Build your food city

Engaging young adults to record and understand their eating beavior

Master Thesis
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easyJet

Acknowledgement

In front of you is the thesis of Master Design For Interaction at the faculty of Industrial Design Engineering in Delft University of Technology. When looking back to the project, it can’t be possible without so many people’s support and encouragement in this special period when we are all troubled by COVID19.

First, I would like to thank my supervisor team, thanks to my great supervisors Natalia Romero Herrera and Boudewijn Boon for supporting and guiding me through this project. I will always remember when I was under high stress due to physical reasons, you told me that you were there to support me in whatever I was needed. Thanks for sharing knowledge with me and encouraging me to think more and do better step by step.

Then I would like to thank my fellow students who participated in the interviews and creative session. It is a pleasure to exchange inspirations and share the mood with you.

Last but not least, I would like to thank my lovely family, thanks to my parents to give me unconditional support during all these years.

Glossary

Personal informatics system
Personal informatics system is a classic system that helps people collect and reflect on personal data. (Li, I., Dey, A., & Forlizzi, J. (2010, April).

Self-monitoring
Self-monitoring is a concept that shows how people monitor their self-presentations, expressive behavior, and nonverbal affective displays.(Day acher, 2009)

EXECUTIVE SUMMARY

The following report outlines a design project about self-tracking, a food diary app, with the goal of encouraging young adults to record and understand their eating behaviour. The project was executed for the graduation course, as part of the Master's program at the Faculty of Industrial Design Engineering at TU Delft.

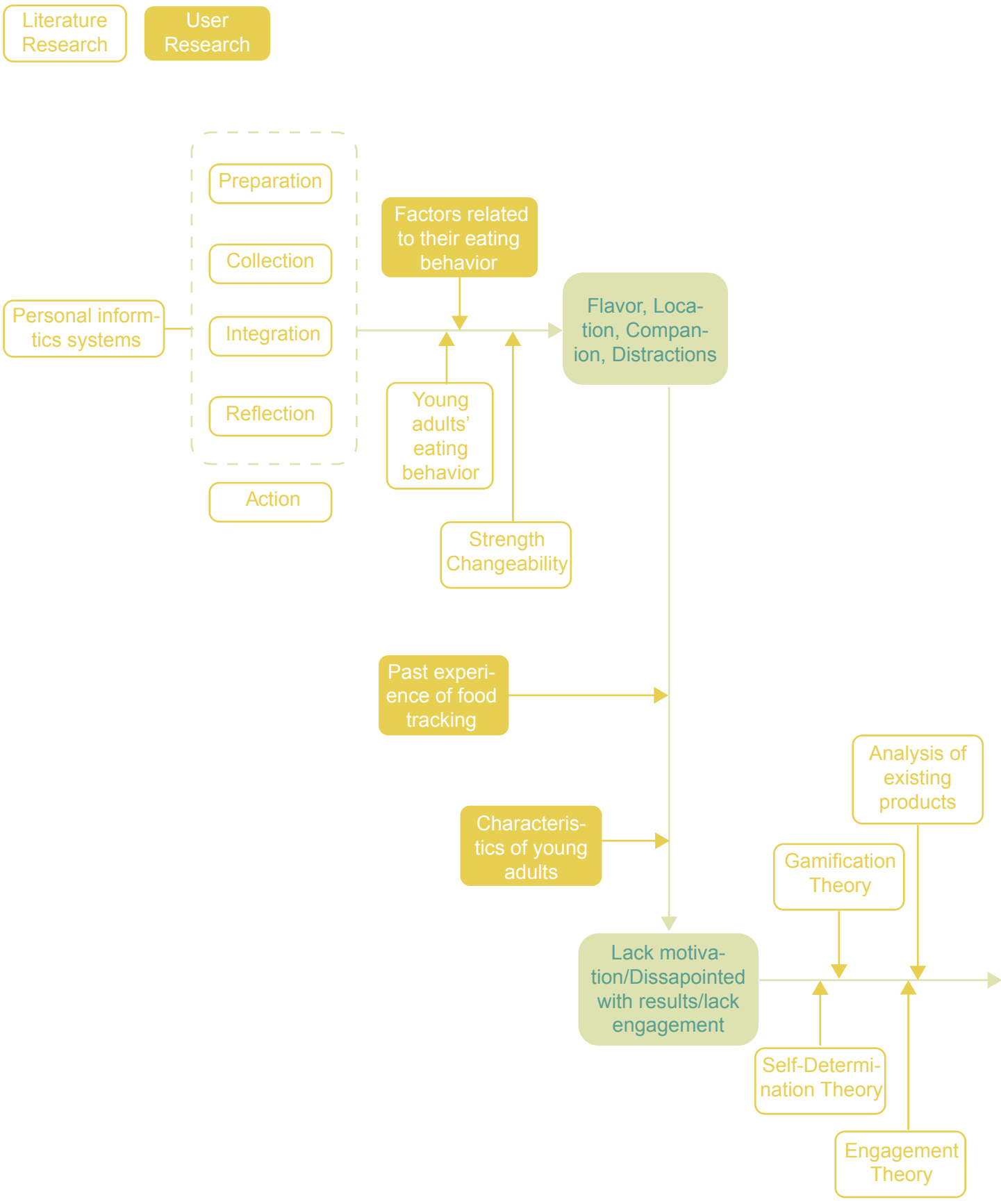
This report begins with an introduction to the project, including the background of self-tracking, assignment and approach. The design will focus on young adults who live alone and work full time.

