

SHEALTHY: The Exploration of a Food-Sharing Bank Interactive System Based on a Working Space

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Abstract

In today's fast-paced world, many individuals turn to quick meals such as fast food, biscuits, and takeaways for lunch, contributing to a rise in chronic illnesses among young adults. Some people decide to prepare many portions of a mixed dish once so that they do not need to cook on the following days, and this also causes a monotonous diet.

To combat this trend, SHEALTHY has been developed as a solution tailored for busy workplaces with limited time for meal preparation and varying schedules. SHEALTHY functions as a compact canteen where individuals can prepare meals in larger portions and store them in a communal fridge to accumulate points. These points can then be redeemed for meals prepared by others who use the shared fridge.

This innovative system is built on the principles of cooperation, ensuring a well-rounded lunch experience that factors in time constraints, cost, the number of participants, and individual appetites through a series of carefully conducted experiments.

Keywords: food-sharing system, healthy diet, food exchange, food waste, sustainable design, sharing for the community, interactive design

1. Introduction

My project began with diabetes, as many of my family members are suffering from it. I conducted a series of research on the causes and people's awareness of diabetes. According to Table 1, we can see that young people seldom care about their health conditions and usually have unhealthy lifestyles, which has led to an increase in the number of young diabetics recently. It is terrible to see that once young people contract such a chronic disease, their

lives will enter a downward spiral (Table 2).

There is a common misconception that diabetes is primarily caused by consuming too much sweet food. However, the true main cause of diabetes is an unhealthy lifestyle. To prevent this disease, it is important to make improvements in four key areas: diet, sleep, stress, and exercise. Unhealthy diet is the most direct factor linked to diabetes, which is why I have chosen to focus on making changes to the diet area.

Table 1. Partial data statistics reveal lifestyle of young people

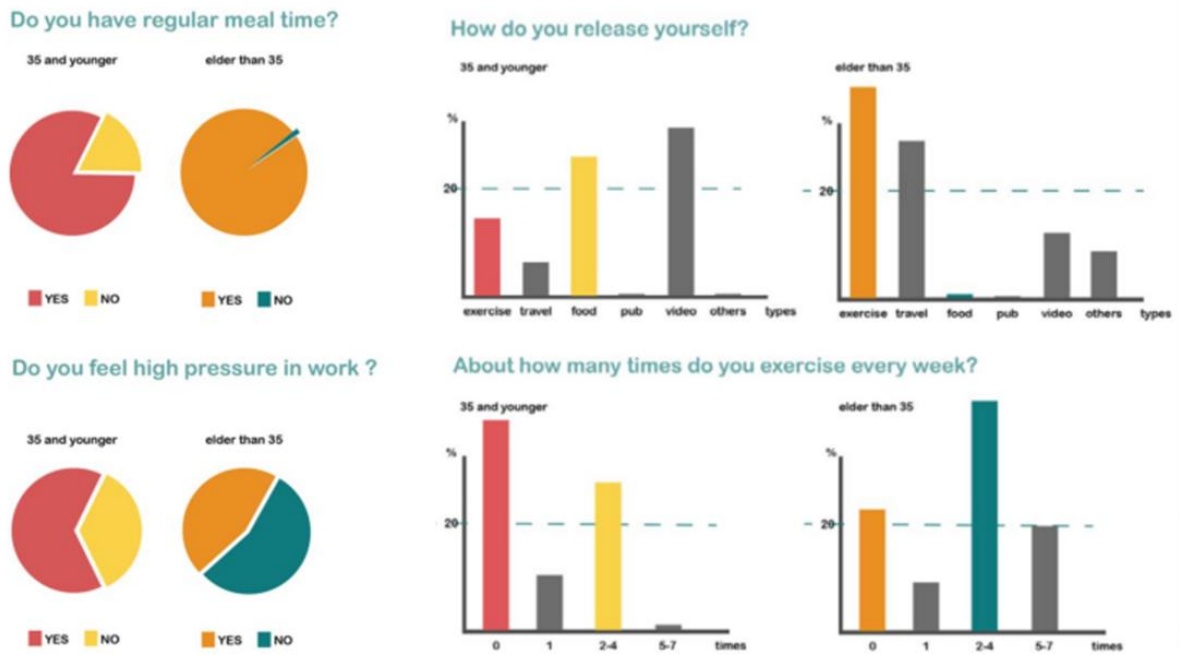
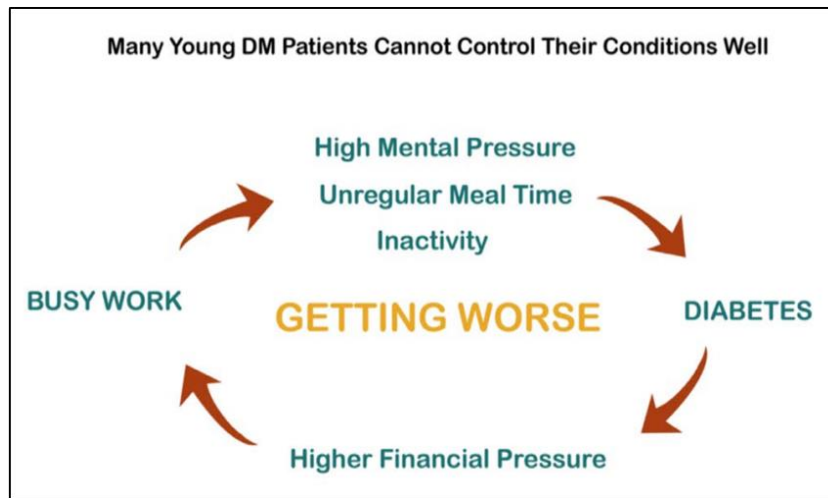


