Deliverable C

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Mealtime Insulin Calculator
Group E-12

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2. Introduction

The goal of the team in Deliverable C is to translate customer needs into ideation and concept generation. In order to do this, the design criteria generated in Deliverable B is considered. Then, a core functionality chart is created. After this, the team will utilise rapid concept generation in order to create a large number of potential concepts for the app. These concepts are analyzed via the decision matrix in order to determine the best possible concept to proceed to the development and prototyping phase with. Then, some strong portions of other concepts will be integrated together in order to create a better overall global concept. Finally, the team will relate the selected concept to its target specifications and conduct a feasibility study in order to determine whether it is feasible to enter development of the selected concept.

3. Core Functionality

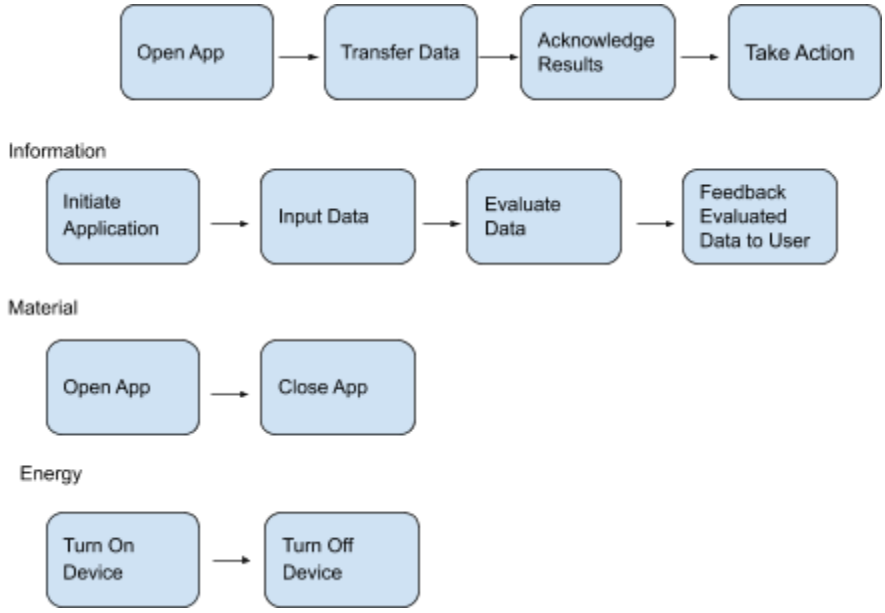
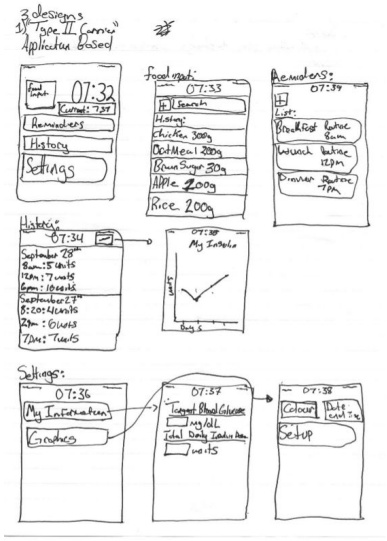


Figure 3.0 - Core Functionality chart

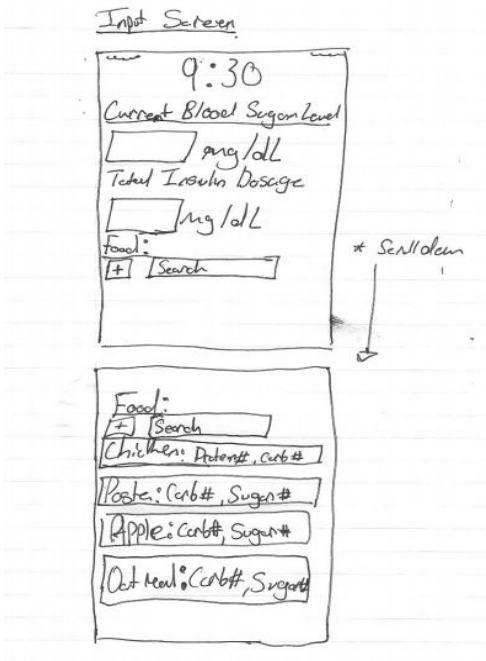
When looking at the functional decomposition table we have broken down our app design to the most basic concepts. This starts off by opening the app and is followed by a transfer of data, and an acknowledgement of the results of that data by the user. The final concept of the user should be to take action and inject the correct amount of insulin based on what the app says. The decomposition of information is more complex as the user of the application must first initiate the app by opening it (energy). Then the app should ask the user to input the data, which is required to evaluate and get a result for the user. The decomposition of material is simple by nature of a software application, the only material based function is the device opening the application. The decomposition of energy is powering the device the application is operating on and powering it off.

