrary, the right diet can play a therapeutic role in disease and help the body to recover. Today, it has become a very hot topic. Because with the improvement of human living standards, more and more attention are paid to the intake of energy and nutrients in each meal. The profession of dietetics does

not appear out of thin air. People need to plan their diet reasonably every day and even every meal in their daily life, which forms a business environment for Food Log and makes people a link to health.

Life support:
As technology advances, more and more devices and software are developed to assist human health. In an era of big data information development, people's self-discipline inevitably needs auxiliary equipment to support their living standards. Personal Food Log can help health institutions, hospitals, athletes, and people who need to maintain a healthy diet to control their daily dietary energy and nutrient intake, which also forms a business environment.

3.2 Mission, goals, and objects

Mission:
Help people measure up to nutritional and energy standards with high accuracy.
Build a bridge between clients(users) and health.

Goals:
Provide users with visual analysis of heat and nutrients with high accuracy.
Provide usability that satisfies users.
Provide users with faster and more convenient operation mode
Help users record and track daily caloric and nutrient intake

Objects:
Personal Food log app to remind users of nutrition.
Help document.

3.3 Business model

Firstly, to provide more scientific data, the extraction of calories and nutrients in daily meal collocation will be developed, which will involve the professional knowledge of dietitians. Specifically, to collect the user's age, weight, height, gender, and presence of certain medical conditions to analyze the metrics for each meal. Based on this index, you can have a more detailed plan of eating and drinking.

Secondly, it is necessary to promote the application so that more users can use it, which involves advertising and sales of the software to attract users to use the software.

Users will then use the app to customize their personal characteristics. Every meal of the user will be photographed and scanned, and the data will be visualized for the user to view. In the process of the user's view, whether the calories and nutrition are in the standard will be explained. The program will also give suggestions and tips to remind and help users how to match their diet. Users can also feedback the analyzed data, so that the VBM system can learn more accurately and effectively.

Finally, with the user's permission, the data will be fed back to Digital Health Inc., Health organizations and food companies. To accomplish their own interests.

3.4 Information environment

(a) Project Portfolio

(1) All users are able to access their own non-local data with the highest priority - such as any secure databases that host such data. This may be constrained by the uptime of AWS (Amazon Web Services) and any other additional data hosts used.

(2) All application support systems must have accessibility >99% of the time. This may be constrained by the availability of support staff during high support times.

(b) Long Term System Plan

AWS has been designed as the cloud server for storing and managing user data. AWS will reduce some of the project's start-up capital, including labor costs. Considering the potential instability of AWS, this long-term plan may be constrained by temporary connectivity issues. So, a robust redundancy system is urgently needed, but may take months to build.

(c) Database Configuration

The main database will be hosted on the AWS platform, with the following preliminary database schema:

Relations:
User [user_ID, name, dob, phone, email, height, gender]
DailyReport [user_ID, date, calories]
CaloriesLog [log_ID, user_ID, date, image, calories, protein, fat]
FoodComponent [log_ID, component_ID, calories]
WeightHistory [user_ID, date, weight]

Other unlisted data will be stored locally on the user's phone. The database availability and accessibility will be constrained by any issues and outages AWS encounters, however due to the built-in redundancies this should be a more fool-proof solution than local hosting.

4 System operational requirements

4.1 System processes

Item No.	System process
1	Users as stakeholders, when opening the app at the first time, they need to register the app as an account with phone number or email and password into the system.
2	Users as stakeholders, are required to agree to the agreement and policy. Otherwise, the registration will be rejected.
3	The system will create a unique id for the user to specify each user.
4	Users as stakeholders, they will receive the confirmation message, and then sign in the account.
5	Users as stakeholders, when after signing in, the system will pop-up a setting page for users. Users need to fill up the profile, and

	set up personal information like Weight, Height, Gender etc,.
6	Users as stakeholders, after setting up the profile, the system will guide them into the testing function and tutorial.
7	Users as stakeholders, After the tutorial, users start to take photos of meals. The system will scan the meals and analyze meals in 1-2 minutes automatically.
8	Users as stakeholders, when the system analysis is complete, the system will alert users and return images of food classification and calories and nutrition, as well as visual data.
9	Users as stakeholders, users can see the information about the food log. they can retake the test if they think the data is wrong. On the other hand, users could provide feedback about that analysis. It can help to train the model for the system.
10	Users as stakeholders, the data will be recorded in the cloud, and users can track their daily food log including food log picture and data analysis. Users also can update their personal information like height and weight.
11	Company stakeholders, the app will provide an account as administrator. That should require a legal contract or signed agreement for that action.
12	Company stakeholders, when they get an administrator account, they have access to all users' food log data reports, and they have access to all legally valid data.
13	Company stakeholders could add third party services and products to demonstrate in the app in order to promote.

