Project Deliverable D: Group C11 Detailed Design, Prototype 1, BOM
GNG 2101
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Submitted by Team C11

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Abstract

The following document for this deliverable is the Detailed Design, Prototype 1, and BOM of team C11's project. This document will contain the Client's feedback on the concepts designed for deliverable C along with any changes and improvements to be made to the concepts, the critical assumptions of the product, images and details of the prototype along with testing results, details of the bill of materials and design of the concept, and works cited list.

Introduction

After a meeting with the client, the team took the time to deconstruct the client's feedback concerning the prototype concepts. Then, the team had the mission to provide a more detailed design to the current concept. Moreover, we created a low fidelity prototype to be able to test the product's most critical functionality and compare the prototype to the target specifications. By comparing the prototype to the target specification, the team is able to determine improvements to the prototype for future iterations. We also analyzed the different financial requirements to accomplish the project.

The objective of this document is to provide insight on the client meeting, design and flowchart update, critical product assumptions, prototype, testing, evaluations, and preliminary bill of materials. Having all of these components will allow the team to take the next steps to create a better prototype that becomes closer to the end goal product.

Client feedback

1. Clean and simple, the customer likes the style that suits well with the challenges of his ADHD.

2. The group believes that a particular difficulty would be programming the pie charts by making them useful and engaging. Mark acknowledges that it would be a challenge to get the information density correct.

3. The client states that the information display would be a stumbling block, the client is open on the matter of who completes the maths. For example, is the app purely displaying the information the client calculates vs. calculating from food inputs.

4. The customer would like to find an option to increase/decrease the useful fibre/sugars when inputting a product, such as an apple.

5. The client would like the option to choose between 'one time only' or 'fresh entry'.

6. The consumer would like to be able to save an update to a current food entry as a separate food item quickly.

7. The customer would like to be reminded of some "extras", such as sauce or toppings ("extra sugars").

8. The customer values features over aesthetics

9. Adding images next to the client's food intake would be appreciated by the client if possible.

10. The client wanted pre-defined measurements for the client's food.

Design and flowchart updates

Design-wise, the client liked the design so we didn't have to update it. As for the functional decomposition flowchart, we added more information on the subsystem and detailed the various functions.

Figure 1.0: Flowchart/Diagram of the Decomposition of the Application
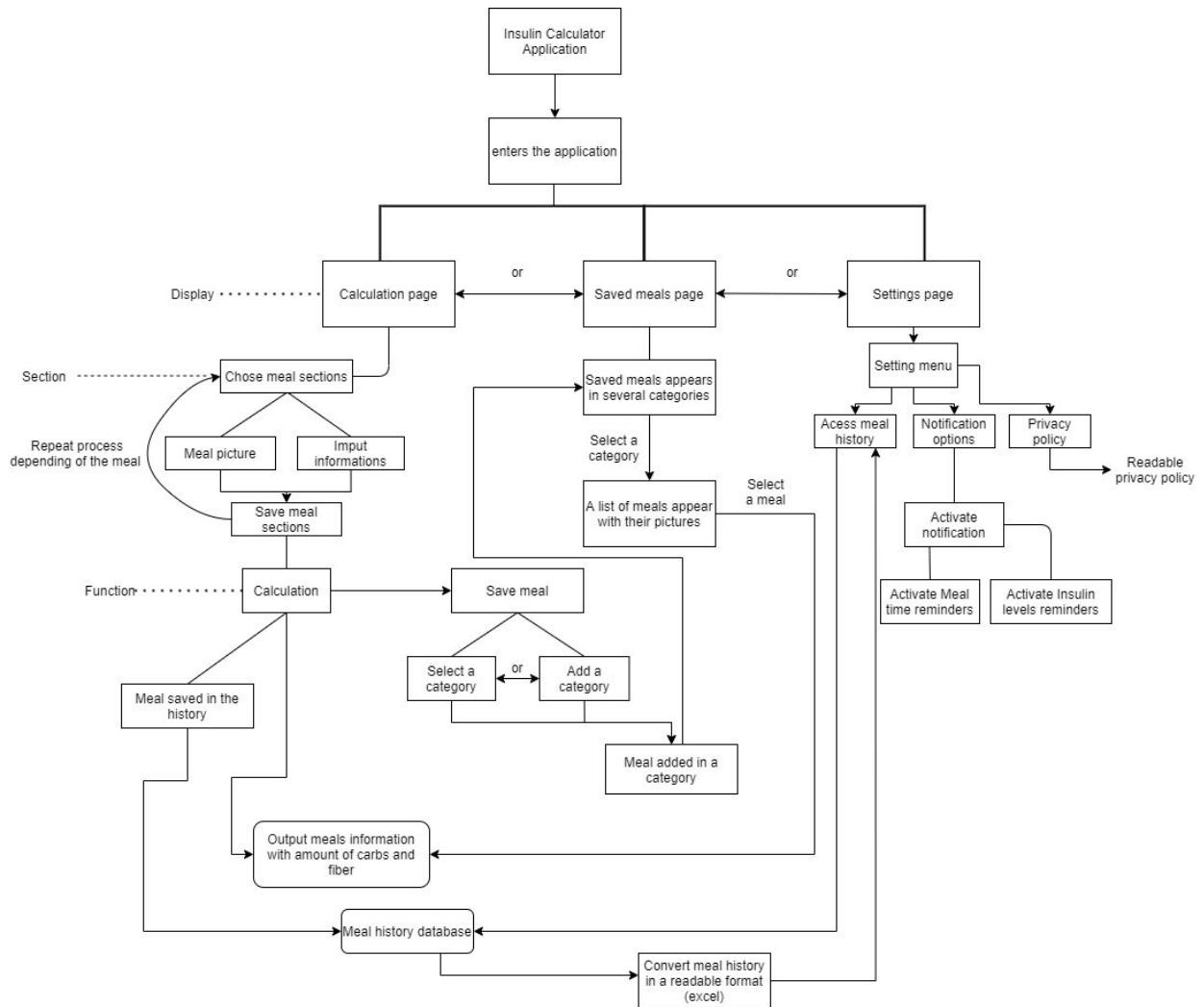
Most Critical Product Assumptions