4. Concept Ideation

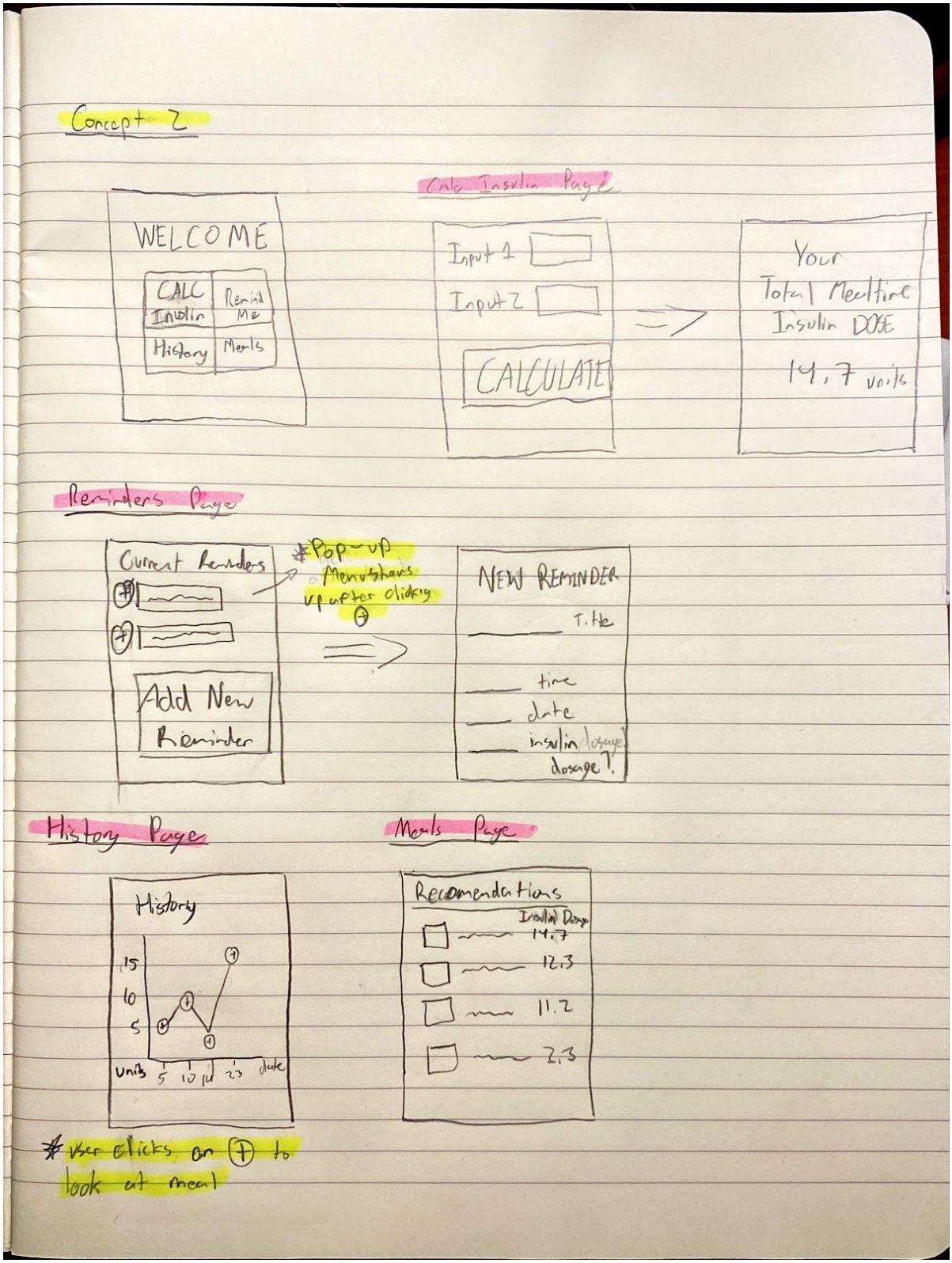
a. Comprehensive Concept 1 (Eric Pitts)