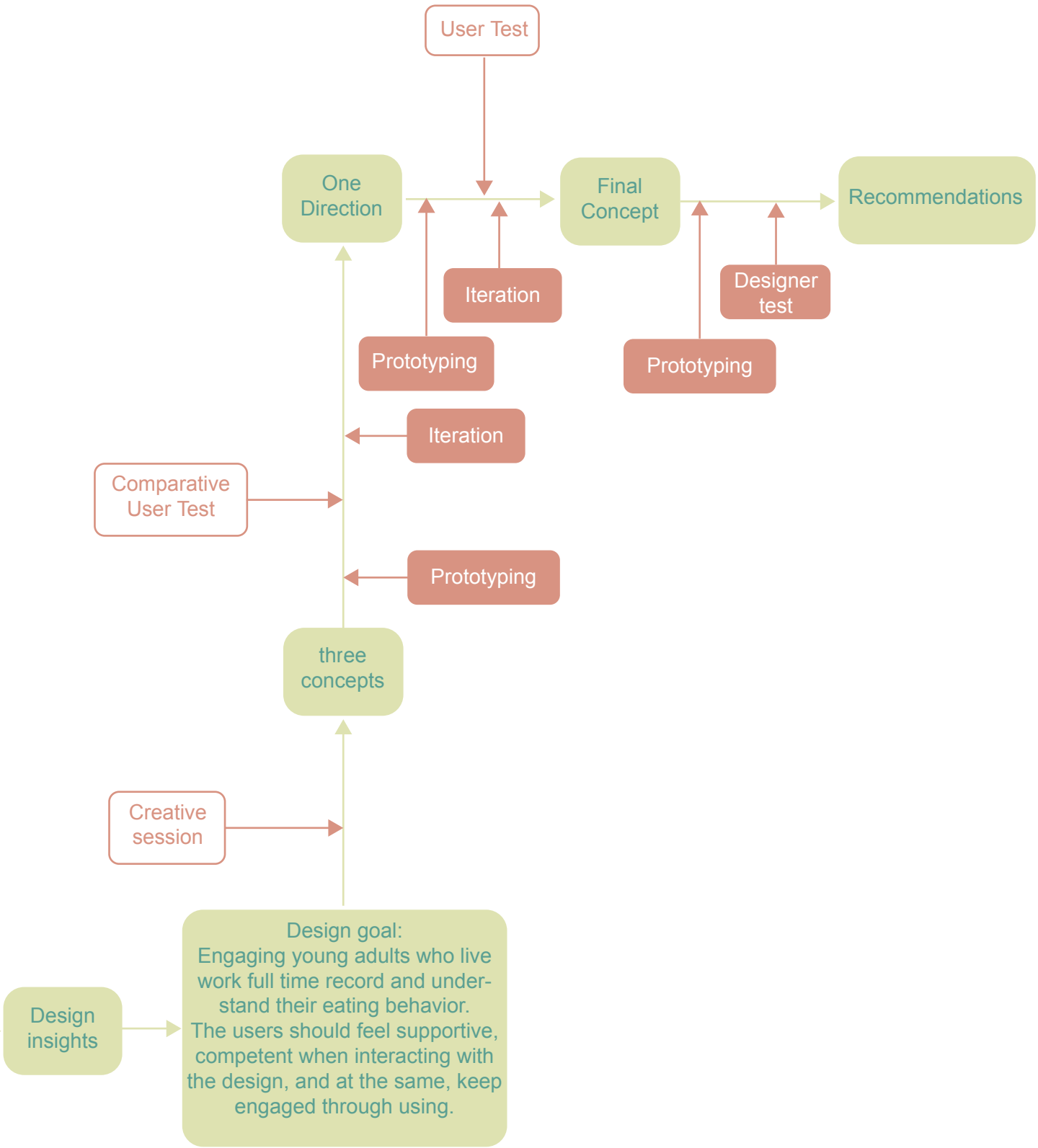
Next, from the literature research and user research, insights were drawn on the current experience of using food-tracking tools. Self-Determination Theory and Gamification Theory were applied to help with analyzing the user characteristics and contextual factors. Based on research, the design goal was formed:

Engaging young adults who live alone and work full time to record and better understand their eating behaviour.
Users should feel supported and competent when interacting with the design, reporting the food-related data without pressure and unpleasant feeling, and at the same, keep engaged through using.

Based on this goal, I next explored the solution space, narrowing it down to three possible concept directions that would take the redesign in three different extreme directions. Evaluations for all three tests were conducted with seven participants. The results showed that a combination of various elements from the three concepts should be used for the redesign in order to optimize the user experience.

Next, after a redesign workshop and a cognitive walkthrough, the final concept was detailed and a high-fidelity prototype was created. This prototype was evaluated in a user test with six participants. The results demonstrated the strength of many of the design decisions, while also showing areas of improvement; such as the need to better guide the user when choosing their weekly goal. The recommendations and limitations were discussed as well in the end.


Literature Research
User Research
Preparation
Collection
Integration
Reflection
Action
Personal informtics systems
Factors related to their eating behavior
Young adults' eating behavior
Strength Changeability
Flavor, Location, Companion, Distractions
Past experience of food tracking
Characteristics of young adults
Lack motivation/Dissapointed with results/lack engagement
Analysis of existing products
Gamification Theory
Self-Determination Theory
Engagement Theory


User Test
One Direction
Final Concept
Recommendations
Iteration
Designer test
Prototyping
Prototyping
Iteration
Comparative User Test
Prototyping
three concepts
Creative session
Design goal:
Engaging young adults who live work full time record and under-stand their eating behavior.
The users should feel supportive, competent when interacting with the design, and at the same, keep engaged through using.
Design insights

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"When I was in college, I often saved money to go to a restaurant called "Xibei Noodle Village" as a reward for my hard work. However, now, I seem to be rich enough to eat this restaurant often, but I don't have friend to eat with me." (Lucas)

1. Introduction

This chapter is introduced from the background of the project, on why I choose this context. The assignment was described together with two main research questions. Based on the assignment, the project scope was formulated.

1.1 Background

Monitoring food intake is important, because the fact that the process of behaviour recording produces a change in behaviour itself (Miltenberger, 2011), and good eating behaviour is an essential part of a healthy lifestyle. To support self-tracking, increasing interest has gone to self-monitoring apps for dietary intake, often called ‘food diary apps’. There is now a range of such apps available on the market. However, it is quite difficult to initiate and maintain such a practice in everyday life. There are some examples of reasons to explain these situations. Firstly, new potential users are unfamiliar with PI technologies and may not know exactly what kind of efforts they may require and benefits they may provide. Secondly, many people do not have a specific goal to start self- tracking. Thirdly, This repetitive behaviour of recording daily diets can make people lose freshness and interest after a period, which makes it difficult to persist (Rapp & Cena, 2016).

Thus, an opportunity for improving food intake monitoring is focused on "engaging users ". O'Brien introduced a proposed model of engagement and its attributes, and this model provides an opportunity for novel design of self- reporting strategies addressing the what is relevant and how is attractive to report about eating choices. Based on this theory, such user engagement could be achieved in various ways. For example, design for aesthetics could attract people to initiate practice; design for usability could give user support and control, as users that feel in control are more likely to feel engaged(O’Brien et al, 2018); design for playful interactions could keep users fresh compared with repetitive log; design for a connection could also attribute, as exchanging data with friends may increase users’ motivation(Toscos et al, 2006). This project will explore how food diary apps can engage the user when monitoring their food intake, particularly young adults who study or work full time. Young adults between the ages of 18–25 are in a period of ‘transition’ from adolescence to adulthood, and there is a steadily increasing trend of obesity among them(Anderson et al., 2003). The transition is seen as a time of displacement, makes young adults vulnerable to energy imbalance, which often lead to weight gain, This phenomenon may not be concerning at the time but later accumulates. Meanwhile, people who work or study full time are more likely to neglect their diet because of their busyness or nervousness.