Table 2. A worse circle of health condition



2. Primary Research

The initial interviews are with individuals I observed consuming takeout, fast food, biscuits, or continuing to work during lunch.

Firstly, the fast-paced lifestyle and busy work mean that young adults do not have much time for cooking. As a result, they tend to eat a lot of fast food and do not have regular mealtimes. The high stress from work also leads them to eat snacks to relax.

Many young people do not cook well, especially when it comes to preparing complicated dishes. As a result, they tend to eat out more often.

Research shows that individuals who live alone are more likely to consume instant food, snacks, takeaways, or even choose to go hungry if they are not skilled at cooking.

Furthermore, they may find cooking boring and lack interest in it. Instead, they prefer to relax by engaging in more appealing activities such as watching TV, playing computer games, or going to a pub.

Last but not least, young people often prefer tasty food over nutritious food, not paying attention to the calories and nutrients in the food they consume. They are more attracted to spicy,





salty, high-fat, and sweet foods compared to those with less salt and oil.

Many individuals have expressed their views on cooking online, stating that while cooking is healthier, it is time-consuming. When people are busy with their careers, they may not be willing to spend 40 minutes on cooking. A net user named mal0808 pointed out that whether we are willing to spend time on cooking is a matter of attitude. If we view cooking as something we enjoy rather than a chore, we will cook more and eat healthier.

Above all, Time is the most significant barrier to cooking proper food.

Table 3 illustrates how four typical people around me handle their lunch on busy working days. They each have different habits and plans. For individuals like Sunfer, cooking is a way to relax. They prepare various dishes on weekends and eat leftovers during the first few days of the following week. However, the food is not fresh, and once they finish their leftovers, they turn to fast food and biscuits. For people like Athena, although they have planned their cooking time well, the dishes they can prepare are limited as they can only cook simple dishes in 30 minutes. It is evident that the diets of people like Fox are unhealthy, while those of people like Lyne are monotonous.

Table 3. Interviews record

	SUN	MON	TUS	WED	THU	FRI	SAT
 <p>Sunfer female 26</p>	Spend a whole day preparing many dishes and eat a big meal	eat leftovers	eat leftovers	biscuits or takeaways	instant food	instant food	biscuits or takeaways
 <p>Athena female 23</p>	rice and two simple dishes, (she can cook them within 30 mins)	rice and two simple dishes	rice and two simple dishes	rice and two simple dishes	rice and two simple dishes	rice and two simple dishes	rice and two simple dishes
 <p>Fox male 24</p>	eat out in a restaurant	snacks	nothing	takeaways	delivery	snacks	instant food
 <p>Lyne female 24</p>	cook a mixed meal such as curry for the whole week, divide them into 7 portions	a portion of mixed meal	a portion of mixed meal	a portion of mixed meal	a portion of mixed meal	a portion of mixed meal	a portion of mixed meal

3. Observation and Inspiration

We can see online discussions where people share their experiences with cooking healthy meals efficiently for just one person.

(Lifehacker.com., 2016) Based on their comments, cooking for one can be time-consuming and can lead to food waste. Many people have shared various ideas to improve this situation, such as

planning recipes in advance, cooking for the entire week, sharing leftovers with friends, finding a cooking buddy, or using the time it takes to cook rice to prepare other dishes.

After conducting further research, I discovered that individuals who live alone or have limited time for cooking often choose to collaborate with friends. They share the cost of ingredients and the cooking process. However, long-term collaboration with a friend can lead to various challenges. I can use this concept and enhance it to provide more opportunities for people to collaborate and prepare a healthy lunch in a shorter amount of time.

4. Case Study

The act of collaborating to acquire food has been extensively researched across various countries, as it has been found to reduce food waste, diversify our daily diet, and promote social interaction. People have experimented with methods such as sharing leftovers, food hacking, arranging to eat at someone else's home, and more. In these scenarios, several factors must be taken into account, including personal preferences, safety, appetites, and scheduling.