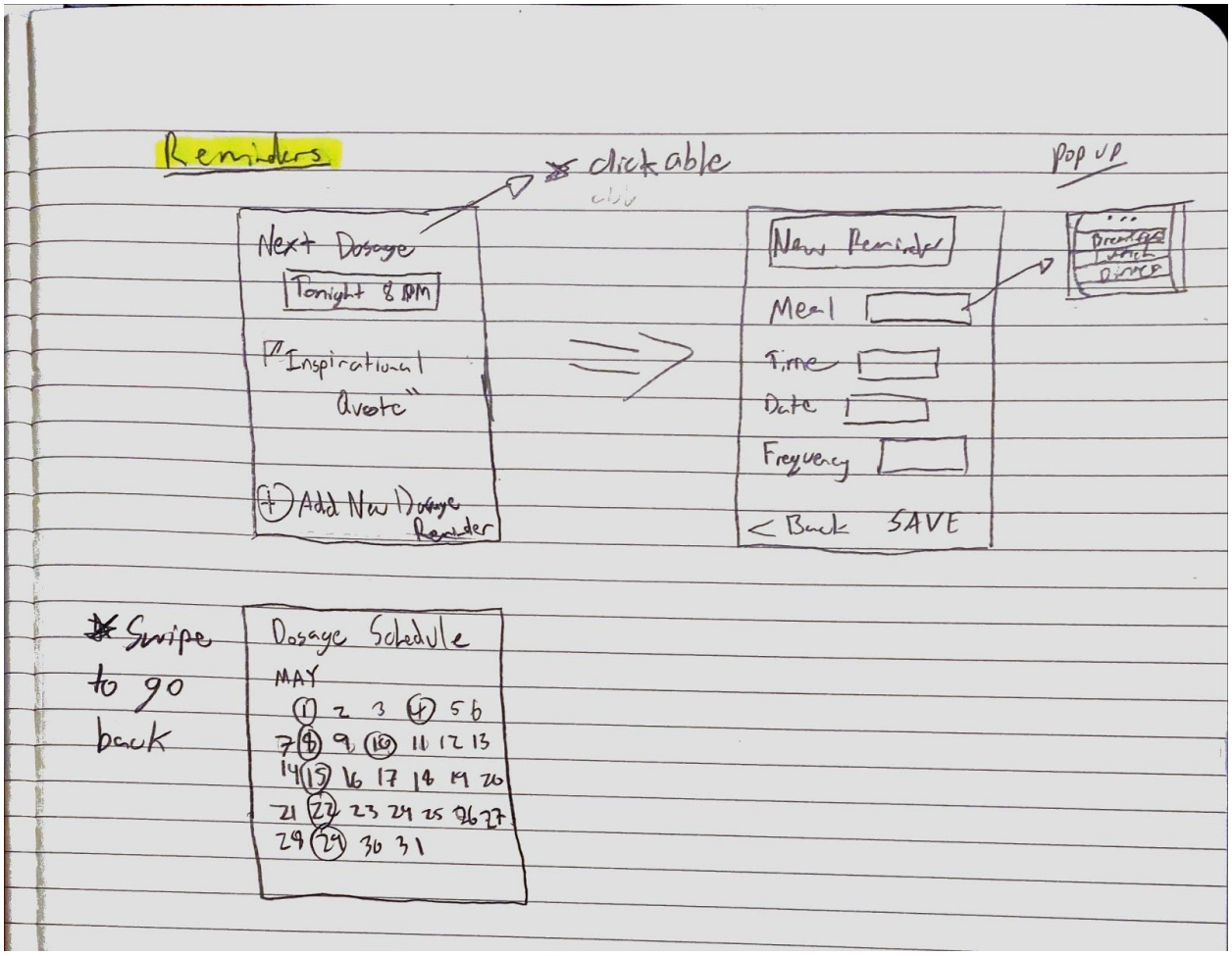
b. Input Screen Concept 1 (Eric Pitts)



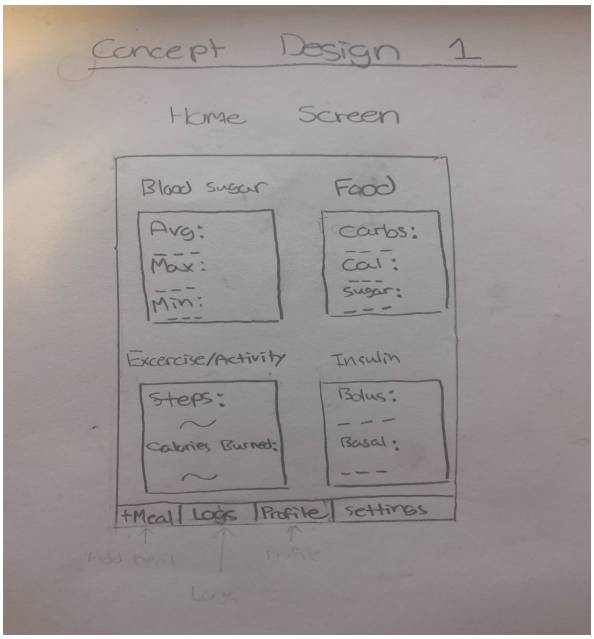
c. Comprehensive Concept 2 (Tanish Swarnan)