4.2 System operational policies and rules

Item No.	Policies/Rules	Reference No. (Business Processes)	Potential way to be addressed in SyRS and SRS
1	Users need to confirm agreement and policy to clarify the standard use of the app and user data.	2	The terms of agreement page asks the users to agree on the data privacy terms.
2	When DDOS occurs, protection measures are enabled to prevent it. Prevent system breakdown.	3,4	Prevent malicious intrusion into the server system.
3	Image scanning and information processing needs to be more accurate with a success rate of at least 94.11%.	6,7,8,9	To improve accuracy, the model will be further trained by collecting data from users' feedback and reupload action.
4	Users and administrators have	1,11	The rights of users and administrators

	different rights to access the app function		must be strictly controlled to prevent non-management users from using administrator rights.
5	According to the Confidentiality Law, it is strictly prohibited to leak users' personal information to protect personal privacy.	5,12	Protect user privacy and avoid user privacy disclosure.
6	According to the rules signed with the third-party company, contributions from the third-party company need to be shown in the APP.	13	Display third-party companies in the APP.

4.3 System operational constraints

(a) Aside from users' network capability, the servers must be able to analyze the uploaded images and return the analysis results to the users within 30 seconds.
(b) When a user password changes, the server needs to send a password modification link immediately to the user.
(c) When a user submits a register request, the server needs to send a confirm link immediately to the user's email.
(d) If the user did not agree to the data privacy terms, no further operations should be allowed.
(e) A thorough analysis should be conducted no later than one week after a release cycle.
(f) The operation and maintenance team should always stay alert once the first release is pushed out.

4.4 System operational modes and states

(a) Planning and brainstorming mode: Teams get together to study the requirements, meet with the product manager, and develop prototypes.
(b) Development mode: In this phase, the development team follows an agile approach to incrementally develop the application.
(c) Technical Support phase: In this phase, the Technical Support team thoroughly tests the app both manually and automatically using scripts.
(d) Release phase: In this phase, maintenance team takes the responsibility to monitor and report how the application and company servers perform.

5 User requirements

★ **UUID:** a119216e-a805-4534-92bd-c5126f31136f
Name: Take_Photo
Requirement: The camera system shall allow the customer to take a photo of the target.
Rationale: Taking photos is the only way that allows users to get user input.

Priority: High
Priority Reason: If the photo system is not available, the system will not be able to detect the composition of the food and will not be able to perform a series of subsequent operations.
Status: Proposed
Contact: Junchen Li
Source: Shervin Shirmohammadi
Create By: Junchen Li
Version: 1.0
Modified Date: March 28, 2022

★ **UUID:** 1be51e8c-ba95-44af-af05-1e74f62e31a7
Name: Detect_Ingredient_Food
Requirement: The ingredient recognition system shall identify each food item present on the surface of the input image in less than 5 seconds with 94.11% accuracy.
Rationale: Detect_Ingredient_Food is based on deep learning multi-food recognition method, more efficient and accurate identification of ingredients. Also it will base on auto-calibration techniques filtering out some Irrelevant interference items.
Priority: High
Priority Reason: If the input cannot be detected, the composition of the input cannot be known and the volume and calories cannot be calculated in the subsequent sessions, which would completely paralyze the program.
Status: Proposed
Contact: Zikun Zhang
Source: Digital Health Inc.
Create By: Junchen Li
Version: 1.0
Modified Date: March 28, 2022

★ **UUID:** f2dcf9b3-502c-4009-badf-58f21570de70
Name: Edit_Detail_Food
Requirement: The system shall allow the user to add or remove some ingredients from the detection page.
Rationale: Edit_Detail_Food is the only way that helps users to adapt the detected report to the actual situation.
Priority: Median
Priority Reason: Since the editing function is only an auxiliary function and will not have a great impact on the overall project, and the accuracy of the recognition system is very high, the priority of this requirement is relatively low.
Status: Proposed
Contact: Jianan Xu
Source: Weilong Xu
Create By: Junchen Li
Version: 1.0
Modified Date: March 28, 2022

★ **UUID:** fc03f274-1122-4969-afed-33f951809a76
Name: Edit_Detail_Weight
Requirement: The system shall allow the user to increase or decrease weight of each ingredient from the detection page.
Rationale: Edit_Detail_Weight is the only way that helps users to adjust the weight of each ingredient to the actual situation.
Priority: Medium
Priority Reason: Since this requirement only plays a supporting role and does not have a serious impact on the primary use, it is not a high priority.
Status: Proposed
Contact: Weilong Xu
Source: Junchen Li
Create By: Junchen Li
Version: 1.0
Modified Date: March 28, 2022