The Fridgematch prototype (Figure 1) was an educational experiment aimed at reimagining the future of sharing food and eating together from both a design and a Science Technology Society studies (STS) perspective. (Kera, Denisa, & Nur Liyana Sulaiman, 2014) Based on several existing projects, it allowed a small group of people to eat and share their food together. The results of people using this prototype were observed in two groups in Prague and Singapore. (Food hacking Workshops, 2011) During the experiment, participants enjoyed food from different cultures. However, they were uncertain if the meals, which were cooked from a random assortment of leftovers, were palatable and worth their effort and time. Participants also raised cultural concerns and issues with food preferences, as well as food safety concerns related to the quality and quantity of leftovers each person contributes to the table. It seems that people may feel restricted when cooking with strangers as they aim to display camaraderie and a desire to ensure the best outcome.

The following two cases have failed due to inappropriate management. The first case is about a public fridge in Berlin (Figure 2) where people can put and get leftovers (Marshall &

Aarian, 2016). The refrigerator was closed due to unhygienic conditions, as people had even put 'non-packaged bread and torn packaging' in it. Another case is an Italian website called SCAMBIACIBO (Figure 3) (Food hacking Workshops, 2011). This website allows users to upload the food they would like to share and swap in a limited district. SCAMBIACIBO has been around for a long time but has a small number of users. There are only three food items on the website, and all of them have already passed the expiration date.

In the Berlin fridge case, the lack of area limitation made it hard to manage. People sharing their food without identifying themselves can easily cause hygiene problems. Something needs to be set up to supervise it. SCAMBIACIBO has considered a lot about those elements as it limits the district and people have to share with their identities shown to each other. It even forces people to swap face to face. The designer seems to hope to increase the chance of communication among people by this. But it does not work well as people have to contact each other and find a location first, which makes the process complicated.



Figure 1. Fridgematch prototype (Kera, Denisa, & Nur Liyana Sulaiman, 2014)



Figure 2. Public fridge in Berlin (Marshall & Aarian, 2016)

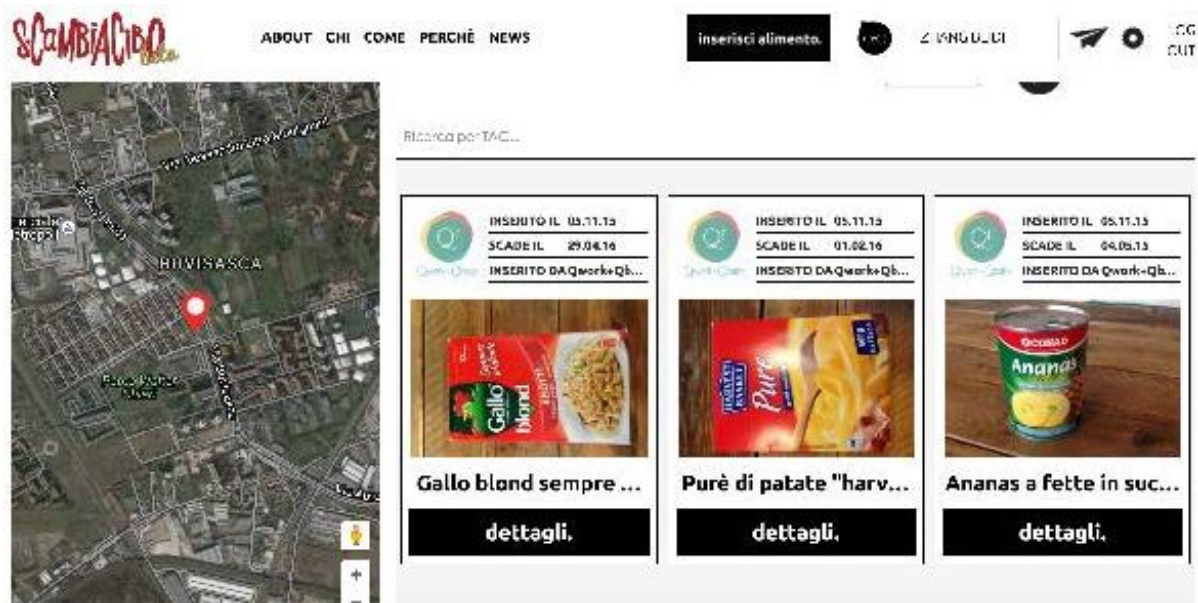


Figure 3. SCAMBIACIBO (Scambiacibo.it., 2016)

5. Experiments

In this step, I started to think about different possibilities for people to cooperate. Except for the ways I learned from case study, I would like to find more ways for people to cooperate, not only food swapping, but more kinds of exchange. I considered the elements that might have effect on the process of cooking together. Basically, they are time, fee, the limit for number of people and appetite. To set up those rules, I found it hard to find a way to satisfy all those elements in a rule. Thus, I decided to set up them first and try if they can work or not without some elements. I listed them and drew a picture.

I found 10 volunteers who are living in Richmond Place. They all have seen but were not familiar with each other. I set up different rules and let my volunteers communicate and practice. After 1 month to experiment, rule 1~5 have been successfully tried and recorded. Rules 6 and 7 can hardly come true after we communicated.

Rule 1: People exchange their material and leftover they cannot eat before the expiring date or the dish they want to share with others.

