School of EECS

SEG 4105/ELG 5100 Course Project, Fall 2025

Personal Food Log App

The goal of this project is to gain real-life practice of the processes involved when creating and submitting a plan for a software project. In the real world, risks are rampant, project definition boundaries fluid, requirements at the beginning less known, and hard work is required to get on top of things. The same holds true for this project. The project is done in groups of 4.

The Case

We are in an age where Fitbit and similar personal health devices and apps have become prevalent. Digital Health Inc. is a leading company providing such personal health monitoring devices and services. While they excel in calculating daily energy expenditure and have a significant share of this market, they see a big gap in a different but related potentially lucrative market: energy intake. Digital Health Inc. would like to be able to log what food a person is eating on a daily basis. This, together with their existing energy expenditure solutions, would provide a complete energy intake/expenditure system that the company can then sell to healthcare providers, diet and health clinics, athletes, and individuals who either suffer from overweightness or simply want to stay fit.

Their initial research has revealed different methods for food logging, summarized nicely in this article (freely downloadable from uOttawa campus). Among those different methods, Digital Health Inc. strongly believes in the potential of *Smartphone Based VBM Systems*, where the user simply takes a picture of the food, and the app calculates the amount of calories and nutrition in that food. They believe this to be the most convenient, practical, and affordable method for logging daily food intake.

Their preliminary scan of existing VBM apps, such as MealSnap or Carbs&Cals, were disappointing. Those apps either were not automatic (someone at the other end actually has to look at the picture and give the estimates), or did not have reasonable accuracy, because even if they identify the food correctly, they do not measure the actual weight of the food. If the company wants to convince clinics and professional athletic businesses to buy the product, its accuracy needs to be a lot better. The company has recently come across a very promising system with reasonable accuracy (94.11%), but it seems that it's only a research proof of concept, and nowhere near a prototype, let alone a product.

As such, Digital Health Inc. has decided to create its own app. They tried to build the app in-house, but they failed! Hence, they are putting the project up for bids.

The Request for Bid (RFB)

Digital Health Inc. is about to post an official RFB for the said project. Meanwhile, they are already sending a draft of this bid to their existing suppliers. Your company has a lead who has been able to receive this RFB draft, which your marketing person summarizes as follows:

1. Accuracy, in both food identification and calorie calculation, is the main selling point! The company wants a system which is at or near the top of the list of existing VBM systems in terms of accuracy.

2. Like most other personal apps, ease of use and pleasantness is highly desired.

3. The system must detect each food ingredient that is visually detectable. For example, determining that a food is *salad* is not accurate enough. It should instead report that the food consists of *carrots*, *lettuce*, *tomato*, etc.

4. The system should assume that what exists on the surface of the food, continues down to the bottom of it more or less uniformly. For example, if pieces of beans are visible in a soup, the system should assume the same density of beans throughout the whole soup.

5. The weight of each ingredient should be calculated. This can be done from calculating the visible surface of the ingredient, then calculating the volume of the ingredient, and then using food density tables to convert volume to weight. Once the weight is known, existing nutrition tables can be used to convert from weight to calories, for each ingredient. We can then calculate the total amount of calories as the sum of the calories of all ingredients. A more detailed description is given in this research paper, which again is just a proof of concept.

6. To measure the actual dimensions of the image (hence measure the size of food ingredients), the system should use auto-calibration techniques, such as this method. It should not use external objects in the image, such as a coin, the user's thumb, etc.

7. Some ingredients cannot be visually detected, such as the amount of salt, pepper, oil, seasoning, etc. Since no other practical existing method (including clinical methods widely in use at this time) can detect those things either, this limitation is acceptable.

8. The system must be highly scalable. The app is going to upload millions of food images every day. So storage, processing, and communication need to be highly scalable. Therefore, Big Data and cloud computing principles should be considered (such as this work and this work), as should the fact that the company's existing infrastructure uses the Amazon Cloud. This is a firm requirement; no changes should be made to the existing infrastructure.

9. The system should use Artificial Intelligence (AI) for food detection. It can use many existing and publically available food datasets for training; e.g., this or this. The AI training should be incremental. In other words, as new images are uploaded, the AI module should improve its model with those new images quickly, as opposed to re-training itself completely from scratch with the entire dataset, which is neither practical nor cheap.

10. The app itself should run on the most common mobile platforms: Android and iOS.

Your company

Your company, which is essentially a consulting company, has a size of 15 individuals in the Ottawa region, 2 working directly in your group (so 3 including you). You are serious about winning this bid and doing the project right. If successful, this will be an important step towards gaining the credibility of many other prospective customers. For all these you know the value of proper project management. Also be warned that the established companies have better profile than yours. That is all the more reason to be meticulous in your proposal to elicit the client's trust. You have to convince them that it will not be a typical chaos and last minute hero's project. Proposals consisting of a **complete and detailed project plan** and **elementary proof of concept** are due as specified in the Deliverables table below. Your proof of concept must be successful in order to move on to the next stage of the competition. The company requires a complete project plan in order to do the evaluation to determine whether or not your company will be one of the competitors for the final project.