★ **UUID:** 6cf837cf-3e68-4902-af3a-9f9d3f833233
Name: Measure_Nutrition
Requirement: The measure system shall estimate calories and nutrition of each ingredient in a meal in less than 4 seconds.
Rationale: Measure_Nutrition will convert the obtained weight to calorie data and calculate the total number of calories from the nutrition table data.
Priority: High
Priority Reason: Converting weight into calorie data is the most important part of the project, it is the core technology of the project and without it the project would not exist.
Status: Proposed
Contact: Longxuan Zhao
Source: Longxuan Zhao
Create By: Junchen Li
Version: 1.0
Modified Date: March 28, 2022

★ **UUID:** ad2c0817-3d6d-4da6-9b54-6b7f6a027441
Name: Friendly_advice
Requirement: The system shall suggest users to consume more/less of certain nutrients or food.
Rationale: Friendly_advice will make reasonable suggestions based on the user's daily body requirements and help users improve their daily dietary requirements.
Priority: Low
Priority Reason: This is a constructive requirement, not a mandatory one, so it's not a high priority.
Status: Proposed
Contact: Junchen Li
Source: Jianan Xu
Create By: Junchen Li
Version: 1.0
Modified Date: March 28, 2022

★ **UUID:** aaeb88dd-ff56-4fb0-83d9-344eebfd3a8f
Name: Summary_Report
Requirement: The system shall summarize and record the calorie data in the format of daily/weekly/monthly.
Rationale: This recording system summarizes the data recorded each time and provides the user with a comparison, which is the only way to provide feedback to the user
Priority: Low
Priority Reason: This is not a necessary requirement, it is to improve the practicality of the software and user operability requirements, does not affect the overall use of the need, so the priority is not very high
Status: Proposed
Contact: Longxuan Zhao
Source: Zikun Zhang
Create By: Junchen Li
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6 Detailed Life-cycle concepts of proposed system

6.1 Operational concept

- Operational policies and constraints
  - The system must be highly scalable.
  - The system should use Artificial Intelligence for food detection
  - The system should use auto-calibration techniques
  - The system should have 24 hours of operation everyday
  - The system should be able to process millions of food images every day
  - The system should storage, processing, and communication data with Big Data and cloud computing principles
- description of the proposed system
  - The system should work on the user's Android or iOS devices to allow the user to take the photo of the food they eat and upload it.
  - The system should use the AI to detect the visible food ingredients and calculate the weight and calorie of each part.
  - The AI training of the system should be incremental.
  - The system should be able to collaborate with other infrastructure on the Amazon Cloud
- modes of system operation
  - Regular mode
  - Maintenance
  - Training
- user classes and other involved personnel
  - general user
  - maintainer
  - tester
- support environment

- Android
- iOS

6.2 Operational scenarios

Scenario name	Scenario detail
Upload photo	The general user takes a photo of the food and upload it
Analyze photo	The AI analyze the ingredients in the uploaded photo
Calculate calories	The AI calculate the weight and calories of each ingredient
Generate record	The photo with the calories of each ingredient is stored as one meal record
View past meal	The general user checks the record of a past meal

6.3 Acquisition concept

- The system solution will be acquired by the requirement of Digital Health Inc.

6.4 Deployment concept

- AI for analytical processing will be deployed to Amazon cloud
- The application will be deployed to APP Store on iOS and GooglePlay Store on Android

6.5 Support concept

- Training support: The system needs AI specialists to upgrade the machine learning model to continuously improve the accuracy of the food recognition
- Maintenance support: The system needs the maintenance support to fix bugs and upgrade to new versions
- Customer support: Provide guidance to the app user and help deal with subscribe/purchase issues

6.6 Retirement concept

- Server: the database and AI models will be removed from Amazon Cloud
- Client: the app archive and the data collected will be remove from the mobile device

7 Project Constraints

(a) Cost management results in the need to change the scope of the project schedule or expand the investment.

(b) Projects may not be delivered on time as expected.

(c) The overall timing inaccuracy of the application can be caused by the current state of machine learning.

8 Appendix

8.1 Acronyms and abbreviations

Acronym/Abbreviation	Definition
Healthy eating plan	A healthy eating plan gives your body the nutrients it needs every day while staying within your daily calorie goal for weight loss. A healthy eating plan also will lower your risk for heart disease and other health conditions.