

Major project

A Scale to Motivate People to Follow their Diet Plan

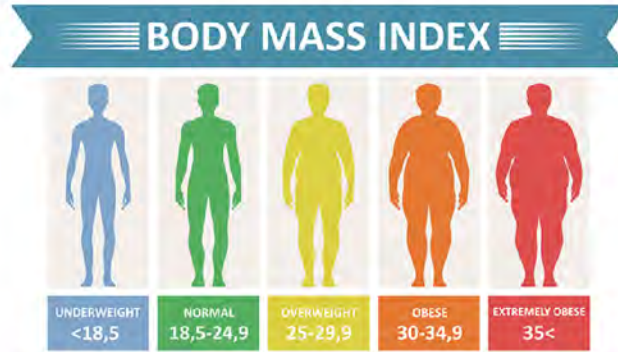
Design Process Journal



THE GLASGOW
SCHOOL OF ART

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August 2021
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Discover



For adults, WHO defines overweight and obesity as follows: overweight is a BMI greater than or equal to 25; and obesity is a BMI greater than or equal to 30.

Yoyo Dieting

Physical problem



Eating disorder



Heart disease



High blood pressure



Diabetes

Mental problem



Depression



Shame



Anxiety



Guilt

How to help people to diet more effectively and lose weight successfully ?

Dieting is important to lose weight

Almost 2/3 of Brits are on a diet "most of the time"

95% of diets fail and most will regain their lost weight within 1-5 years.

Some people even become yo-yo dieters



Define

Design Opportunity & User Group

<p>Calorie Counter - MyFitnessPal, Inc. MyFitnessPal, Inc. Contains ads - In-app purchases</p> <p>4.4★ 2M reviews</p> <p>50M+ Downloads</p> <p>myfitnesspal</p> <p>TRACK calories, macros & more</p> <p>Like weight with MyFitnessPal, the smartest calorie counter and macro tracker</p>	<p>Add Food</p> <p>Cheeseburger (MaccDonalds)</p> <p>Number of Savings</p> <p>691</p> <p>Percent of Your Daily Goals</p> <p>Calories 45% 7,000 kCal</p> <p>Fat 45% 55g</p> <p>Protein 45% 37g</p>	<p>Diary</p> <p>Today</p> <p>Calories Remaining</p> <p>1,590 - 1,923 + 0 = -333</p> <p>Goal Food Exercise Remaining</p> <p>Lunch 681 of 477</p> <p>Dinner 261 of 477</p> <p>Snacks 290 of 159</p>	<p>Nutrition</p> <p>Calories</p> <p>50% 1,923</p> <p>25% 961</p> <p>25% 961</p> <p>Highest in Calories</p> <p>Cheeseburger 681</p> <p>Fish and Chips 661</p> <p>Chicken 316</p> <p>Mixed Rice 191</p> <p>Yogurt 00</p>	<p>Plans</p> <p>Find a Plan</p> <p>Meal plans, workout plans, and more. Start a plan, follow along, and reach your goals.</p> <p>Available Plans</p> <p>6,000 Steps a Day</p> <p>Healthy Kickstart</p> <p>11,000 Steps a Day</p>	<p>Diary Complete</p> <p>It every day was like today, in 5 weeks, you'd weigh</p> <p>57.2 kg</p> <p>Your projected weight loss is an estimate based on your total kcal. Calories for today. 2023 and results may vary.</p>
<p>Current app functions</p>	<p>Show food nutrition in number</p>	<p>Show daily food intake</p>	<p>Show calories intake in number</p>	<p>Weight loss plans to achieve</p>	<p>Tell results of accumulative intake</p>
<p>Disadvantages</p>	<p>It is hard to tell if the food is appropriate to eat or not</p>	<p>Need to input food intake manually. Can not stop people eating high-calory food</p>	<p>It is hard to alarm people they are actually eating too much</p>	<p>Not a clear and straightforward motivation</p>	<p>Not a clear and straightforward reward/punishment</p>

New motivations, new plans.

Plans

Find a Plan

Meal plans, workout plans, and more. Start a plan, follow along, and reach your goals.