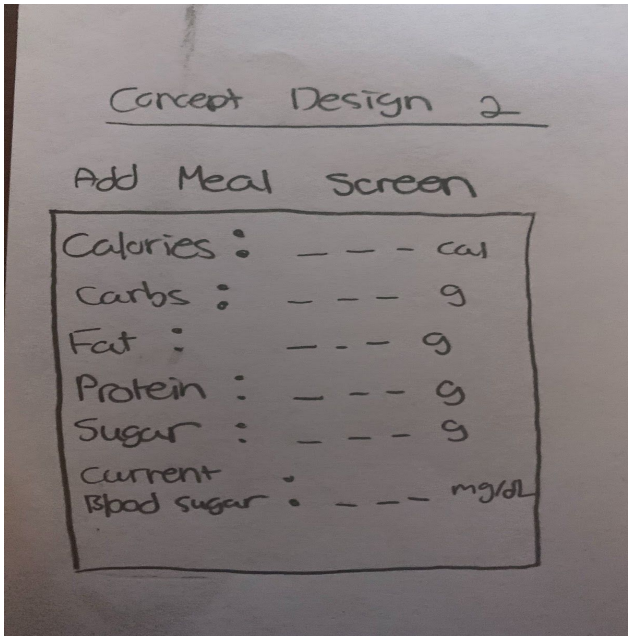


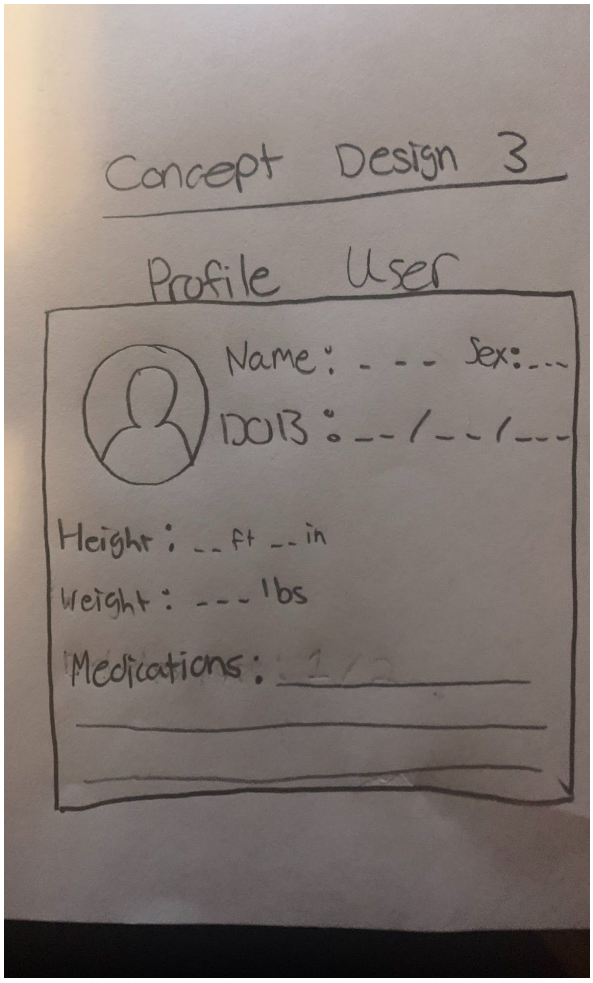
d. Reminders Concept 1 (Tanish Swarnan)



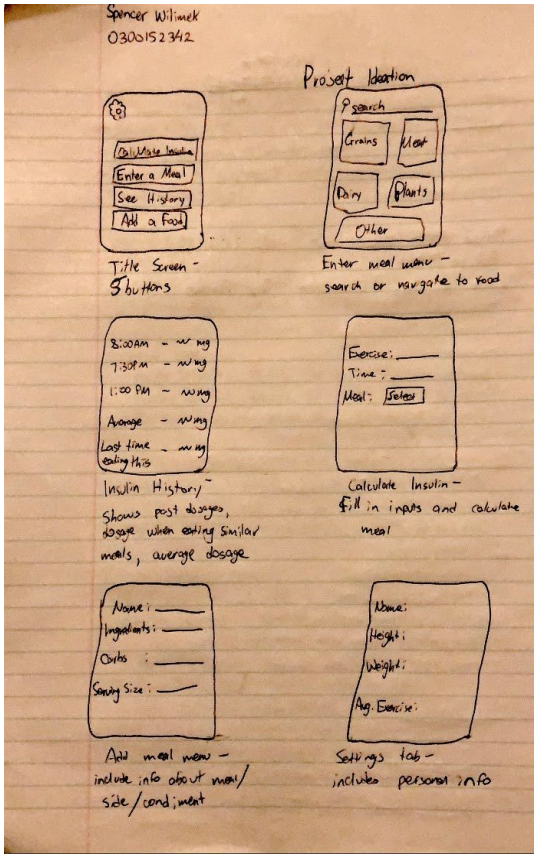
e. Home, Input, & Profile Screens Concept 1 (Matthew Lannigan)



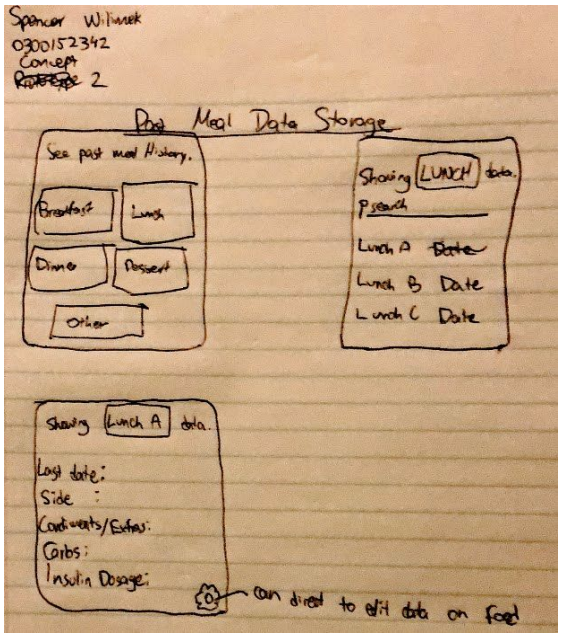


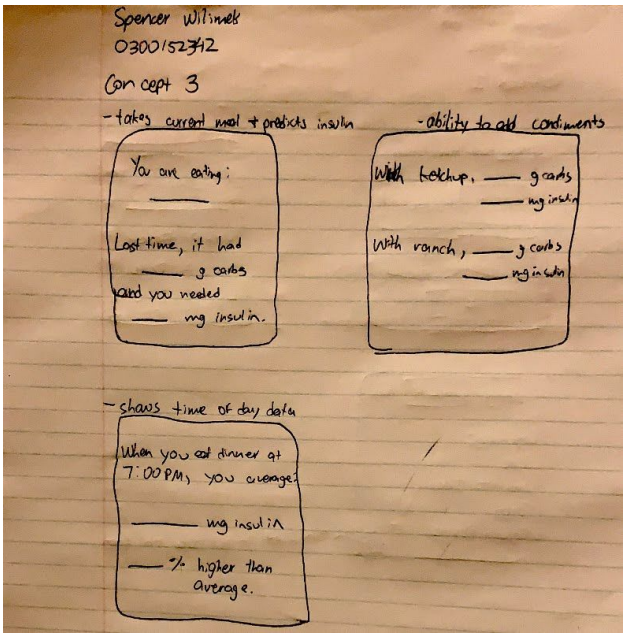


f. Comprehensive Concept 3 (Spencer Wilimek)