In this section, the most critical product assumptions will be discussed and analyzed. It is important to consider that these assumptions are mostly relevant to the prototype being developed for this deliverable and future iterations of prototypes. The two most important assumptions are:

The first critical product assumption that will be looked at is the simplicity factor. The client specified clearly that they want it to be simple. The assumption is that there are enough questions being asked to gain all necessary input information to calculate

carbohydrates. Further analysis has to be made to make sure that the amount of questions is about to satisfy the client's needs and the simplicity. Finding a middle ground between both is going to be important.

The second critical product assumption that will be evaluated is practicality. Assumptions were made that the interface is user friendly to manipulate and intuitive. The client has ADHD and thus, having a practical solution/software is important to ease the usage of the application. The application has to be useful, or else there is no need to use the application. Further analysis will have to be made to determine if the application is appropriate for the practicality of the current conceptual ideas for the project.
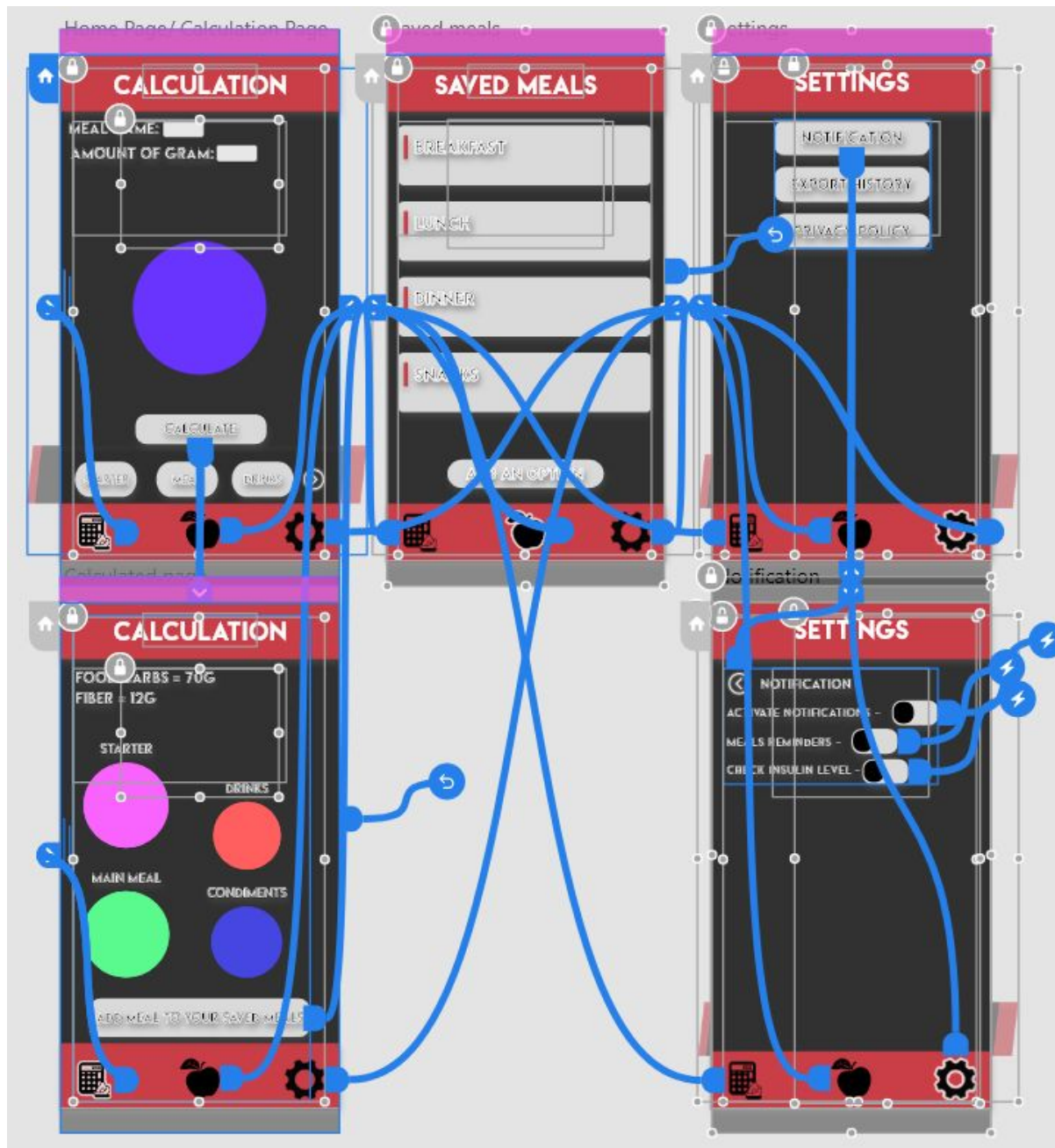
Prototype Analysis