Experiments: a) Originally, everyone has 5 points, b) put your leftover and materials you want to share in the public fridge and tagged the points you want to get on them, c) If someone get your food, you get points, d) If you do not have points, you have to share something to get

points.



Figure 4. Experiment record of Rule 1

In this experiment, I used a very physical way to record the transaction. I shared many materials so that they began to follow me. Because of this rule, when they need some materials, they will

check the public fridge first. This has reduced the waste of food and saved the time to buy materials. Sometimes they could get dessert and delicious food shared by others which made them feel surprised (Figure 4).

However, for people who has no time to cook, there will not be enough leftover that is ready to eat. Also, they do not have many choices to get a healthy and balanced food, and food in the public fridge is usually not fresh.

Rule 2: I divided the whole process of cooking a lunch into small tasks. Every volunteer can get a task according to their timetables. These tasks are buying materials, washing and cutting materials, cooking (one dish is one task), washing dishes, cleaning kitchen. They pay for the ingredients equally.

Rule 2 focused on the time we spent on cooking. As participants have different timetables, I suggest them join one of the cooking processes according to their own conditions. For people who get back early, they can buy materials first. The second one can wash and cut the materials. The following people cook and put them in different plates for everyone. After eating, the left people washed all the dishes and cleaned the kitchen. At the beginning, it looks very appropriate as it saved time and reduced the waste of food. When we calculated the fee, we found it saved a lot of money for us (Figure 5).

Figure 5 shows the process of my experiment: 1) I wrote the rules on the first page of the account book so everyone can see. 2) We recorded the fee in the account book. 3) Participants cut the ingredients and put them in the fridge to keep fresh. 4) 5) 6) Participants are doing their own tasks.

However, when the deadline was coming and everyone started to be busy, some of them were not willing to do even one task and chose to get out of this rule. When the number of my volunteers became less and less, it became a failure as a result.

According to the feedback, Cam, one of my volunteers, said this rule looks quite fair, but we still need time to gather together. And when people who has paid for materials but has no time to come back to get their meals, it was unfair to them. So, after 3 months, with four times of improving rules, everyone still went back to their original living conditions.

To get back to my project, this rule needs a place

of cooking. If the scenario is in a working place, the tasks of a lunch will be divided into 4 days. This will also cause the raw materials to become not that fresh. The time to finish a cycle is so long and the experience of bringing ingredients to the workplace and back is not ideal.

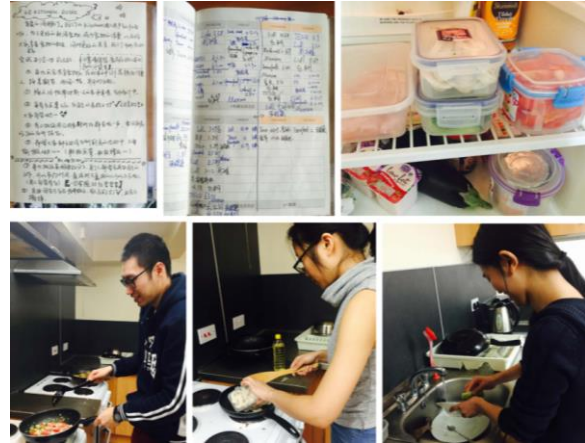


Figure 5. Experiment record of Rule 2

Rule 3: Do a 10-min-work to get a lunch. Everyone should contribute 10 minutes for the lunch and do part of the cooking process. This rule is similar to the last one but has more strict requirements on time.

In this rule, we should have a maximum number of volunteers as the more people participate in, the longer the cooking time is. 4 people have participated and they could do their work together if their time is available.

Mary was responsible for cutting a vegetable while Athena was responsible for cutting another food (Figure 6). Cam and I were both responsible for cooking a dish. They still needed to put food in the fridge waiting for us to cook and we washed dishes together.

This way gave us a chance to communicate when we eat together, but is not flexible for time controlling. The time different tasks of different dishes are different. Some dishes are complexed. Take a pork dish in the photo below as an example, it took Athena a long time to deal with the ingredients which is longer than 10 minutes.

The location is limited, you must be in the kitchen. The freshness of food is hard to be confirmed if it is cut but not cooked immediately.



Figure 6. Experiment record of Rule 3

Rule 4: Match two volunteers as a pair and let them share. All the tasks and fee are equally distributed.

This is a common way that people cooperate to cook. But during this matter, it requires two people to discuss the decision because the task is not measured and allocated, so the most common way that people use is to stay together during the whole process. It is so time-consuming and even more than the time we take to cook for ourselves. The benefit is it has reduced food waste and saved money. It is time-consuming but people can communicate a lot and feel relax during this time.

Some pairs chose to divide the tasks into cooking and cleaning. This approach is timesaving. But in the cooking process, we also have to clean cooking tools. If cooking and eating are in two locations, such a task allocation is unfair, so some people will feel unhappy about this.

