

# Stakeholders Requirements Specification (StRS)

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## 1. Introduction

### 1.1 Overview

Nowadays, people's living standards keep improving, as a result, people are able to choose what they want to eat. However, if people don't have a good eating habit, it may cause serious health problems such as weight gain, high cholesterol, or high blood pressure.

One method is to let people know how much they eat. There are many dietary health apps that can help make energy visible such as MealSnap or Carbs&Cals, however, users can not get accurate daily food intake. Digital Health Inc., one company that commits to personal health monitor technology, is trying to design a new app for people to log their food.

Through the app, people can calculate the calories by taking or importing the picture, they are able to upload the analyzed report to the cloud database for further study.

### 1.2 Stakeholder

#### 1.2.1 Customers:

- a) Stake: Product quality and value
- b) They are the people who care about personal health, especially some office workers who don't have time to plan their diet and need the app to give information. They care about the quality of the app and its value.

#### 1.2.2 Employees:

- a) Stake: Income and safety
- b) Employees will decide the app's quality, including identification accuracy or user interface design. Furthermore, they have to earn income to support themselves and have rights in a safe work environment.

#### 1.2.3 Investors:

- a) Stake: financial return
- b) Investors should invest capital in order to make objectives and gain a rate of return depending on how much they invest.

#### 1.2.4 Digital Health Inc.

- a) Stake: Product quality
- b) Digital Health Inc is a leading company providing health monitoring devices and services. They provide the requirements and send the request of bid (RFB). Our product should meet the requirements and make a lead in competitors so that DHI will choose us.

## 1.3 Stakeholder purpose

- a) Customers can calculate calories by analyzing the images and checking nutrition from ingredients according to the app.
- b) Customers can upload the analyzed report to the cloud database for the app's AI to improve accuracy.
- c) Employees can earn income and manage the app.
- d) Investors can accomplish a financial objective and earn a rate of return

## 1.4 Stakeholder scope

### 1.4.1 Customers:

- a) Customers are able to use their phones to register their own accounts
- b) Customers are able to take or import pictures and send them to the system to calculate the calories
- c) Customers are able to send their analysis to the Cloud database for tracking and studying
- d) Customers are able to see the details of ingredients.
- e) Customers are able to see their history of previous calculations

### 1.4.2 Employees:

- a) Product staff will determine the direction of the app's development, plan objectives for the future and collaborate with others to push the process.
- b) Marketing staff will compare with other competing apps, analyze the market changes to find where the app needs to improve, and maintain the reputation of the project through media.
- c) Technicians will provide technical support for the project and have the duty to complete the apps according to the requirements given by the team.

### 1.4.3 Investors:

- a) Investors will invest money in the project, as a result, they can get some equity and affect the project's determination.

## 2. Reference

Peddi, S. V. B., Kuhad, P., Yassine, A., Pouladzadeh, P., Shirmohammadi, S., & Shirehjini, A. A. N. (2017). An intelligent cloud-based data processing broker for mobile e-health multimedia applications. *Future Generation Computer Systems*, 66, 71–86.

Pouladzadeh, P., Peddi, S.V.B., Kuhad, P. et al. A virtualization mechanism for real-time multimedia-assisted mobile food recognition application in cloud computing. *Cluster Comput* 18, 1099–1110 (2015).

## **3. Business Management Requirements**

### **3.1 Business environment**

#### **3.1.1 External Environmental Factor**

##### **Pandemic**

Due to the epidemic in the past two years, more and more people need to work from home or have online classes. Thus, people would pay more attention to personal health through daily exercises and diet plans. In this case, the whole market demand is constantly expanding.

##### **Political Factor**

The government issued a series of legislation to protect users' private data, such as bank information, customer information, and address, from being leaked to untrusted third parties without notice. Also, the existing infrastructure, Amazon Cloud, should be regulated to prevent any form of disclosure of images and information. Data security is strictly administered, so the organization should follow legislation and consider political factors.

##### **Social/Customer Factor**

The app could potentially influence users' daily food choices since it allows them to see the number of calories can get from various food at each meal more intuitively. Then, users are more likely to monitor their health status through energy intake data and adjust eating habits accordingly. On the other hand, with the popularity of social platforms, more and more people are willing to share their daily life, for example, what kinds of food they had for lunch. With the release of our app, users can post their food photos and share their nutritional information. If society could become more aware of healthy eating habits and daily calorie intake, there would be more and more users, thus significantly improving the awareness and popularity of the app in the market.