1.2 Assignment

As mentioned earlier, recording eating behaviour is a very meaningful process because it will produce a change in behaviour itself. With the development of smartphones, food diary app is a good choice for people to collect food data. However, this tool has achieved little success in engaging young adults in active self-reporting.

This design project aims to explore the current food-tracking experience performed by young adults and to come up with an app that focuses on engaging young adults to record and understand their eating behaviour. There are two main research questions:

What are young adults values when deciding what to eat?

What engaging strategies serve for them to self-report eating behaviour in a sustained way?

1.3 Approach

The design project applied the “Double Diamond” model developed by the British Design Council in 2005. The phases of divergence and fusion are integrated in the design process. It includes four main phases: discovery, definition, development and delivery. it includes four main phases: Discover, Define, Develop and Deliver. (Design council, 2005). The aim of literature research and user research conducted in the discovery phase is to uncover the unmet needs of target users when using the current tools to track their food intake, as well as locate the opportunities as the foundation for the Develop Phase.

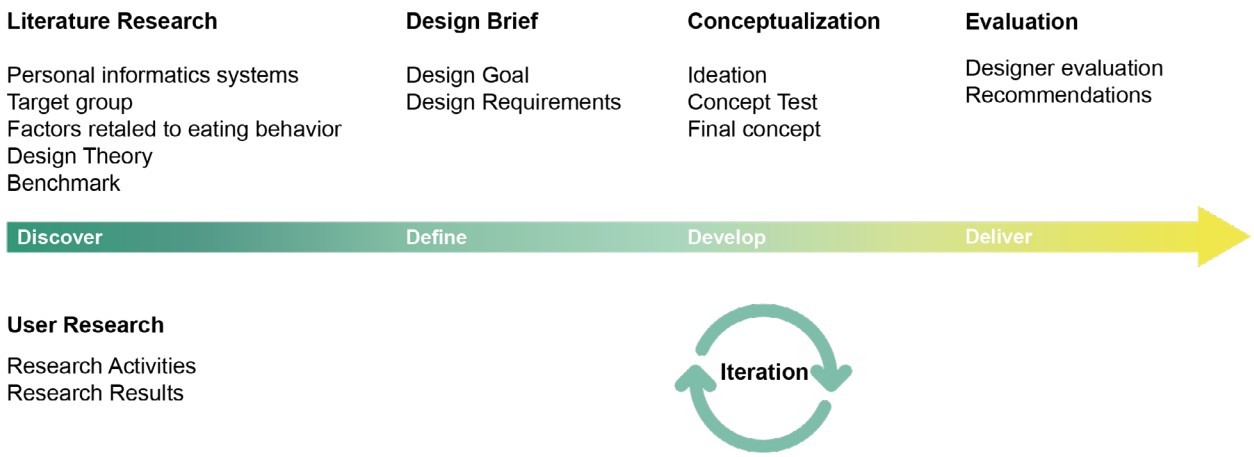
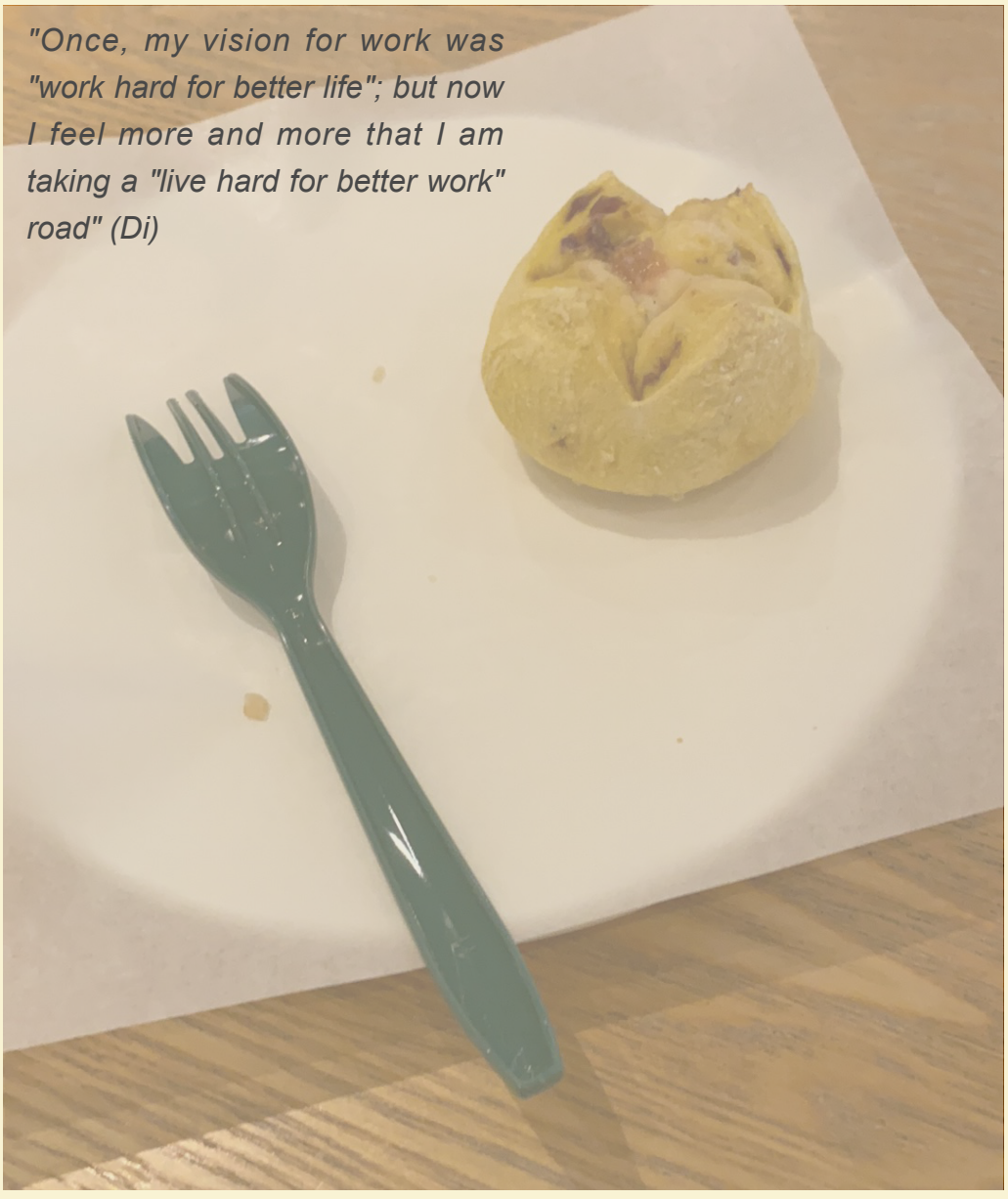