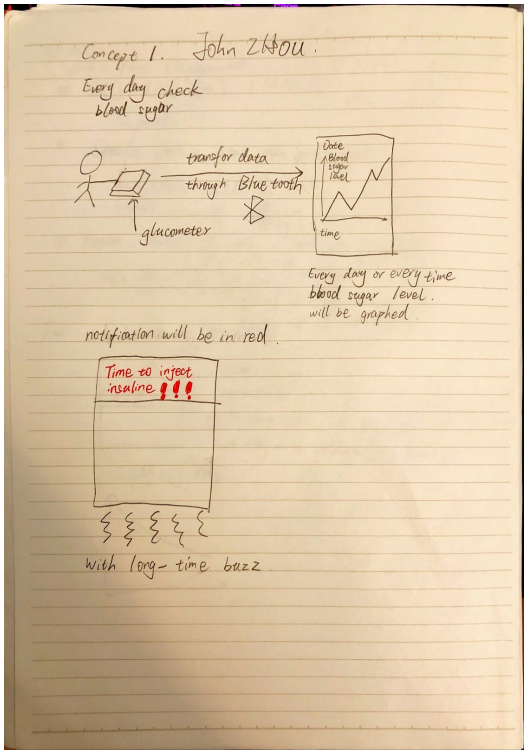


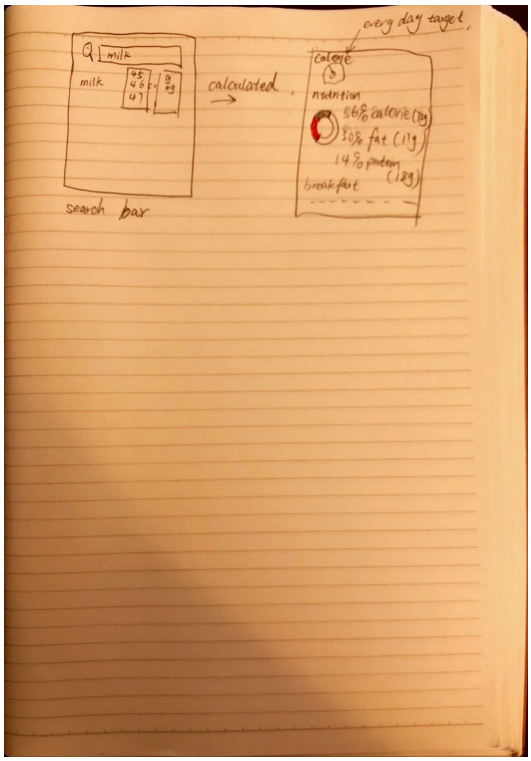
g. Data Storage Concepts 1 & 2 (Spencer Wilimek)