Rule 5: Rule 5 also requires two participants to match and cooperate. One of the volunteers is very busy and has no time to cook while the

other one is free. The exchange way is: the busy one provides ingredients for two, another person is in charge of cooking for both of them. The fee of Ingredients is paid by the one who provides the ingredients. Roles can turn interchangeable when their timetable changes.

This is my original solution. In this scenario, the problem lies on how people value their works and this transaction looks quite like a restaurant.

Finding an appropriate way to do the experiment is particularly difficult, because the essence of this rule is to pay for the labor in a price of materials. But in the invitation, it is hard to let volunteers to pay, which means I have to provide materials to let them cooperate. Buy this way, when choosing the roles, almost everyone chose to play the role that can get shared from others. Finally, I gave my volunteers materials for two people and let them ask people if anyone is willing to cook for them. People's answers are various. A girl smiled and said 'It depends on what this guy looks like and I prefer cooking for girls'. Also, some people asked if there are carrots and onions in the ingredients as they hate them. In this case, we found it depends on appearance, gender and whether the ingredients people like or not.

In the first pair, Athena cooked for Lyne. However, Lyne does not like spicy food and the dish Athena cooked was too spicy. In the second pair, Cam found a girl to cook for him. But the girl had not cooked enough food for Cam as Cam is an athlete and eats a lot. In this rule, it seems if participants hope to get better experience, it would be better for them to communicate in advance. However, this makes it be more complicated (Figure 7).

I decided to simply try food-food swap in rule 6 and 7. I considered a lot of elements in cooking a dish such as price, time, the complexity of a dish. I tried to manage them in an appropriate way so people would not feel unfair in this exchanging process.

However, too many elements made the rule complicated and when I communicated with my volunteers, we found it hard to manage all the details in a simple experiment as there are various kinds of food and dishes.

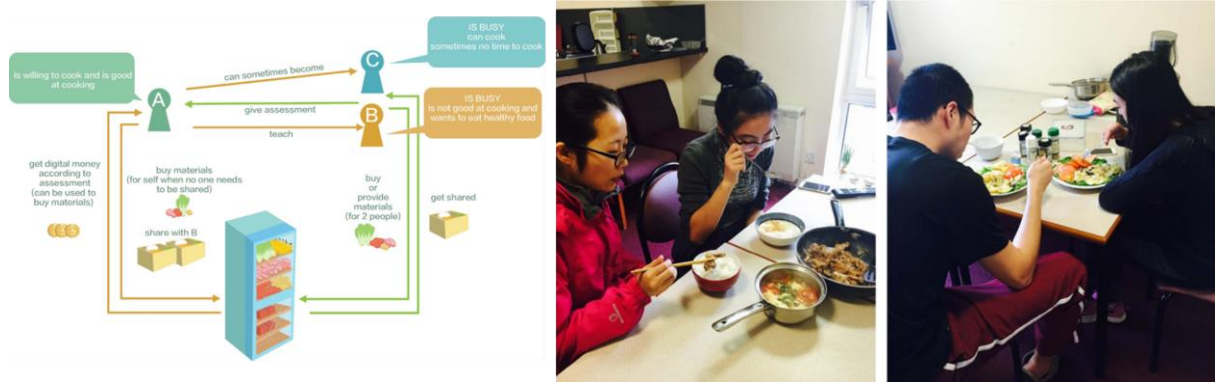


Figure 7. Visualization of rule 5 description and the record of experiment

Rule 6: Everyone should cook and they use cooked food to exchange according to the price and time. For example, a meat can get two vegetables, a vegetable can get two staple food and so on.

It is also about the value of food. The price is too broad estimated that the transaction will make people feel emotional imbalanced. Therefore, when I first proposed this rule, my volunteers started to criticize me. People planned to cook vegetables and staple food should prepare a lot to get a balanced food which made the choice became very limited.

Rule 7: Every dish is a task and has different points. The fee was paid by everyone. The whole process has 10 points. A vegetable is 2 points, a meat is 3 points, staple food is 1 points and a dessert is 3 points. Everyone bought ingredients and washed dishes themselves.

This approach is more complicated, because different dishes took different time and have different difficulties. This is hard for volunteers to judge and may feel unfair sometimes. So when I told volunteers, everyone has a lot of different views, so the programme should be improved.

In order to know how to encourage people to be willing to share with others and find a flexible rule, I interviewed individuals about getting what kind of return can make them be willing to share with people they are not very familiar with (but you know you are working in the same place or living in the same building).

Ziyu: I'm willing to share as long as I can confirm this guy is safe. If they like the food I cooked, I will feel really happy. I don't need anything in return, if I have to choose, I hope I can get a dish they cook as an exchange.

Lily: I prefer to choose cleaning as a swap because I don't really trust food from others.

Nan: I'm willing to accept food exchange. For me, it is simpler and clearer to exchange food by food, time by time, and money by money. If you want to share, I can do the cook and you clean up, and we share the fee. Otherwise, you can share a dish with me in return.