Filter by:

Free Meal Plan Nutrition Walking Workout

Available Plans

6,000 Steps a Day

28 days • Daily

Healthy Kickstart

28 days • Daily

11,000 Steps a Day

28 days • Daily

→ Live longer

→ Fit in a dress

→ Find a boyfriend

Everyone has its motivation to lose weight.



Nichol has 5 grandsons, she wants to be healthier in order to grow up with them.



Yaxin is getting married, she wants to fit in her wedding dress and look good on wedding.



Lifan has been single for a long time, she wants to lose weight in order to attract boys.

The dieter's journey

Develop



Female



24



58kg

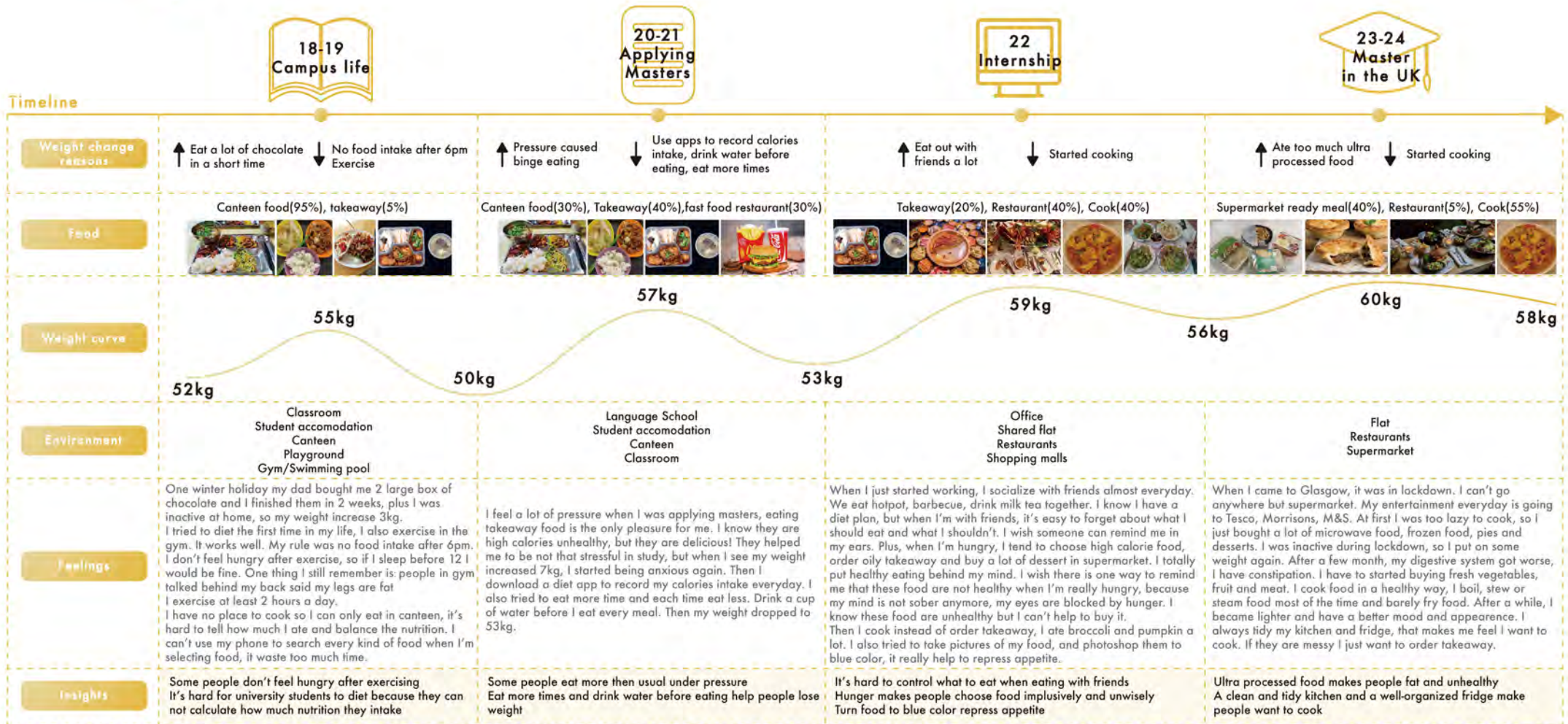


22.6



Student

An interview was held with a yo-yo dieter through video call. She tried to lose weight since she was 18. Her BMI is 22.6 which is within normal range but she thinks the ideal BMI for her is under 18.