Looking at both the assumptions of simplicity and practicality, the need of further prototyping is needed to better the future iterations. In order to satisfy low time constraints and the visual aspects of these two product assumptions, a low fidelity prototype is seen as appropriate. One week to complete a prototype is little. The second part of the decision for the prototype is the visual aspect of the prototype. Creating an application from the group up to test fundamental concepts of the application can take a long time. The prototype might change these fundamental concepts enough to force the team to start again from the group up. Instead, a wireframe prototype has been chosen.

The wireframe prototype allows for a much clearer view of the separate functions needed to make the project work. The prototype will allow the team to see how many questions are being used to get the needed information to get the correct output from the application. The second aspect of the prototype is that a wireframe prototype will allow the team to better analyze the practicality of the interface (e.g. analysis of the practicality of the pie charts).

Prototype

Figure 2.0: Picture of the Prototype Used for Analysis

Note: The prototype link can be provided if need be.

Design Testing

This section will be given to test the foreseen simplicity and practicality of the prototype. This section will incorporate a table summarizing the analysis of the prototype and analysis of the prototype. Please refer to *Project Deliverable C: Group C11 Conceptual Design, Project Plan* for more details on the target specifications.

Table 1.0: Comparison between the Target, the Prototype before Meal Bank, and Prototype after Meal Bank.

Target Specification	Foreseen (before)	Prototype (early after)	Prototype (after)
Simplicity (# of questions)	4	6-7	2-3
Practicality (Subj (low-high/1-5))	3-4	2	4
Customer needs (# of customer need)	7	N/A	8

Note: To be noted that the number of questions is considered on a per food basis. Green represents exceeded expectations. Yellow represents satisfied requirements. Red represents unsatisfied requirements.

Below, the different aspects of the table will be discussed in detail for better understanding to improve the project in order to better future iterations of prototypes. The first section will refer to the values given to each section of the table while the second section will discuss the considerations for future prototypes.

The foreseen(before) column represents the values that are aimed at the target specification. More information can be found in *Project Deliverable C: Group C11 Conceptual Design, Project Plan.* These values were used from previous analyses of other groups that have done this project as well as professional applications on the play store.

The prototype (early after) represents the usage of the application with no prior use of the application. It can be noted that the prototype (after) column reflects on the prototype (early after) in the sense that the values go from worse to better. For simplicity, more questions have to be asked before the application stores any foods in its memory. Because of this, a higher number of questions is necessary. These questions include the food name, carbohydrates, fibers, picture, selection, carbohydrate meal specific correction, and fibre meal specific correction. The first four questions are specific to storing the meal information, while the last two questions are centered on entering food into a meal.