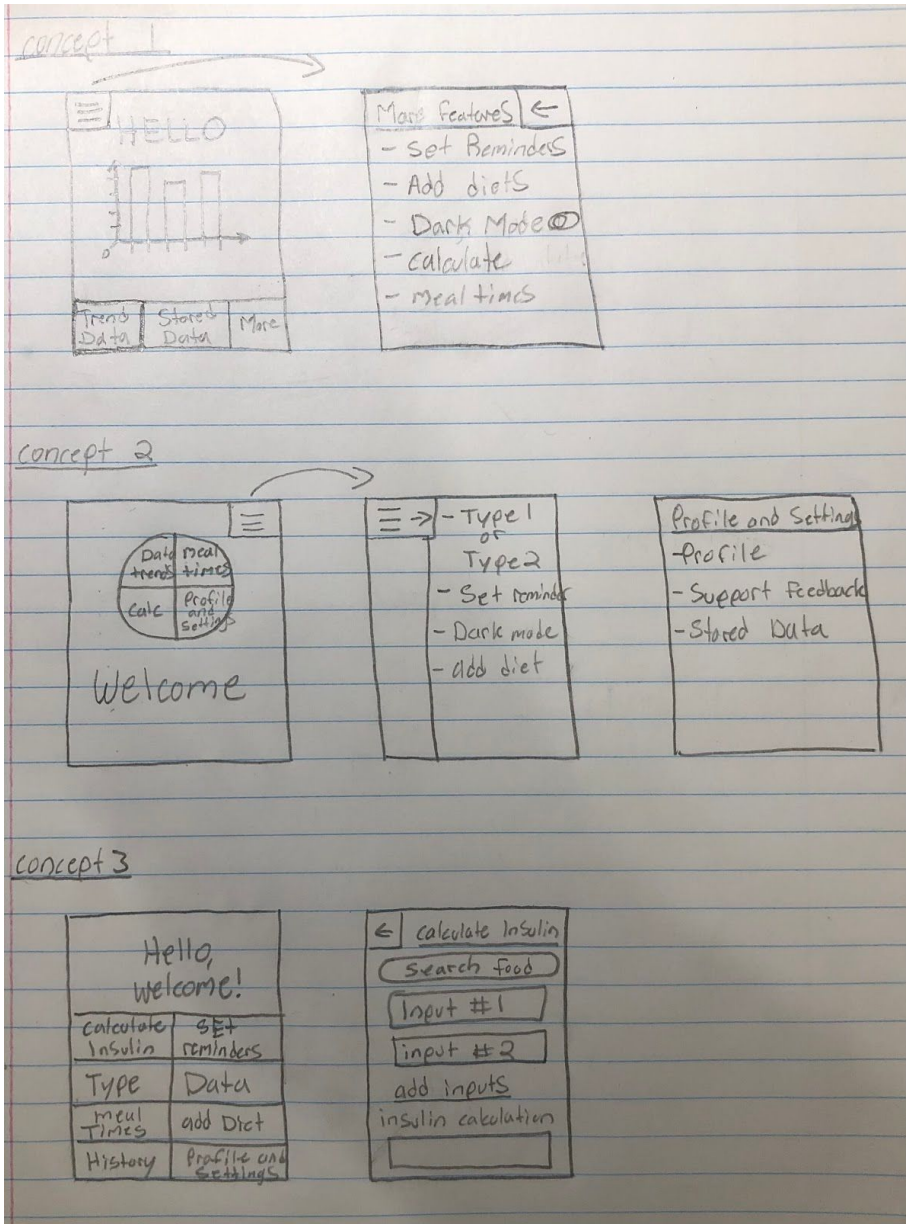


h. Comprehensive Concept 4 & Input Screen Concept 2 (John Zhou)





i. Comprehensive Concept 5 & Input Screen Concepts 3 & 4 (Owais Tabassum)



5. Concept Analysis/Evaluation

The following are ranked on a scale of 1 to 5, 5 being the best and 0 being the worst. The selection criteria is based on the customer needs. These needs are weighed in terms of importance from 1 to 5, 5 being the most important and 1 being the least important. Then each concept is ranked and multiplied by the weight to get a final total. In theory, the highest scoring concept should be chosen.

Comprehensive Design Matrix

Selection Criteria	**Names >** **Weight** \/	**Concept Options**					
		Comprehensive Concept 1	Comprehensive Concept 2	Comprehensive Concept 4	Comprehensive Concept 3	Comprehensive Concept 5	Home, Input, & Profile Screens Concept 1
Easy to Read Interface	4	Easily read. (4)	Minimal Text (4)	Yes,only a few buttons(4)	Yes, minimal text (5)	Easy to read. (4)	Yes,(4) 4 mini screens, 4 buttons
Simple graphics	5	Simple design but lots of options. (3)	Simple graphics on main screen (4)	Yes,only a few buttons(3)	Yes, 5 buttons on main screen (5)	Yes, simple graphics with many options (4)	Yes (3) simple to read, lots to look at
Reminders for mealtime insulin injections	5	Has reminders (5)	Yes, Reminders are set up (5)	Yes, words are in red with long time buzz(5)	No reminders set up (0)	Accurate reminders (5)	Has reminders (5)
Reminders are sleep coordinated	1	They are routine based (4)	No reminder needs to be set (0)	Yes(3)	No reminders set up (0)	Yes reminders are sleep coordinated (3)	Yes (3)

Ability to add different foods easily	4	Easy to add food and different additives (4)	Yes and No, has option for meals but hard to add (2)	Yes, search bar make the activity much easier(4)	Yes, requires hitting 1 button and typing in food's info (3)	Options to add different foods and diets. (4)	Yes, requires 5 simple inputs (4)
Stores past meal information	2	Stores data on device (5)	Stores meal info in app (4)	Data will be stored (3)	Yes, logs all meal, condiment, and extra ingredient information (4)	Yes, app includes data storage for history. (4)	Yes, contains stored data from past meals (5)
TOTAL	/	86	77	81	65	88	85

Figure 5.0 - Global Concept evaluation matrix

Input Screen Evaluation

Selection Criteria	**Names > Weight ⋁**	**Concept Options**		
		Input Screen Concept 1	Input Screen Concept 2	Input Screen Concepts 3 & 4
Easy to Read Interface	4	Easy to read, particular screen is simplistic.(4)	Easy to read(3)	Easy to read. (4)
Simple graphics	5	Little data on design, allows for easy understanding. (4)	Simple Graphics (3)	Simple Graphics (3)

Ability to add different foods easily	5	Easy search bar. (4)	Yes, able to search different foods and add them(5)	Yes, option to add different foods. (4)
TOTAL	/	56	52	51

Figure 5.1 - Input Screen evaluation matrix

6. Concept Selection

As a whole, Comprehensive Concept 5 was judged using the benchmarking matrix to be the best overall solution. However, as not all of the segments were the best in their respective category, it will be important to integrate some segments of other concepts in order to achieve the best possible result. Therefore, the overall design of Comprehensive Concept 5 will be the design the team chooses to move forward with and further develop.