Athena: If it is not a long-term relationship but for once, I don't really care to share my extra food, and I don't really demand to get something in return. If I have to choose, I prefer to get a dish in return. I would feel weird if they help me to clean up, so I won't choose that.

Lyne: I am willing to get a food swap as it can save my time in cooking. I also expect the food people share with me and hope people will like my dish as well.

Above it found that people prefer to value the price of food in a simple and direct way which is food to food, labor to labor and money to money. When it is not a long-term cooperation, they do not really demand to get something in return. Whether they are willing to make new friends through sharing or not is various between different individuals. According to the interviews, I decided to simplify the rule.

Rule 8: Rule 8 is inspired by buffet. Everyone prepares a dish and put them in the public fridge the next day. I suggest them to cook a simple dish and let them count the time they spent on it. At lunchtime, they can use a part of their dish to swap a part of others. They decided what kind of dish (vegetables, meat, dessert, staple food) they were going to cook in advance.

In this rule, I found the choices become various. Cam even created a new dish by using different food, which is very delicious. Lyne also got a balanced dish through swapping. When they

gathered together, they can not wait to introduce their food to others. They communicated a lot (Figure 8).



Figure 8. Experiment record of Rule 8

6. Design Process

After experiments, I designed my first prototype of the system. The process is (Figure 9):

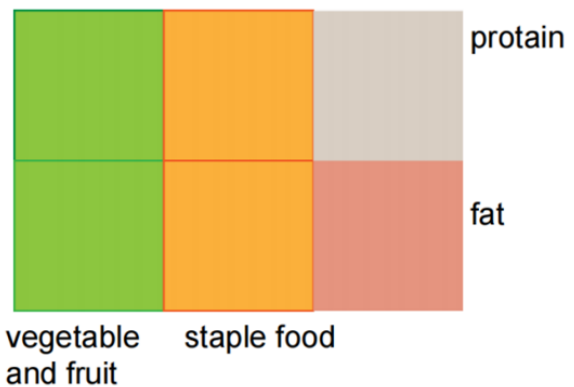
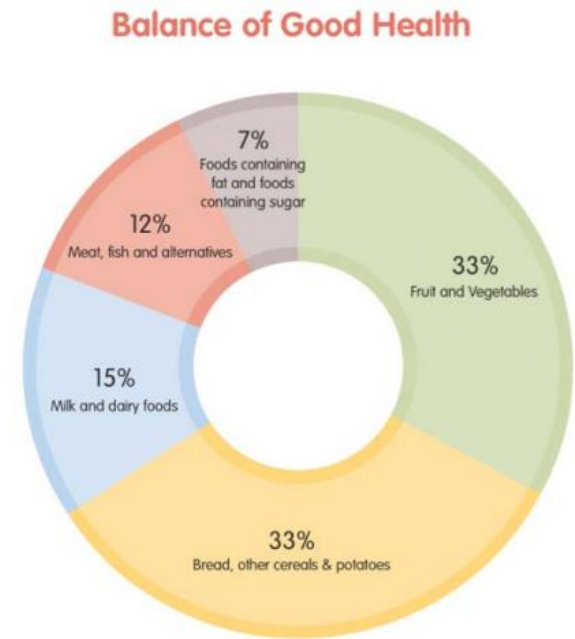
- a) get a task (a dish) and get public lunch boxes from the station, b) go back home and finish the dish, divide the dish into different portions and put them in lunchboxes, c) go to the station next day and put them in it, get points, d) at lunchtime, use points to exchange lunchboxes.

In this prototype, the lunchbox should be specially designed as it has to be easy-taken. I started to think about the concept of modified lunchbox and thought about different kinds of joints to group the small-scale lunchboxes. I divided a normal size of a whole meal lunchbox into 6 parts according to the Table 4 that shows the balanced proportion of different types of food.



Figure 9. The prototype of the system

Table 4. A balanced proportion (Food Standards Agency, 2006)



From my experiment, I found some people like to leave a message on their lunchbox, so I designed a space to put the message, which is also a joint to connect two lunchboxes. I also made different size of boxes for people to choose. (Figure 10)

Many people argued that the lunchboxes are too small when they saw them. They also suggested me that there must be a part of the box to be transparent as it is more convenient for them to see what dish is in it.

I have also considered about what the structure of the station might be like so that people can put and get their lunch efficiently (Brighthub Engineering, 2016). Without a good distribution of station and a classification of food, it is highly possible that the station will be in a mess as we can see from the Berlin fridge case.

Keeping food fresh is an important function of the station, as people suggested. So, I decided to design the station as a fridge.

This fridge prototype is designed according to the home-used fridge. I asked my volunteers to pretend to select a lunchbox. I found they were hard to get the lunchboxes deeply inside. They had to take out some boxes out, which made the inside space a mess. (Figure 11)



Figure 10. The prototype of lunchbox



Figure 11. The test of original fridge prototype

The structure of the compressor fridge shows that it needs a large space to store the compressor. I measured the compressor size of the fridge in my kitchen and made a prototype according to that.