Key Findings



It is difficult to follow a diet plan just from using diet apps



Turn food to blue color repress appetite



Pressure and stress is one of the reason of binge eating



It is hard to stick to a diet motivation



Hunger makes people choose food impulsively and unwisely



It's hard to control what to eat when eating with friends

User Requirements



Showing real-time food information without checking phone



Remind unhealthy food when hungry or eat out with friends



Strong motivation to keep diet plan

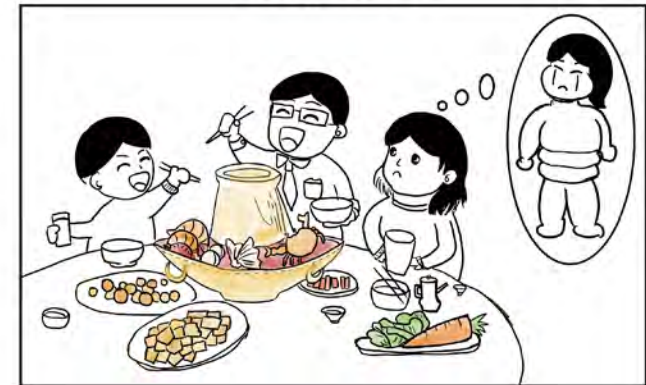


Food recommendation when choosing food

What if...



Scenario 1

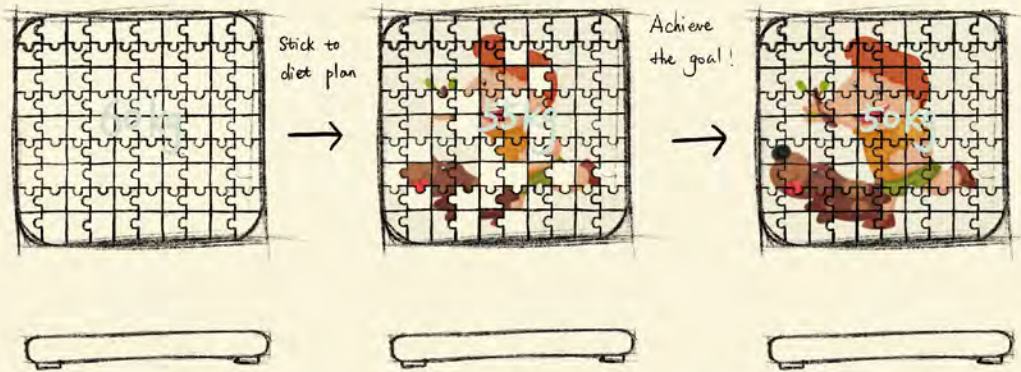


Scenario 2



Scenario 3

Concept 1: Puzzle Scale



The scale can detect your body index and recorded on an app. Users upload a photo of their goal, the photo will show on the screen of the scale like a puzzle. Each improvement of body index will light up a piece of puzzle, when users reach the goal, they can see a completed picture.

User's comment: "I don't know what I should do to light up the puzzle piece, there is no clear target about my diet"