##### **Economic Factor**

The growing economy leads to a low unemployment rate, higher quality of life, and income level. People will no longer only focus on careers but have more time to care about personal health. However, there are not too many applications that provide accurate energy intake tracking, which is the field that Digital Health Inc. excels in and has a significant share of this market. When many potential users need such a product, the organization will be more likely to gain success and financial revenue.

##### **Technological Factor**

The growing technology leads to more advanced and convenient solutions to provide more accurate health data to users with the help of AI algorithms. Also, the system is highly scalable and allows to upload millions of food images every day. Moreover, big data and cloud computing principles enable the organization to store, process, and

communicate user data effectively at a low cost. These technological factors will help developers implement a high-quality mobile app without worrying about scalability and cost too much.

### 3.1.2 Internal Environment Factors

#### **Human Resource**

Human resources can be a great treasure of an organization. A business has skilled and motivated workers, and they are sure to be the biggest asset of this enterprise. For example, talented software developers will contribute to the project, and their abilities can decide the quality of the product and development time.

#### **Capital Resource**

Financial capital is the funds necessary to grow and sustain a business. Once a company has enough budget, it can quickly launch projects, expand its scale and employ specialists to achieve impressive results. For example, Digital Health Inc. has enough budget to invest in this personal health app so that the developer team can gain support on algorithm research and implementation and maintenance.

#### **Business owners and managers**

They have a great deal of control over the internal environment of business, which covers day-to-day decisions. They supervised the whole development process and guaranteed that the app could be delivered with promised quality within budget.

## 3.2 Mission, goals and objectives

- a) Automate the entire stages of the product and it no longer needs someone at the other end actually has to look at the picture and give the estimates.
- b) Apply advanced AI algorithms to detect any visually detectable ingredients in legitimate food photos uploaded by users
- c) Improve the accuracy of food recognition and calorie calculations for multiple foods.
- d) Provide users with diet records, customized meal plans, and health advising services
- e) As a pioneer, the organization can establish a solid foundation of energy intake tracking in the emerging market. Through the popularity of this health app, people will pay more attention to the close connection between diet and health so that society will be instilled an idea of a healthy diet.

## 3.3 Business model

- a) Provide customers with membership subscription services, allowing members to use more functions such as analyzing the nutritional value of food and customizing recipes.

- b) Record the nutritional value and calorie consumption of each day and push data to users to improve users' dependence on products.
- c) Establish a food community, allowing users to share their food and nutrition in the community, attracting users to discuss and share.
- d) Cooperate with offline chain brand restaurants to increase product awareness and attract more people to become users.
- e) Provide individuals with personalized weight loss plans and custom at-home exercise schedules, allowing more users to move toward further goals.

## **3.4 Information environment**

### **3.4.1 Project portfolio**

To achieve the goals of this project, we need software development, AI analysis, database configuration. The software development part can be done by various departments to solve the basic software requirements. AI models and databases can be chosen from products of Amazon such as Amazon Cloud and Amazon AI to build better web services for analyzing.

### **3.4.2 Long-term system plan**

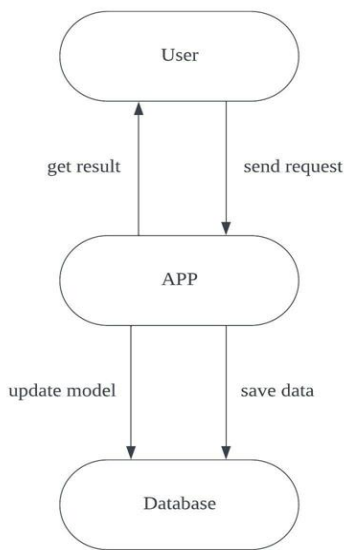
The project is highly dependent on big data recognition and the construction of AI models. This will require a large enough database and strong cloud computing support to keep the project running.

### **3.4.3 Database configuration**

The app is going to upload millions of food images every day. So, storage, processing, and communication need to be highly scalable. Amazon Cloud should be used in this project in order to not change the existing infrastructure.