Figure 1: Project scope applied the "double diamond" model


"Once, my vision for work was "work hard for better life"; but now I feel more and more that I am taking a "live hard for better work" road" (Di)

2. Literature Research

Literature research in this chapter includes the basic knowledge of Personal informatics systems, to understand design challenges and opportunities; the characteristics of the target group(young adults), and the factors related to young adults' food choices, to see what kinds of factors are important for the target group to record; theories like self-determination theory, user engagement theory and gamification, to inspiration for the engaging strategies. In the last part of this chapter, benchmarking was made on the food tracking applications currently available on the market. The results will be combined with user research to come up with a design brief.

2.1 Personal informatics systems

The project is about designing a food diary app, which is one kind of personal informatics system. Therefore, it has the commonality of PIS. It is necessary to look at what personal informatics system is and how does it work. In addition, to have a basic understanding of design challenges and opportunities about PIS.

2.1.1 Definition

Personal informatics systems are commonly defined as “those that help people collect personally relevant information for the purpose of self- reflection and gaining self-knowledge” (Li et al., 2010, p. 558) This definition emphasizes the main hope these technologies seem to bring to users: improving lives on the basis of regaining self-understanding.

2.1.2 Background

Collecting personal data and reflecting on it have a long history. For medical and clinical purposes, the self-monitoring system has been used for many years under the guidance of a therapist or doctor (Elliot et al., 1996). Nevertheless, since the beginning of the 20th century, self-tracking technologies such as weight scales have been transferred from the doctor’s office to the family, from the form of professional medical knowledge to private habits and daily family discipline. (Crawford et al., 2015); Since its appearance in the commercial market in the middle of the last century, other instruments such as pedometers have been used privately to meet fitness goals (Tudor-Locke and Bassett, 2004). These days, thanks to ubiquity and advances in wearable technology, PIS can now attract a larger audience of users. (Rapp & Cena, 2016).