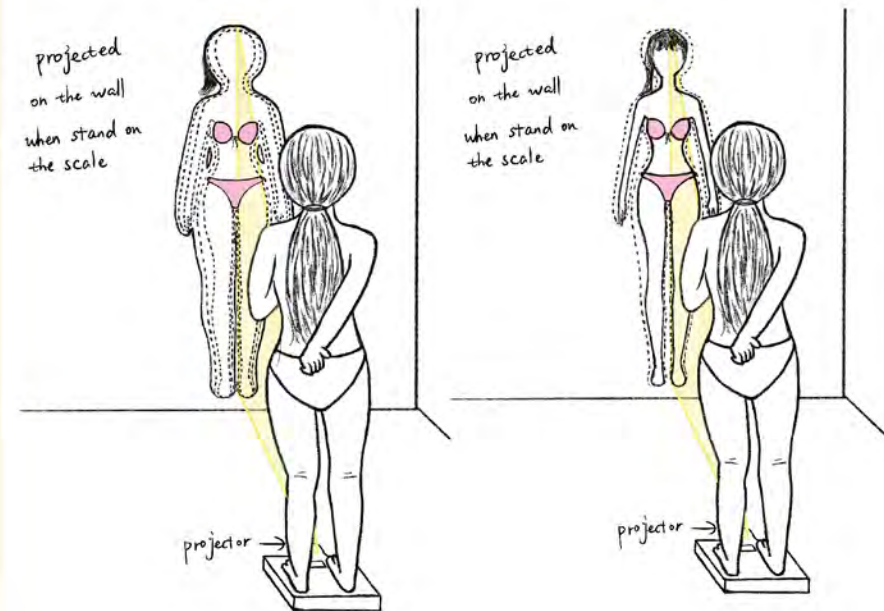
Concept 2: Expression Scale



Users input every meal they ate on an app, if the daily nutrition and calories goal is achieved, the scale will show a smile face, if the goal is not achieved, the scale will show an angry face. When users stand on the scale, instead of showing the weight of body, the scale will show an encourage sentence or tips to lose weight. However, the weight will be recorded on the app and show a diagram to user once a week.

User's comment: "It's a good way to remind me to keep dieting. I feel the scale is a small pet that I should make it happy. I feel anxious if my weight increase so tell me my weight once a week will help me focus on dieting rather than only worrying about result all the time."

Concept 3: Projector Scale



User choose or upload their favorite cloth such as bikini. When users stand on the scale, the projector will project the image on the wall, showing how much to fit in your favorite cloth. The scale can detect your body index and recorded on an app. Each improvement of body index will make the body outline smaller, when users reach the goal, the body outline will fit in the cloth.

User's comment: "When I see the body outline, I will doubt if I am ready in this shape or not. Losing 10kg my shape won't be THAT different, so this image is kind of exaggerated. Thus, I don't will very motivated to diet."

Earlier concepts

Work Flow

Eat well and scale give feedback
In order to see the feedback,
you want to eat healthy