## 4. System Operational Requirements

### 4.1 System process



### 4.2 System operational policies and rules

- a) Require the storage, processing, and communication of the system to be highly scalable. Big Data and cloud computing principles should be considered.
- b) Require incremental AI training. The AI module should improve its model quickly as the new photos are uploaded.
- c) Ensure the usability of the software by making the interface easy to access and understand.

### 4.3 System operational constraints

- a) Ensure the consistency of the operating system to make post-maintenance easier.
- b) Only appropriate employees are given access to background information.
- c) Sensitive information should be archived in the background after being retrieved.
- d) The retrieved sensitive information cannot be saved or sent by private accounts.
- e) Local storage cannot be uploaded to the database.

### 4.4 System operational modes and state

The application program runs in a dual-mode state, user mode and kernel mode, respectively. Dual-mode execution provides protection means to prevent the operating system and user programs from being affected by erroneous user programs. When a computer system executes a user application, the system is in user mode. However, when a user application requests an operating system service through a system call, the system must switch from user mode to

kernel mode to satisfy the request. When the system boots, the hardware starts in kernel mode. The operating system then loads and begins executing the user program in user mode. Once there is a trap or interrupt, the hardware switches from user mode to kernel mode.

## 4.5 System operational quality

### 4.5.1 Effectiveness & Efficiency

This application will provide customers with the most accurate and rapid calorie identification system.

### 4.5.2 Maintainability and portability

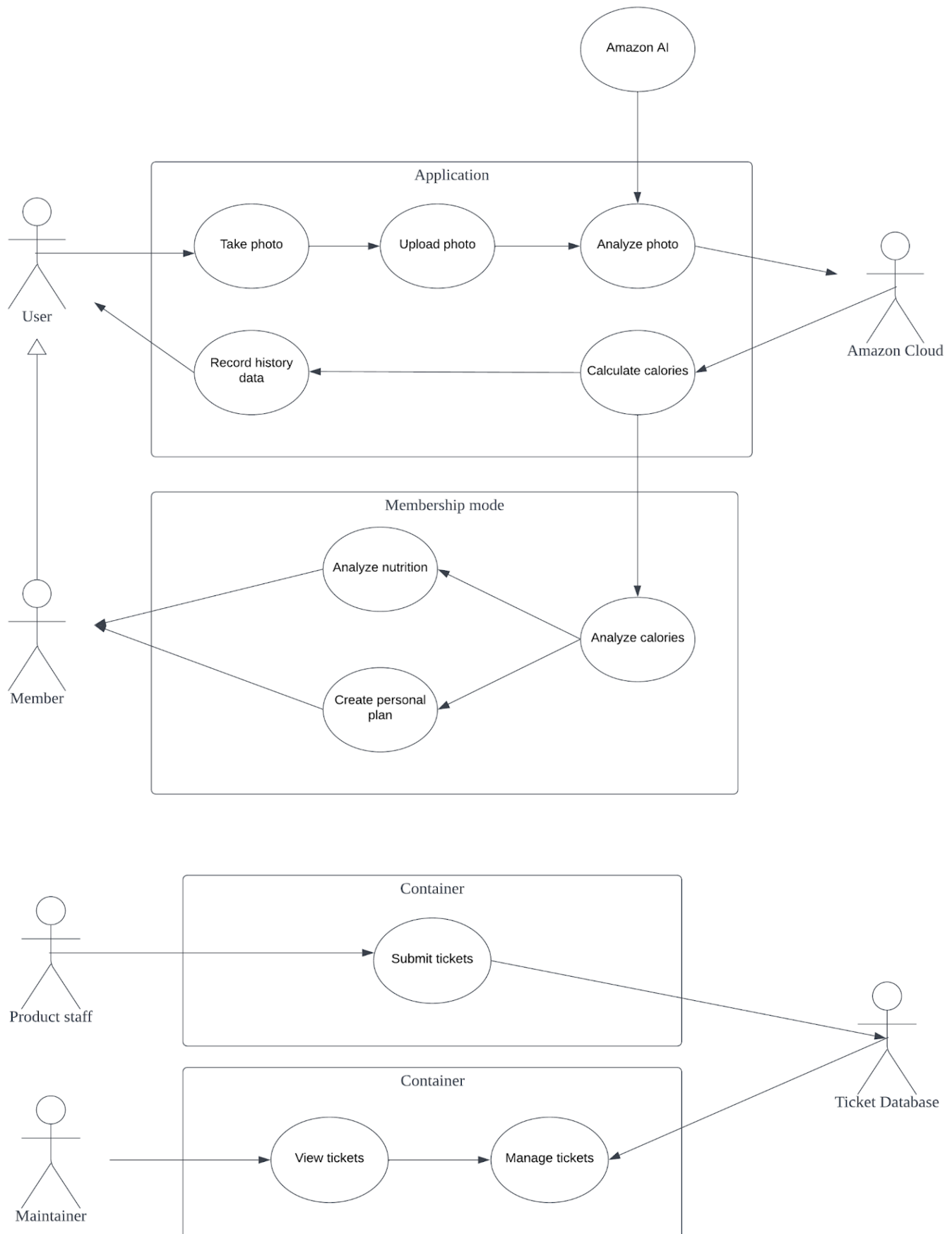
The app will be checked for bugs every weekend and debug and update work will be done by Monday.