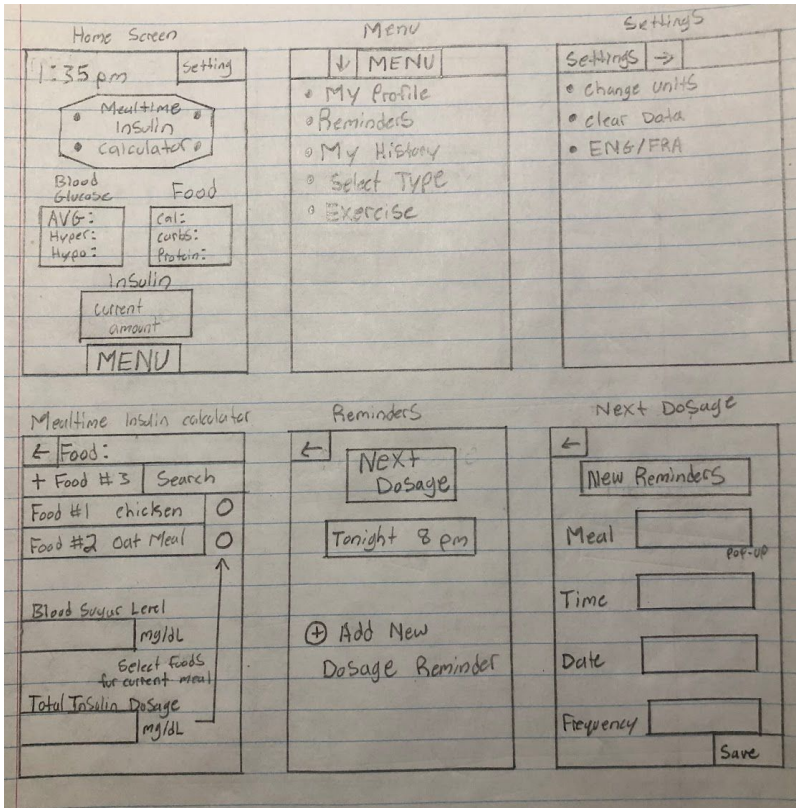
7. Concept Integration

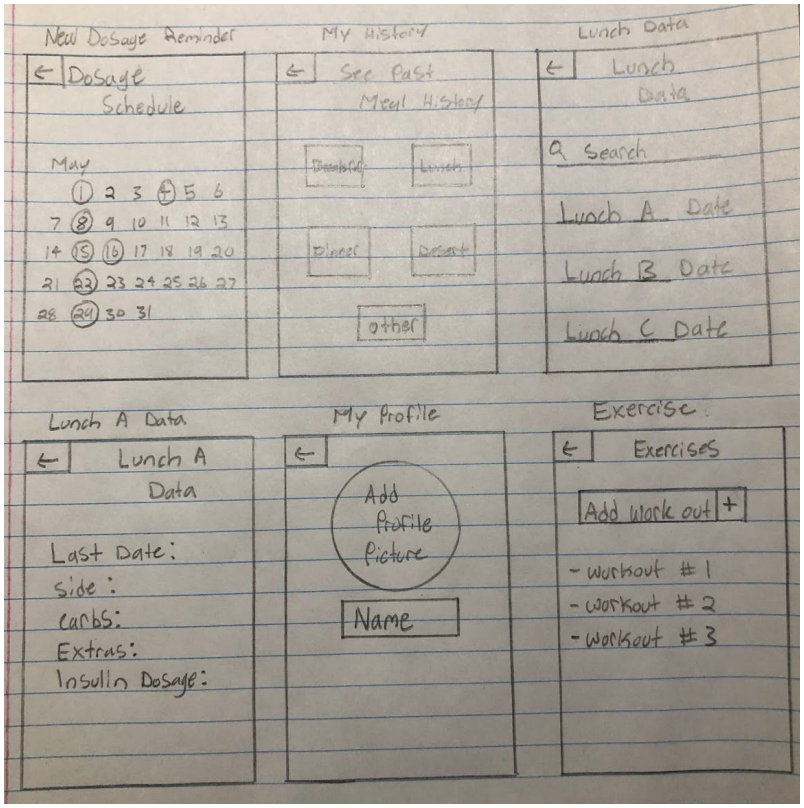
To further develop Comprehensive Concept 5, the team decided to select some strong portions of different concepts in order to create a stronger global concept. These integrated concepts include:

- Comprehensive Concept 5 - Overall Design
- Home, Input, & Profile Screens Concept 1 - Home Screen
- Comprehensive Concept 1 - Input Screen
- Comprehensive Concept 2 - Reminders Screen
- Data Storage Concept 1 - Meal History

The decision matrices were used to decide which overall design and input screen was most effective. The overall design of Comprehensive Concept 5 was picked as it best fit the design criteria. As explained in Figure 5.0, Comprehensive Concept 5 was the most organized and simple concept as it had few menus and was clearly and concisely formatted. It met all the other criteria as it has insulin injection reminders which are sleep coordinated and the ability to add and save the information of the user's meals. Most other aspects of the design such as the reminders page and past meal history page were decided by majority vote as these were not crucial elements to be judged using a decision matrix. The input screen was chosen by a decision matrix as there were multiple concepts for the input screen and there were no concepts that emerged as a clear top selection.

8. Visual Representation





These drawings are a visual representation of how our group's insulin calculating app will look. The home screen will display the time, blood glucose, meals, current insulin dose, a menu bar, a settings tab and a button to direct the user to the mealtime insulin calculator. This insulin calculator screen has various food options to calculate the accurate insulin dosage; there is also a line for the user to enter their blood glucose level, allowing for a more accurate dosage reading. The pull up menu screen has the options to direct the user to my profile, reminders, my history, select type and exercise. When directed to the reminder screen there are two options. First to add the next dosage and meal time, second is to add a new dosage reminder to a monthly calendar. The settings tab will give options to change units, clear data and change language (ENG/FRA). From the menu bar, the user can be directed to my history which will include past meal history (breakfast, lunch, dinner, dessert, etc.). The history tab will include each meal and what kinds of foods were a part of those meals, along with the insulin dosage taken by the user. In the menu there is a button that will direct the user to the exercise screen where they can add the workouts they would like to complete and mark off the ones they have completed for the day. Lastly, the my profile page accessed from the menu bar will allow the user to add a profile picture and their name. All these settings and features will allow for the user to better personalize this app for themself.