2.1.3 A stage-based model of PI

In this project, my purpose is to engage young adults to record and understand their behaviour, rather than change their habits. Thus I want to understand the different stages of PIS and gain knowledge about stages related to my design scope.
The model consists of five stages (Figure 2): preparation, collection, integration, reflection and action.

The preparation phase occurs before people start collecting personal information. This stage is related to people's motivations for collecting personal information, how they determine what information will be recorded and how to record it. The obstacles in the preparation phase are related to determining the information to be collected and the collection tools to be used. Some people stumbled upon tools and these tools prompted them to start collecting.

The collection phase is the time when people collect information about themselves. At this stage, people observe different personal information, such as inner thoughts, behaviors, interaction with people and their surroundings. People encountered some obstacles during the collection phase. Many problems are due to the tools used to gather information. Some problems occurred because of the user, either because they lacked time, lacked motivation, or they did not remember to collect information. . Other problems are related to the data: 1) The data may rely on subjective estimation; 2) The data may rely on subjective scoring and there is no standard for inputting data; 3) The data may be difficult to find.

The integration stage is expressed as the distance between the collection and reflection stages. The distance depends on how much effort the user has to put into

preparing the collected data for the reflection stage. Integration barriers prevent users from transitioning from data collection to data reflection. When the collected data comes from multiple inputs, the reflection of the data will appear in multiple outputs, and the format of the collected data is different from the format required for reflection, and users will encounter these problems.

The reflection stage is when users reflect on their personal information. This stage may involve viewing a list of collected personal information or exploring or interacting with information visualization. Users can reflect on their own information immediately after recording the information (short-term) or after a few days or weeks involving extensive self-reflection (long-term). Short-term reflection is valuable because it allows users to know their current status. Obstacles in the reflection phase prevent users from exploring and understanding information about themselves. These problems are due to lack of time or difficulty in searching, exploring and understanding information.

The action stage is the stage where people choose what to do based on new discoveries. Some people reflect on information in order to track their goals. By understanding their information, people can adjust their behavior to achieve their goals. Some systems warn users to take action. Most systems have no specific recommendations for the next step, which hinders applying understanding of personal information.

What does it mean for my project?

This model shows different stages of PIS and barries at different stages, and good PIS requires a smooth transition in all stages, but most of the food diary apps on the market have not solved these obstacles. For example, in many food recording apps, users will encounter common problems such as not knowing how to calculate the amount of food and how to enter a specific ingredient in the "collection" step. These barries will hinder the engaging experience. Therefore, these barriers cascades are what I need to consider in my subsequent design. To have a good iteration.