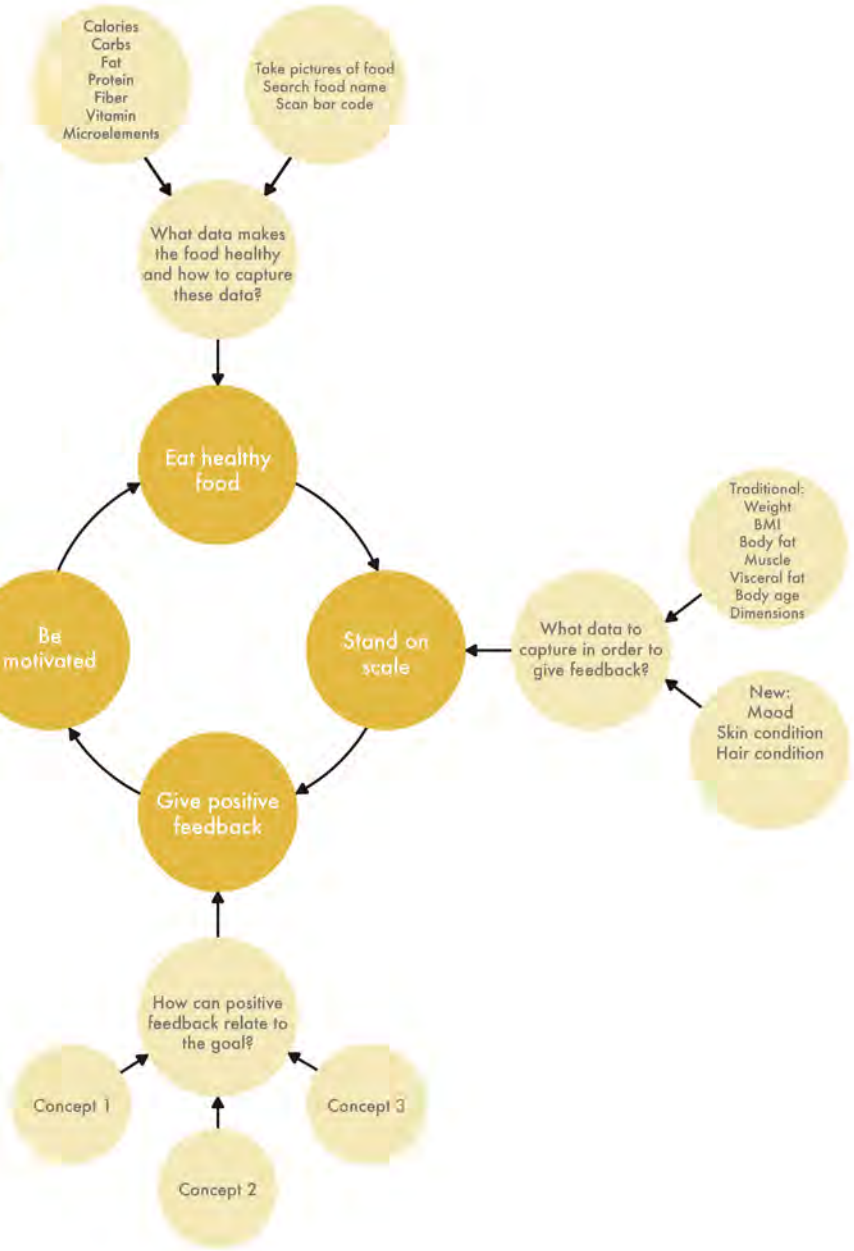


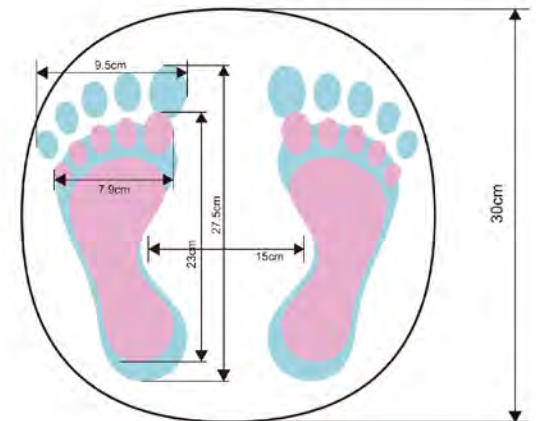
Table 1. Anthropometric Data of Hand, Foot and Ear for Male

Parameter	Percentile			Standard Deviation	Standard Error
	5 th	50 th	95 th		
Age (Years)	20	25	28.7	1.25	0.13
Foot Breadth(cm)	7.9	8.6	9.5	0.55	0.06
Foot Length (cm)	24.8	26.4	27.5	1.2	0.12
Foot Height (cm)	5.2	5.9	6.7	0.54	0.05
Hand Breadth(cm)	8.8	9.6	10.0	0.49	0.05
Hand Length (cm)	18.5	19.5	20.1	0.59	0.06
Hand Thickness (cm)	3.0	3.4	4.0	0.39	0.04
Ear Height (cm)	5.1	5.5	6.2	0.32	0.03
Ear Breadth (cm)	3.1	3.4	3.8	0.28	0.03

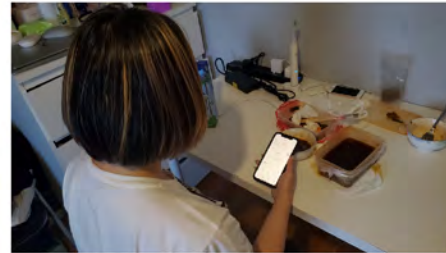
Table 2. Anthropometric Data of Hand, Foot and Ear for Female