Note: fibre meal specific correction is considered as an uncertainty, due to the unlikelihood of changing this value hence the margin 6-7.

The practicality of the prototype (early after) is not as good as we wish it to be. Using the application constantly adding foods/meals would make the idea of the application absolute because the application would be adding workload to the client when taking care of their diabetes. By having a couple of extra questions, the usage of the application can be made easier. The addition of the meals while eating a meal is less practical than the goal of the application giving it a value of 2 (lower than the targeted 3-4).

The prototype (after) column represents the usage of the application after having added every meal that the client will be eating on a daily basis. Only two-three questions need to be asked to the client in order to have the information necessary for each food being the food name, carbohydrate meal specific correction, and fibre meal specific correction.

Note: fibre meal specific correction is considered as an uncertainty, due to the unlikelihood of changing this value hence the margin 2-3.

The final value given is the prototype (after)'s value for practicality. For this section, the targeted value is compared to past group teams and play store applications.

The value that we gave those applications come to 2-3 in most cases. The goal for the application is to do a bit better (3-4). When all the necessary meals are entered in the meal history bank, the application becomes more practical for the user and comes to the highest range of the target we have for the application. The application also shows pictures of the foods, increasing the practicality of the application to a 4.

Using *GNG2101 Report: Deliverable B Mealtime Insulin Calculator - Needs Assessment, Problem Statement, Metrics, Benchmarking, and Target Specifications*' table 2: Need statements obtained from the client and evaluated according to their importance, the number of client needs met can be calculated. The target specifications have given this value a 7. It would not make sense to evaluate the prototype (early after) column, because there is no difference to the prototype (after) as both are the same applications. The other target specifications looked at have some differences to be mentioned. Every client need was looked at (in table 2.0 below), given the value of 8 for the current satisfied client needs met.

Table 2.0: Representation of the Client Needs Met by the Prototype

#	Needs	Importance (1-5)
1	The application works on the most recent version of android.	5
2	The application calculates the amount of carbohydrates from the meal information.	5
3	The application must be able to calculate the amount of carbohydrates for beverages, condiments, and all the other foods that could contain carbs in less than 2 minutes.	5
4	The application provides a simple, user-friendly design for the interface, one that is easy to navigate.	4
5	Application incorporates a meal history that stores information about previous meals to make the application usage faster and more accurate to the carbohydrate intake.	4
6	The meal history can be exported to an excel file.	4

7	Push notifications give notifications for mealtimes and reminders about hidden sugars.	3
8	Overlapping picture of the meal and a pie chart to show the different foods.	1
9	The application should be available to everyone on Android with a cost of $0.	3

Note: Green represents met client needs. Yellow represents exceptions, details explained in text above. Red represents client needs not met.

Prototype Evaluation

Using the values gathered in table 1.0, an evaluation can be made to improve future prototypes. The following section will discuss what information can be gathered, analyzed, and changes to be made.

Looking at the prototype (early after) column, each row is marked in red showing further analysis to see potential concerns/improvements. The prototype (after) column shows either exceeding or up to standard. From this point, the table is a mixture of good aspects and not as good aspects.

Further analysis of the table shows promising results for the project. The initial red can be explained from the initial trade-off (more questions) resulting in fewer questions in the long run than the anticipated number values. The team expects the user to use the meals stored in the meal bank more than once. The client has mentioned that storing the meals would be nice as their meals are not too diverse. Giving this information, it can be assumed that foods will be used multiple times, giving overall usage of the application fewer questions with more application usage time. The second part that can be analyzed is the practicality that can be observed in the table. For this section, the practicality depends highly on the implementation of adding the meals in a meal bank. Once again, the high initial pay-offs are estimated to be worth the higher practicality over long periods of time using the application.

Looking at the customer needs, a couple of considerations have to be made. First of all, one of the client needs was morphed into a different function that the client wants as well. This morphed need is the need for an overlapping pie chart over the food. Instead, the team decided to use pie charts for visual simplicity where the client reacted with positive feedback to this novel change. The reason it is marked as 8, is considering this slight change of perspective and acceptance of the client during the last client meet.

Future Implementations

Using the prototype to confirm two assumptions, the team was able to determine a couple of changes that should be made to better satisfy the target specifications. Overall, the prototype shows that the team's ideas are on the right track with either getting values that are within target specifications (practicality) or better than the target specifications (simplicity and customer needs).