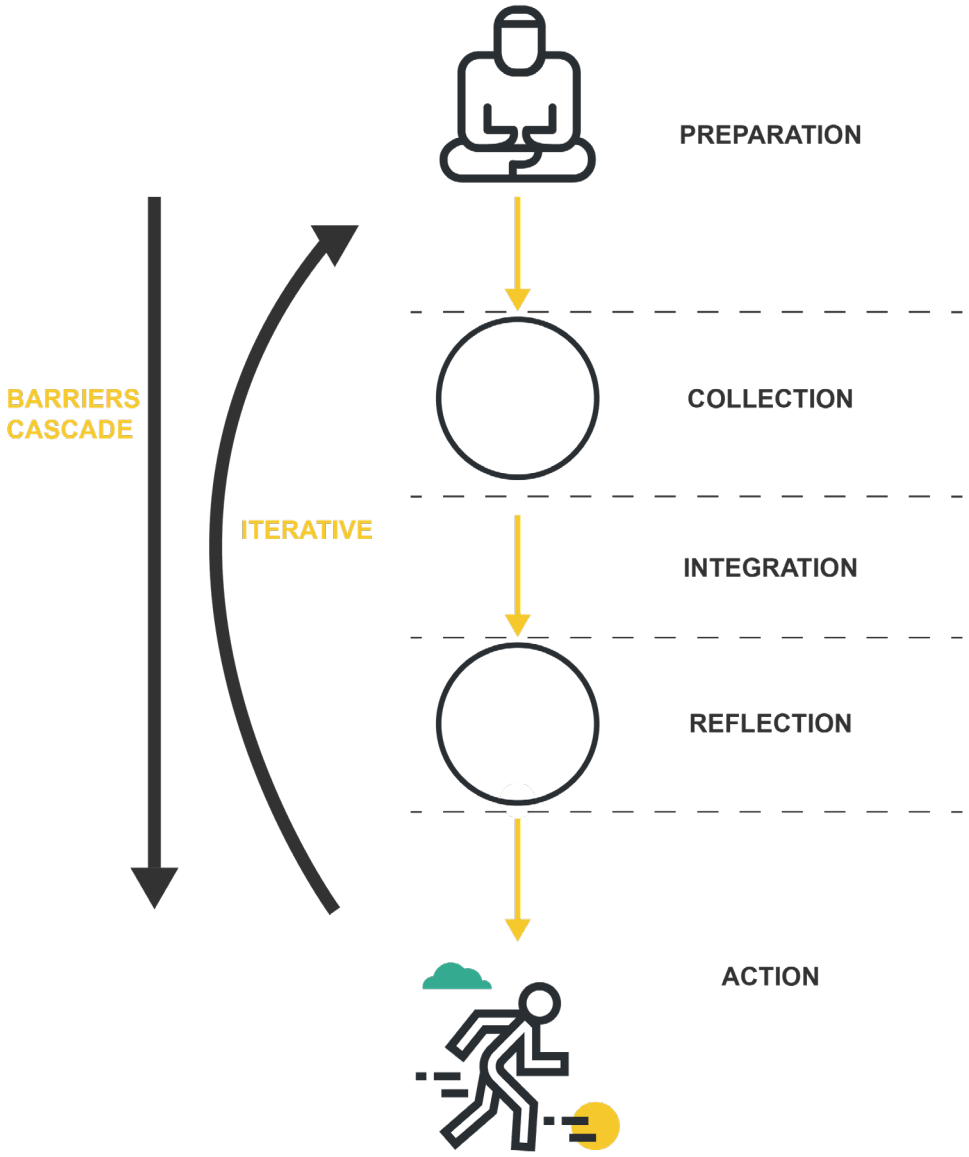


Figure 2-1: A stage- base model of personal infomatics system

2.1.4 Advantages & Challenges

The PI system allows individuals to track data anytime and anywhere, thereby improving self-monitoring behavior, which may trigger self-reflection and trigger the process of behavior change (Rapp et al., 2018), and self-monitoring usually changes behaviour, and this change usually moves toward Ideal direction development (Miltenberger, 2007). For example, many people use daily fitness records to complete their weight loss goals, and some people who suffer from insomnia can make some sleep adjustments by recording their sleep conditions and time. PI tools can also help people see themselves in novel ways and support them to find their own goals and "happiness" ways based on their particularities (Rapp & Tirassa, 2017). In addition, digital self-tracking devices provide a way to clarify the human body and self-operation (McCluskey, 2009). Data from self-tracking systems provide greater insights than information observed from people's perceptions.

It should be emphasized that the data collected by most PI tools is isolated (Rapp and Cena, 2014).This limits their applicability because it narrows the vision on the user's 'self', by focusing on separated aspects of her life (Rapp and Tirassa 2017).On the other hand, the current model of how people use personal informatics systems is mainly based on behavior change goals. They do not fully describe the characteristics of people who have different goals of integrating self-tracking into their daily lives. Moreover, many people lack long-term self-tracking engagement. A study highlights that only one-third of Americans who bought trackers after six months gave up trackers (Ledger and McCaffrey, 2014).

What does it mean for my project?

PIS is facing obvious challenges, these challenges will guide my design in the follow-up.

1.The data that most PI systems collect are siloed, which makes people focus on separated aspect. - Discover and connect related data

2. Most PIS is based on behaviour change goals, do not adequately characterize the integration of self-tracking into everyday life by people with varying goals. - Gain knowledge of characteristics of the target group and their behaviour.

3. Many people lack engagement for long-term self-tracking. - Make people engaged.

2.2 Young adults and food behavior

As the target group in this project is young adults who study or work full time, which is accessible, user-specific knowledge will be gained through interviews, questionnaire and so on (chapter 3). The desk research of the target group is mainly to gain a macro understanding of this group and to find some inspiration for the further design direction. The research questions here are: 1.What is the eating habits of young people; 2.What kinds of data are relevant and meaningful for the target group in managing food behaviour?