## 5. User Requirements

ID	User Requirements
1	The system shall reach accuracy at least 94.11% on the FooDD Dataset.
2	The use of icons and logos with the same purpose shall be consistent throughout the interface.
3	With no prior training, the system shall enable a new user over the age of 55 to get calorie and nutrition information of food within 8 minutes.
4	The system shall detect each food ingredient that is visually detectable in the uploaded photo.
5	The system shall assume that what exists on the surface of the food, continues down to the bottom of it more or less uniformly.
6	The system shall use food density tables to convert volume to weight.
7	The system shall calculate the weight of each visually detectable ingredient.
8	The system shall use existing nutrition tables to convert from weight to calories.
9	The system shall calculate the total amount of calories as the sum of the calories of all ingredients
10	The system shall measure the actual dimensions of the food ingredients without referencing external objects in the image.
11	The system shall support over 3 million food images every day.
12	The system shall improve AI models with new images instead of re-training itself with the entire dataset.
13	The system shall run on Android and the iOS platforms.

## 6. Detailed Life-Cycle Concepts of Proposed System

### 6.1 Operational concept





## 6.2 Operational scenarios

Users:

<b>Scenario 1</b>	<b>Add new food</b>
<b>Actor</b>	Customer - user of the Calorie Camera mobile app
<b>Precondition</b>	Customer is on the home page
<b>Normal Flow</b>	<ol style="list-style-type: none"><li>1. Customer clicks on the camera icon.</li><li>2. Customer takes a photo of the object.</li><li>3. System identifies all visually detectable ingredients in the image.</li><li>4. System calculates the weight and calories for each ingredient.</li><li>5. System shows the name of the food and total calories.</li><li>6. System shows the image for each identified ingredient.</li><li>7. System presents each ingredient with weight and calories.</li><li>8. Customer clicks on the ingredients to view its more detailed nutrition information.</li><li>9. Customer chooses to save the meal to the history log.</li></ol>
<b>Alternate Flow</b>	<ol style="list-style-type: none"><li>2a. Customer takes a photo that is not food.</li><li>3a. System is unable to identify any ingredients.<ol style="list-style-type: none"><li>3a1.1. System asks the user to retake a picture</li><li>3a1.2. User uploads a picture from the album.</li></ol></li></ol>
<b>Post-condition</b>	The food is added to the history for the user.

<b>Scenario 2</b>	<b>View food history</b>
<b>Actor</b>	Customer - user of the Calorie Camera mobile app
<b>Precondition</b>	Customer is on the account page
<b>Normal Flow</b>	<ol style="list-style-type: none"><li>1. Customer chooses the date of food history.</li><li>2. System displays all food on that date with images and time it was saved.</li><li>3. Customer selects a different date.</li><li>4. System refreshes the list and presents food information on the new date.</li></ol>
<b>Alternate Flow</b>	<ol style="list-style-type: none"><li>1a. Customer has not added any food into history.<ol style="list-style-type: none"><li>1a1. System displays a message that there is no food in the history for that day.</li></ol></li></ol>