Parameter	Percentile			Standard Deviation	Standard Error
	5 th	50 th	95 th		
Age (Years)	19	24	28	1.1	.11
Foot Breadth(cm)	8.0	9.0	10.0	0.59	.06
Foot Length (cm)	23.0	25.0	27.0	1.4	0.14
Foot Height (cm)	4.3	5.4	6.4	0.68	0.07
Hand Breadth(cm)	8.1	9.5	10.5	0.75	0.08
Hand Length (cm)	17.4	19.0	21.5	1.21	0.12
Hand Thickness (cm)	2.7	3.5	4.1	0.41	.04
Ear Height (cm)	3.2	5.5	6.2	0.88	0.09
Ear Breadth (cm)	2.5	3.0	3.4	0.23	0.02

The 95th percentile of male foot length is 27.5cm. A bathroom scale should be greater than this number in order to support human feet evenly and comfortably. The width of the 95th percentile of male is 9.5cm, $9.5 * 2 = 19\text{cm}$, so the width should be greater than 19cm. There is also a screen in the middle of the scale so people should be able to see what is shown on the screen when they are standing on it. A super ellipse shape in which the length and width are both the same (30cm) is not only ergonomic but also aesthetically pleasing.

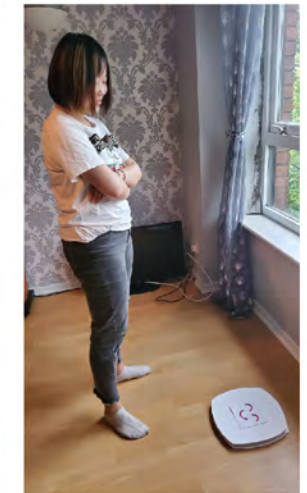
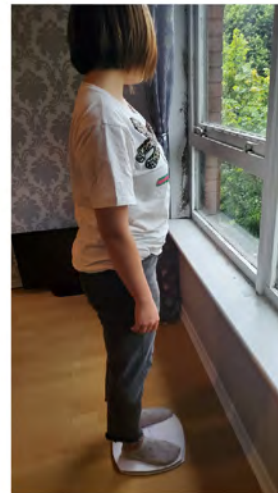


Prototyping & User Testing



Task: A dieter who is 24 years old studying in University of Glasgow was invited to my home. She was asked to choose a meal by her self, after she ate it, she input what she ate on she phone. After that, she was asked to stand on the scale. The scale showed "you look beautiful today" to her. When she stepped off, the scale showed an angry face.

User feedback: "When I eat a lot of high calories food, I always feel stressful to stand on the scale, because I will see my weight goes up. But this scale makes me feel someone is caring about me abd I need to make it happy. I don't feel anxious to diet anymore."



Upper Shell

Frosted polycarbonate (PC) will be used for the upper shell, polycarbonate can be transparent but also made to be frosted. It is also durable and resists scratches and dents, making it an ideal material for protecting the components inside the scale and providing a long-lasting durable surface for the user to stand on.

Lower Shell

Use acrylonitrile butadiene styrene (ABS), since the material should not be transparent. ABS plastic is very durable and suitable for use in impact scenarios where the component will be knocked, scratched.

Battery Cover

The battery cover will clip onto the lower shell and should have the same material and texture for uniformity. There it makes sense to also make this component using ABS.

Feet

The scale will have four feet which will elevate the scale a small distance off the ground and provide a grippy surface to stop the scale from sliding on the ground. The material will need to be durable and non-slippery. It therefore makes sense to use natural rubber for the feet, not only is it readily available but also cost effective.

LCD Screen

The screen will be a 5 inch LCD panel made by Shenzhen Reaper Electronics Co, Ltd. It will be controlled via a microcontroller.

Load Cell

The load cells will be manufactured by Youmile. It will comprise of 4 x 50kg load cells, connected to a HX711 AD weighing module.