9. Relation to Specification

The global concept developed was chosen and designed to relate specifically to the team's target specifications and customer needs. A concept was selected that met important criteria such as a high level of ease of use, simple graphics and a low price. Another key specification was in the reminders. A reminder screen was selected to be ADHD-friendly, yet also helpful and accurate in order to avoid missing a dosage at mealtime accidentally. The concept was also made to allow for storage of information relating to past insulin dosages. Finally, some smaller target specs were allowed for in the concept, such as the compatibility with Android OS and WiFi-dependence being minimal.

10. Target Specifications

Specifications	**Group Design Concept**
Ease of use	The concept we created should be simple for the user as the placements of buttons and menus are very simply laid out. The app also clearly shows the user the recommended insulin dosage very clearly on the home page
Price	The price of this app should be free as it most likely will not cost anything to develop the app

WiFi dependence	The app concept should not rely on WiFi as there will most likely be a database of foods that can be chosen to calculate insulin level. The user can also input information about food & should not rely on WiFi to calculate insulin dosage
Reminder	The app concept uses different color labels to remind the user. It is also very simple to add a reminder to the system. There
ADHD friendliness	The app concept has a simple interface which should avoid any confusion for the user. This is because the app has very big buttons and everything is spaced out very evenly.
Compatibility with Android OS	When this app is being developed it should be able to be compatible with Android OS and its devices.
Data storage	The app concept has a past history section and will be able to display past meals related to a certain mealtime (ie. breakfast, lunch, etc) and within that show the insulin dosage required at that meal.

Figure 10.0 - Target Specifications chart

11. Feasibility Study

The task at hand is to develop an application that is able to calculate the required insulin dosage of an individual after this individual inputs the required information. The app must include simple graphics and an easy to use interface, in order to be ADHD friendly. One risk that is being taken to accommodate for this design criteria, is that the menus and pages of the app have been significantly simplified. On each page of the app, unnecessary inputs and information are not included. Although this can be seen as a positive for users that possess ADHD, like the client Mark, it may not be ideal for other diabetics as they may find the app itself too simple. This can make some users feel as though more insight should be added to certain pages of the app and that, in their eyes, the app is lackluster.

Technical

The group's technical expertise is also a source of risk and weakness as the team will have to learn to code a complex application as they begin creating our solution prototypes. Some team members are experienced in coding languages such as C or Python; however, these languages may not be able to build an application that will effectively solve the problem at hand. There may be other existing solutions to this problem but further research needs to be done to verify.

Economic

The project budget has been set at $50. Considering this, the team's goal is to make the application free. The fact that the product will be an app is an inherent advantage as it means there is no need to purchase any physical materials. The risk with building a functional app is that the group is not experienced in app creation and unfamiliar with the costs involved. Apps can cost money to build depending on what software is used to create the app. If the app requires technical skills that are beyond the scope of the team, then reinforcements such as app builders and other such things may have to be used, which could ultimately cost the team money.

Legal

There are many important legal factors that the team will need to consider when building an app like this. It is crucial that the application works properly for users when inputting information and calculating results. The team would be liable for mistakes in calculations on our app. These mistakes can result in the client and other users taking too much or too little insulin which is very dangerous for a diabetic patient and can result in death. The major legal liabilities are why prototype testing and thorough research must be done on the app. This also means that there will be many iterations of the app allowing the calculations to be as precise as possible.

Organization & Scheduling

The team is required to have this application functional and ready to be used in just 3 months. The team's time management is a strength as we are consistently completing project deliverables early and perfecting them before submitting. Moving forward, the team will be facing a lot of adversity as it is very new to the concepts of app building. Thus, there is always going to be a moderate level of risk and uncertainties associated with the team's task at hand. Therefore, the group will continue to strengthen knowledge on the concept, in order to create an app that can be competitive compared to other insulin calculator apps.

12. Conclusion

In Deliverable C, the group has developed a crude concept of an application that will be able to calculate an insulin dosage based on a given meal. The scope for Deliverable C was designing a basic UI concept to initialize our project plan. The concepts of functional decomposition, rapid concept generation, decision matrices, & TELOS were used to develop and create an initial team concept. First, functional decomposition is used to help break down the app to the most basic principles to better understand the limits and boundaries of app creation.Then, each team member comes up with their own overall design concept of the UI and concepts of specific pages of the app. Ideas are then deliberated, using decision matrices and majority voting, to see which is best. After deliberation it was found that Comprehensive Concept 5 along with other separate page concepts were the best to further develop. The best ideas are brought together to create one global concept to show the client, Mark, at the second client meeting. Finally, a feasibility study is done using the TELOS concept to determine whether it is feasible to enter development of the selected concept. With the work that has been completed by the

team, the first global concept was produced. The work that has been done in this deliverable will help in laying the foundation for our first prototype and hopefully help us in reaching our goal of developing a mealtime insulin calculator app.