<b>Scenario 3</b>	<b>Rename the food in history</b>
<b>Actor</b>	Customer - user of the Calorie Camera mobile app
<b>Precondition</b>	The history list contains at least one food
<b>Normal Flow</b>	<ol style="list-style-type: none"> <li>1. Customer chooses the food he/she wants to rename.</li> <li>2. Customer assigns a new name to the food.</li> <li>3. Customer confirms with the name.</li> <li>4. System displays the new name of the food.</li> </ol>

<b>Scenario 4</b>	<b>Move the food to a new date in history</b>
<b>Actor</b>	Customer - user of the Calorie Camera mobile app
<b>Precondition</b>	The history list contains at least one food
<b>Normal Flow</b>	<ol style="list-style-type: none"> <li>1. Customer chooses the food he/she wants to move.</li> <li>2. Customer assigns a new date to the food.</li> <li>3. Customer confirms the changes.</li> <li>4. System displays the food under this new date.</li> </ol>

### Product Team:

<b>Scenario 5</b>	<b>Submit ticket</b>
<b>Actor</b>	Product staff
<b>Precondition</b>	Product staff is authorized and logs into website
<b>Normal Flow</b>	<ol style="list-style-type: none"> <li>1. Product staff receives feedback from customers.</li> <li>2. Product staff navigates to the tickets page.</li> <li>3. Product staff opens up a new ticket.</li> <li>4. Product staff enters feedback details.</li> <li>5. Product staff confirms changes.</li> <li>6. Product staff submits the ticket.</li> </ol>
<b>Post-condition</b>	The new ticket is sent into the tickets list.

### Maintainers:

<b>Scenario 6</b>	<b>View Tickets</b>
<b>Actor</b>	Technician - developer of the Calorie Camera mobile app
<b>Precondition</b>	Technician is authorized and logs into website

<b>Normal Flow</b>	<ol style="list-style-type: none"> <li>1. Technician navigates to the tickets page.</li> <li>2. Technician chooses a ticket.</li> <li>3. Technician view details of the ticket.</li> <li>4. Technician works on the issue.</li> <li>5. Technician submits merge request of the ticket.</li> <li>6. Technician closes the ticket.</li> </ol>
<b>Alternate Flow</b>	<ol style="list-style-type: none"> <li>4a. The issue cannot be resolved within a reasonable amount of time.</li> <li>4a1. Technician leaves the comment under that ticket.</li> <li>4a2. Technician flag the ticket.</li> </ol>

## 6.3 Deployment concept

Requirements for the product are obtained through interviews with different stakeholders and a collection of user stories. After completing this series of requirements elicitation and analysis, it will enter the next stage.

Based on the collected requirements, the developers will develop a prototype of the product. Then check and improve with different stakeholders to help them better understand the system requirements.

Developers will start implementing the software according to the revised prototype. And after each iteration, the result will be shared with stakeholders and gather their views until the product is finally developed to deliverable.

The developed software will be handed over to the testing department for final testing, after which the first version of the software will be publicly tested. The version after the public test will be continuously updated and maintained, according to the collected user feedback and extended requirements.

## 6.4 Support concept

The customer service department can provide support for software services, such as member Q&A and account information.

The IT department provides technical support for software, such as software bugs and data errors.

Product staff can collect data when users use the product, as well as product error reports, and upload them to the log for maintenance personnel to perform routine maintenance.

## 6.5 Retirement concept

Software retirement happens when spending most of the budget on application maintenance, which can deliver significant cost savings. This product will continue to maintain and update more functions related to health and nutrition within five years, and it is initially expected to stop updating more functions after five years.

## **7. Project Constraints**

### **7.1 Schedule**

Initially, project time should be estimated with reference to past similar projects. At each phase of software development, analyze the current progress and plan for the next stage accordingly. Manage time effectively by considering uncertainties. The software will be maintained for two years after public release.

### **7.2 Cost**

Estimate project cost by conducting an in-depth study of the market prices of the goods. The labor cost to maintain the software after two years needs to be factored into the long-term costs.

## **8. Appendix**

AI - Artificial intelligence is the ability of a computer or a robot controlled by a computer to do tasks that are usually done by humans

AWS - Amazon Web Services, provides servers, storage, networking, remote computing, email, mobile development, and security.

iOS - iPhone Operating System, is a Unix-derived operating system powering all of Apple's mobile devices.

Inc. – incorporated, a company's business structure is a legal corporation.