Microcontroller

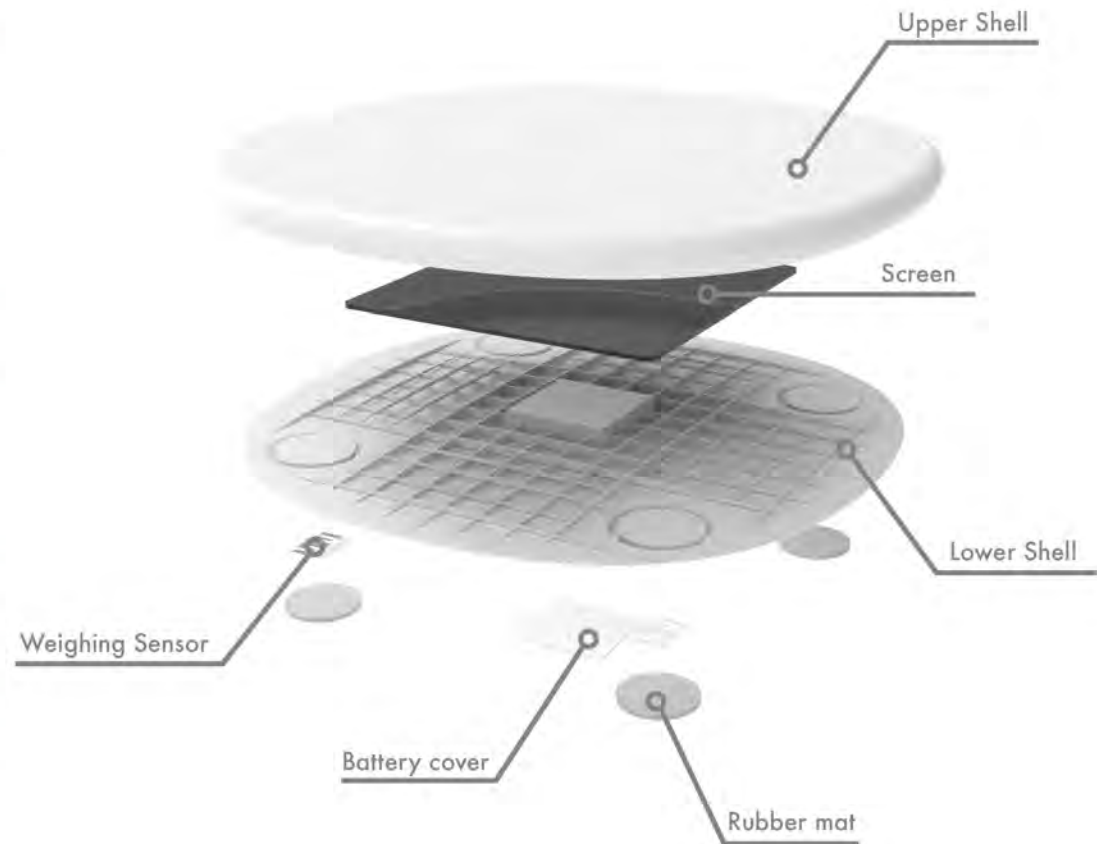
Key features of the Cortex-M3 core are: High Performance 32 bit RISC CPU; 32 bits; C friendly; Advanced debugging with CoreSight; Large memory address space; Interruption handling; Internal and external oscillator options; Power saving backup mode; wide voltage supply tolerance; built in temperature sensor; Analog to digital converter; Digital to analog converter; Pulse width Modulation; 103 input/output pins with individual direction control.

Circuit board

Arduino is a single-board microcontroller, with complementary components that facilitate programming and incorporation into other circuits. (Lecture notes from ENG4098). The cost is around 10 pounds purchased from China. The dimension is 101.6mm x 53.3mm.

Bluetooth

In order to communicate with the app on the phone, a bluetooth module HC-05 is needed. Data throughput is between ZigBee and wi-fi, with typically maximum of 2 Mbps. This is fast enough for compressed audio. Bluetooth uses more power than ZigBee; much lower power than wi-fi.