Your team is being sent on-site to Digital Health Inc. to establish a project plan, to build a first-draft proof of concept, and to compete against other teams. The winning team will be expected to act as a management team and will be allowed to bring only that very team into the company. Since the company has excellent HR and equipment resources, the winning team may not bring additional personnel or production equipment into the company. In short, the following lists the conditions for your work after (and if) the bid has been accepted:

- The company's programmers are highly dynamic and intelligent individuals. They exhibit the height of programming expertise.
- The company prides itself on building cutting edge, quality software. While this is not necessarily true, there are enough resources that, if properly managed, can make this a reality for this project.
- You will be able to interview whatever customers, employees, and managers you need to establish a base to accurately develop the project plan.

You will have access to 19 software development professionals at the company:

- One development manager;
- Two analysts who have extensive experience in developing applications;
- One programmer/analyst who has extensive experience with this specific type of application;
- 8 programmers with five or more years of experience in developing applications;
- 7 programmers with less than five years of experience; the company is extremely interested in these people receiving on-the-job training so they must be used; of the 7, only two have been with the company for more than a year.

In this course, you are required to PLAN this project and also IMPLEMENT (i.e. programming) a proof of concept. For a working system that will also be acceptable to the users, you need a detailed idea of users' preferences. Prepare a strategy of how you are going to understand what

the users really want. In your plan, explain your strategy and the requirements you actually came up with. Also make sure you and your customer agree on the environment the system is going to run on.

If any members of your team are unfamiliar with this type of product, it is imperative that you ground your knowledge in how this type of software works in the real world – more specifically, research it!

QUALITY is what your employer (i.e., your TA) is expecting, not quantity. Your customer for this project is the TA, available at the time slots specified the deliverables table below. Do not send long emails to the TA, as details are either lost or take a long time to be clarified in such conversations. Meet face to face instead.

Project Details and Timelines

1) Form groups of 3 members and choose a project manager (PM) whom the TA can use as the main contact point. Sign up your group in Brightspace under Groups->Project Groups by the deadline in the deliverables table below.

2) Read the case described above carefully. Details may be superfluous or missing, you must determine what is essential for your submission. Deliverables include:
    a. Project Charter
        i. All assumptions are to be documented
    b. Project Plan (PP) for the project, with as high a level of quality as possible
        i. All assumptions are to be documented
        ii. Appropriate parts of the plan should be built in a project management tool (MS Project, Jira, ClickUp, Monday.com, etc.)
        iii. The format for the PP should be IEEE 1058, and should include at a minimum the following sections:
            - 1.1, 4, 5.1 to 5.4, 6, and 7.
    c. Proof of Concept
        i. UI: be creative, this is open to interpretation. Be reasonable about the level of effort
        ii. Backend: the Proof of Concept must show that:
            - you can obtain a photo from a smartphone's camera
            - upload the photo to a web service
            - process the photo with machine learning; no need for actual food recognition and calorie calculation, but you must somehow convince the customer that you can do those things eventually
            - send data back to the smartphone

2) The project plan will be seen as a bid for the project; your project group is acting in competition for the bid against other groups.

3) **Effort.** The detailed work and time allocation for each team member is to be negotiated within the group members themselves. It is important to get the project started properly, so choose your PM wisely. **Only the PM communicates with the**

customer.

4) **Time period.** Please carefully note the deadlines given in the table below. Plan and spread the work so that you have sufficient time to finish the deliverables on time. There is considerable amount of work for each deliverable, so start early and **do not wait until the last few days!**

Deliverable	**Due**
Project Assigned	Effective Immediately
Team formations	September 18, signup in Brightspace (Groups)
Project Charter	September 26, through Brightspace
Customer feedback meeting 1	Week of October 6, groups to be scheduled by TA
Customer feedback meeting 2	Week of October 20, groups to be scheduled by TA
Project Plan and Proof of Concept Program	November 11, through Brightspace
Project Presentation and Customer Demo	November 12 to 26 during regularly scheduled class times (also labs and tutorials, if applicable)
Post Performance Analysis (PPA)	December 5, through Brightspace

5) **Evaluation**

10% ***Project Charter***

45% ***Project Plan***

Marked to determine how **complete, concise,** and **realistic** the plan is.

+ Requirements Specifications
+ Work Breakdown Structure
+ Estimating schedule, effort, cost
+ Software Architecture
+ Risk Management Plan
+ Configuration/Change Management Plan
+ V&V Plan
+ A table listing % contribution from each team member

20% ***Project Presentation (15 minutes)***

+ discussing how the project was tackled, which approaches were used, challenges faced and how they were overcome, and lessons learned.
+ Each group member must present.

20% ***Customer Demo (5 minutes)***

+ presenting the proof of concept effectively to the customer, and convincing the customer to choose your product for this project.
+ It is not necessary for each member to present.

5% ***PPA***

Keep In Mind

A project plan is a sizable project in and of itself – without proper attention to process, this project cannot be completed in the time period specified with an acceptable level of quality.