I changed the size of lunchbox and use four as a group. The size of the fridge was designed according to the lunchbox, which can allow at least 8 people share their lunch together (32

lunch boxes). I divided the space into four parts: meat, vegetable, staple food and snacks.

From the prototype, I found the space of the fridge can not be distributed efficiently as one third of the fridge is the compressor. After that, I found semiconductor freezer is small and cheap, so I deconstructed one, saw the structure of it and made a prototype of fridge. A semiconductor fridge is not as strong as a compressor fridge, but it is enough to keep food fresh. (Figure 12)

The second interface prototype (Figure 14) has been improved from the first one (Figure 13). The tasks I let people to choose has been reduced into four: meat, vegetable, staple food and snack. The first prototype can be downloaded and try from <https://www.flinto.com/p/54b52fa4>.

However, when I let people try this prototype, people asked me a lot of questions, such as 'If I shared a mixed food, where should I put my lunchbox?', 'What if I really want to eat Lisa's food, how can I find it?', 'What if I have not decided what food I am going to cook when I choose the task?' etc.

In order to make the system more flexible, I gave up letting people get a task a day before. I focused more on how to let people know the details of food in the fridge. People can get the food they like according to the cook and type. I changed the four types into meat, vegetable, staple food and others.



Figure 12. Exploration of the fridge structure

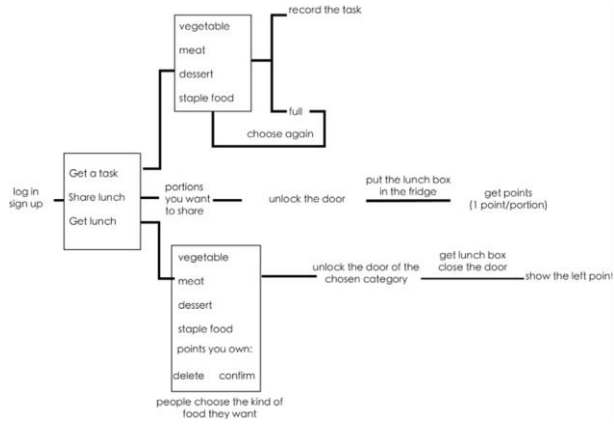


Figure 13. Prototype 1 of the interface

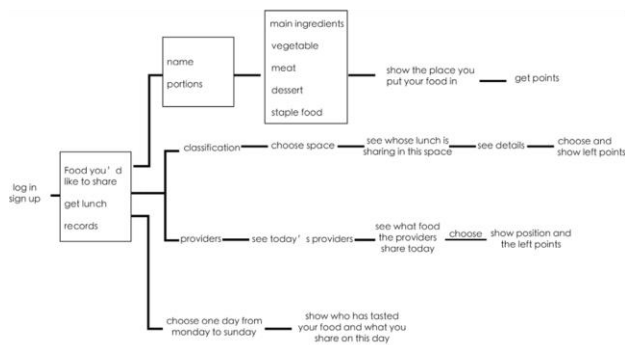


Figure 14. Prototype 2 of the interface

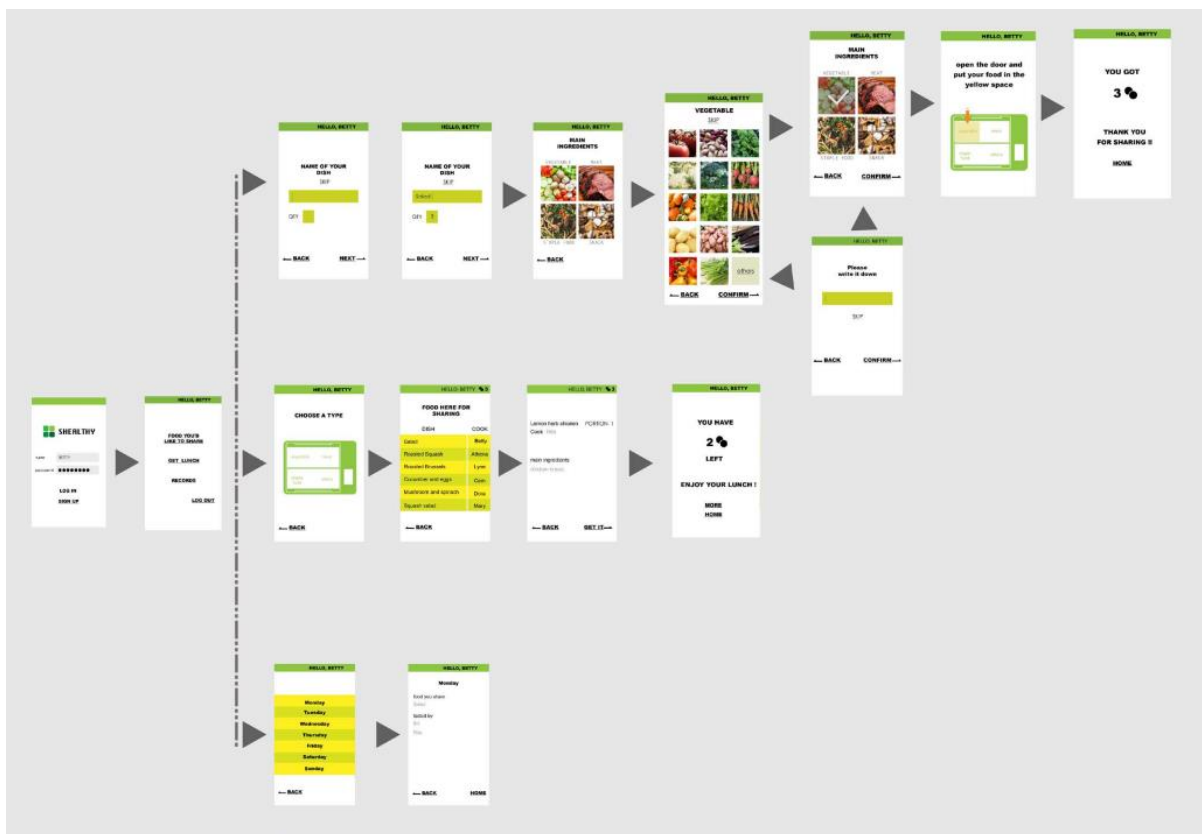


Figure 15. The final interface prototype

I have implemented a 'record' module to track the individuals who have accessed their respective lunchboxes (Figure 16). The updated prototype can be accessed at: <https://www.flinto.com/p/6d8adb02>.

In response to user feedback, I have reduced the number of lunchboxes to four and increased their dimensions to create a more cohesive unit. Instead of using joints, I have introduced a tray to connect the four lunchboxes, and redesigned the message placement structure. However, users found this design too intricate. Consequently, I have integrated a clip and handle structure to simplify the process while maintaining functionality (Figure 17).



Figure 16. Exploration of the lunchbox design



Figure 17. The SHEALTHY system

You can see how SHEALTHY works (Figure 17) at this link: <https://youtu.be/z-QoUBWrpxA>

7. Summary