The first consideration for future change would be the potential addition to a cloud storage system. Firebase was suggested and should be considered as a potential option. By adding a cloud storage system, the amount of questions could on average be lowered if the user changes phones or wants to operate on multiple devices. The trade-off would be accessibility to the storage if the client does not have DATA. That information will have to be asked to the client.

A second consideration is the addition of carb and fibre modifiers. Instead of having to go back to the meal history bank, up and down arrows should be added to allow everything to be selected from the food addiction itself. This would make slight temporary changes much easier for the user and thus increasing the practicality of the software.

The third that can be made from the prototype includes the consideration for the actual display location of pictures. Prior to creating the prototype and going through the functionality of the prototype, the client mentioned that pictures would be appreciated and would help the practicality of the application. Once the prototype was created, the team went over how the user would use the application and realized that the placement of the pictures was not agreed upon. Some team members wanted the pictures to be in the history meal bank, while others wanted it to be in the food selection bar. Asking the client where the pictures would be placed according to them is the safest option.

The fourth consideration that can be made covers the implementation of notifications. This would bump the number of client needs met to a 9. There are no necessary questions for the client, as all the information considering this issue was already provided to the team.

In conclusion, a couple of changes can be made from using the prototype. These changes include using a cloud storage system, the addition of up/down arrows for carbohydrates and fibre, the location of displayed food pictures, and implementation of notification. The second and last considerations can be solved with the team's current information, but the other two need more specifications (cloud storage system and the location of displayed food pictures). In order to get the missing specifications, an email will be written to the client to clarify the above-discussed uncertainties.

Preliminary Bill of Materials (BOM)

Looking at the monetary requirements for the production of software, it has been discussed and determined that the BOM would be $0 for this project. The following section will discuss the details of this decision.

The first point to be made is the low cost of making software from the perspective of a student. The team is composed of University students meaning that the resources of "employees" to be free of cost. With this information, it can be concluded that the time and people working on the project are relative to the effort and experience of the students of the team and not due to money constraints.

The material cost will be the second point that will be considered for the price. Because the project consists of software, it is not made of tangible material and therefore will cost $0 material wise. Technically, someone could think of using a phone to test being a potential cost in order to test the product, but some members of the team already possess multiple different androids that can test the application.

The third and final point that will be covered is the delivery of the product. The software can be either uploaded on the play store where the client can download the application from the play store. This option that was covered is approximated to cost $25 for the ability to publish applications on the play store[1].

The client mentioned that they do not mind getting directly the apk file. They mentioned that the team does not have to publish the application. Both publishing the application on the play store and delivering the product directly to the client both require the usage of the apk file. Public access to the application is the only difference between either decision. Because of this, the team decided that the cost of $25 is unnecessary, and providing the apk file directly to the client to be appropriate. It can be noted that the other previous groups that were analyzed had the same solution to the topic of delivering the product to the customer.

In conclusion from the BOM analysis, it can be concluded that the project will have a total cost of $0. The project could consider a $25 margin or error if the team decides later in the project to publish the application on the play store.

Conclusion

Through the analysis of the project, concerns were found considering the simplicity, practicality, and the number of customer needs met. These assumptions could become difficult to fix later in the project when using higher fidelity prototypes. By analyzing these concerns in a low fidelity prototype, testing assumptions that require higher fidelity prototype will be able to fully focus on these aspects without noise from other wrong assumptions.

From the prototype, the team was able to find a couple of considerations (found from testing the prototype with the critical assumptions) that can be looked into to improve the project and its future iterations. Comparing the target specifications with the prototype's critical assumptions gave four considerations. These considerations include using a cloud storage system, the addition of up/down arrows so the user can manually control the amount of carbohydrates and fibre, in their meal, the location of displayed food pictures, and the implementation of a notification system. Questions will need to be forwarded to the client in order to have enough information for the first and third considerations stated above. Once the new information is collected, the team can make further decisions on how to proceed to the next prototype.

Taking the client's needs and turning the needs into an actual prototype was a valuable experience for the team. We intend to present the results of the prototype and the various features it will include to our client such as the meal menu, the transition from option to option, as well as the general look of the current application. We will explain the functionality of the different sections and subsections. We hope to receive more feedback on the aesthetics of the application as well as other improvements and changes that the team could make to the application's interface. During that time, we are going to learn how to do the second prototype using java and aim for a physical application that our client can navigate through himself. Thus the client could directly test it and give us more precise feedback.

Work cited

[1]Sims, Gary. "Publishing Your First App in the Play Store: What You Need to Know."
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