Deliver

When standing on



When step off



Diet Plan Achieved



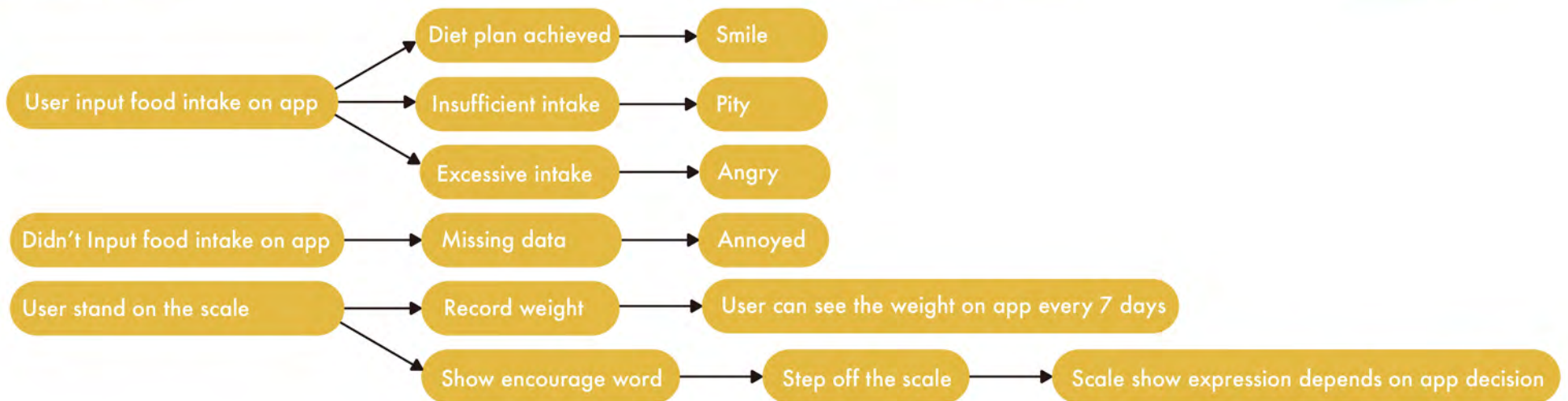
Insufficient Intake



Excessive Intake

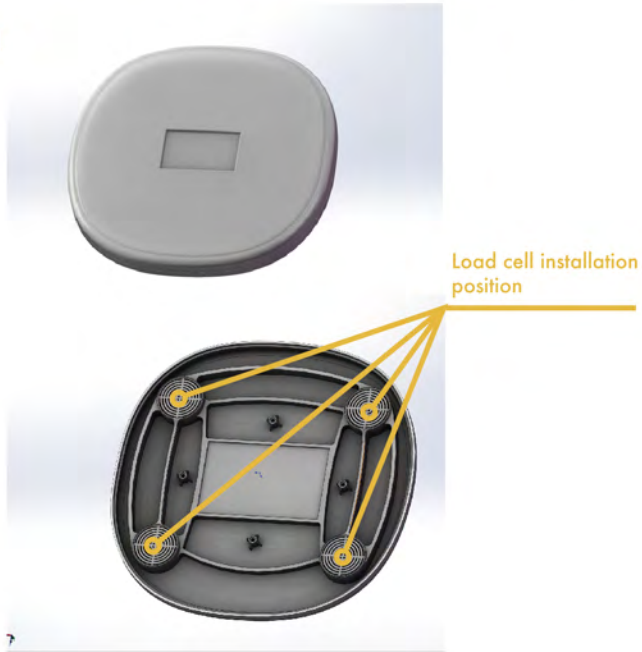


Missing Data



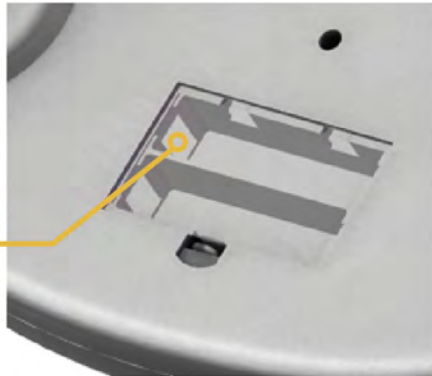
Structural Design & Usage Scenario

Upper Shell



Lower Shell

Battery Compartment



Screen position