Regarding the system, there are still possibilities of misuse by people. There are additional concerns about food security, such as allergens like peanuts, which should prompt people to label their food. Processes like listing the main ingredients, which I believe is important, may require more patience from people. There are still many potential issues in the system. To test it, I plan to find a professional coder to assist me and allow people to try it out in order to improve the details.

I have endeavored to design the refrigerator to assist individuals in organizing their food. However, it is challenging to completely prevent mishaps. While a real-name system may theoretically mitigate certain hygiene issues, it cannot eradicate them entirely. Effective management of the refrigerator is imperative for

the system to operate optimally.

The lunch box serves as a standard for portion control; however, individuals may be reluctant to partition their meals and transfer them to the lunchbox on a daily basis. I am contemplating a solution involving the amalgamation of smaller lunchboxes into a larger unit that demonstrates portion sizes on a graduated scale. Nevertheless, it is imperative to initially encourage individuals to trial the system using their existing lunchboxes, as fostering participation is currently the primary objective.

References

- Anon, (2016). [online] Available at: <https://apps.facebook.com/fridgematch/> [Accessed 16 Aug. 2016].
- BrightHub Engineering. (2016). Domestic Refrigerator Parts: How Does the Refrigerator Work?. [online] Available at: <http://www.brighthubengineering.com/hvac/66729-domesticrefrigerator-parts-and-their-working/> [Accessed 16 Aug. 2016].
- Carculator.net. (2016). Automedia > Home. [online] Available at: <http://carculator.net> [Accessed 16 Aug. 2016].
- Davies, Anna R. (2014). "Co-creating sustainable eating futures: Technology, ICT and citizen-consumer ambivalence." *Futures*, 62, 181-193.
- Food hacking Workshops. (2011). Food hacking workshops in Singapore in 2010-2011. <http://diybiosingapore.wordpress.com/2011/02/13/food-hacking-2011-singapore/>
- Food Standards Agency. (2006). Healthy-eating Guide for Employees. London: LONDON UNDERGROUND LIMITED, p. 8.
- Hearn, Greg, et al. (2014). "Using communicative ecology theory to scope the emerging role of social media in the evolution of urban food systems." *Futures*, 62, 202-212.
- Kera, Denisa, and Nur Liyana Sulaiman. (2014). "FridgeMatch: Design probe into the future of urban food commensality." *Futures*, 62, 194-201.
- Lifehacker.com. (2016). [online] Available at: <http://lifehacker.com/how-i-broke-myaddiction-to-takeout-and-started-cooking-476039932> [Accessed 16 Aug. 2016].
- Marshall, Aarian. (2016). "Berlin's public refrigerators were just declared a health

hazard." City Lab, 12

Scambiacibo.it. (2016). S-Cambia cibo. [online]
Available at: <http://www.scambiacibo.it/>
[Accessed 16 Aug. 2016].