2.2.1 Risk of obesity in young adults

Young adults are generally people ranging in age from their late teens or twenties to their thirties. Young people between the ages of 18-25 are in the "transition period" from adolescence to adulthood, and the trend of obesity among young people is steadily increasing (Anderson et al., 2003). Many young adults have undergone major changes in their lifestyles, such as leaving home, going to college/university, starting work, developing relationships, getting married, maybe getting pregnant and raising children. These transitions are regarded as periods of displacement, and young people feel “lost” and “stopped” when they leave their familiar environment and start a new business. At these critical moments in life, young people are susceptible to energy imbalances, which often lead to weight gain. You may not have to worry at the time, but it will gradually increase. It is well known that the interaction of social, psychological, and biological factors that occur during these transition years may make them vulnerable to many risk-taking behaviors, and the positive and negative health behaviors established during this transition to adulthood tend to lasting. In life, so this is a key stage in a person's life. This is also a period of obvious inequality of opportunity. For those who are already vulnerable, the transition period is particularly dangerous (Poobalan & Aucott, 2016).Young people in Western countries gain weight faster than their parents, and are more likely to gain weight than young people in any other age group (Munt et al., 2017). According to a study of 738 college students aged 18 to 27 in the United States, more than 69% of participants reported less than 5 servings of fruits and vegetables per day, and more than 67% reported less than 20 grams of fiber per day. In addition, the obesity of young people is very serious, even affecting their current physical health (Huang et al., 2003).

2.2.2 Factors related to food behavior

This section will study the factors that influence the food choices of young adults, These factors can answer the following research question: "What data are meaningful and relevant for young adults in managing food behavior?

Internal factors

The main driving factor of diet is of course hunger, but the food we choose to eat is not entirely determined by hunger. Internal factors related to food behavior include biological determinants and psychological determinants. (Figure 3) These internal factors will not only affect people's choice of food types, but also affect consumption.

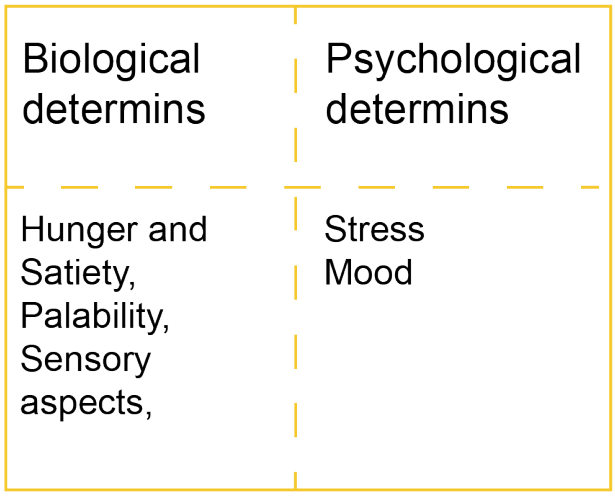


Figure 2-2: Internal factors related to food behavior

Environmental factors

The environment can be organized into the eating environment and the food environment(see figure x). The eating environment refers to the ambient factors related to the eating of food, but which is independent of food itself, such as the atmosphere, effort to obtain food, social interactions that occur, and possible interference.On the contrary, food environment refers to factors directly related to the way food is provided, such as the distinctiveness, structure, packaging or serving size of the food, whether it is stored and how it is provided. Environmental factors affect the number of food people eat more than the type. (Wansink, 2004)

determining leverage points for interventions

One of the main reasons for trying to determine the forming factors of emerging adults' dietary behavior is to find interventions. When determining the leverage point of intervention, health promotion experts should always consider not only the strength of the relationship between factors and results, but also the variability of factors, because this is a key aspect in determining whether it is suitable as a potential intervention target. (Stok

et al, 2017) According to Stok and Larson, more upstream factors (such as environment and policies) seem to be feasible, variable entry points for intervention, but these types of factors have been largely ignored in previous research work. The stock researched food-related factors (Stok et al., 2018) and found 18 articles describing the original findings of factors related to dietary behavior (changes) during the transition period between adolescents and adults. One hundred and five different factors are described in these articles. Most of the factors (64%) identified in the eighteen articles are personal factors. Among these personal-level factors, most of them are psychological factors, so these factors clearly and consistently become the driving factors of eating behavior in adulthood. At the level of interpersonal relationship, product environment and micro environment, almost no factors were found, and at the meso/macro environment and policy level, almost no factors were found.

What does it mean for my project?

- Internal factors, including biological and psychological determinants, and environmental factors are relevant in managing food behaviour.
-When determining the leverage point of intervention, we should always consider not only the strength of the relationship between factors and results, but also the variability of factors,
- Environmental factors are changeable entry points for intervention, which is meaningful in managing food behaviour for young adults.

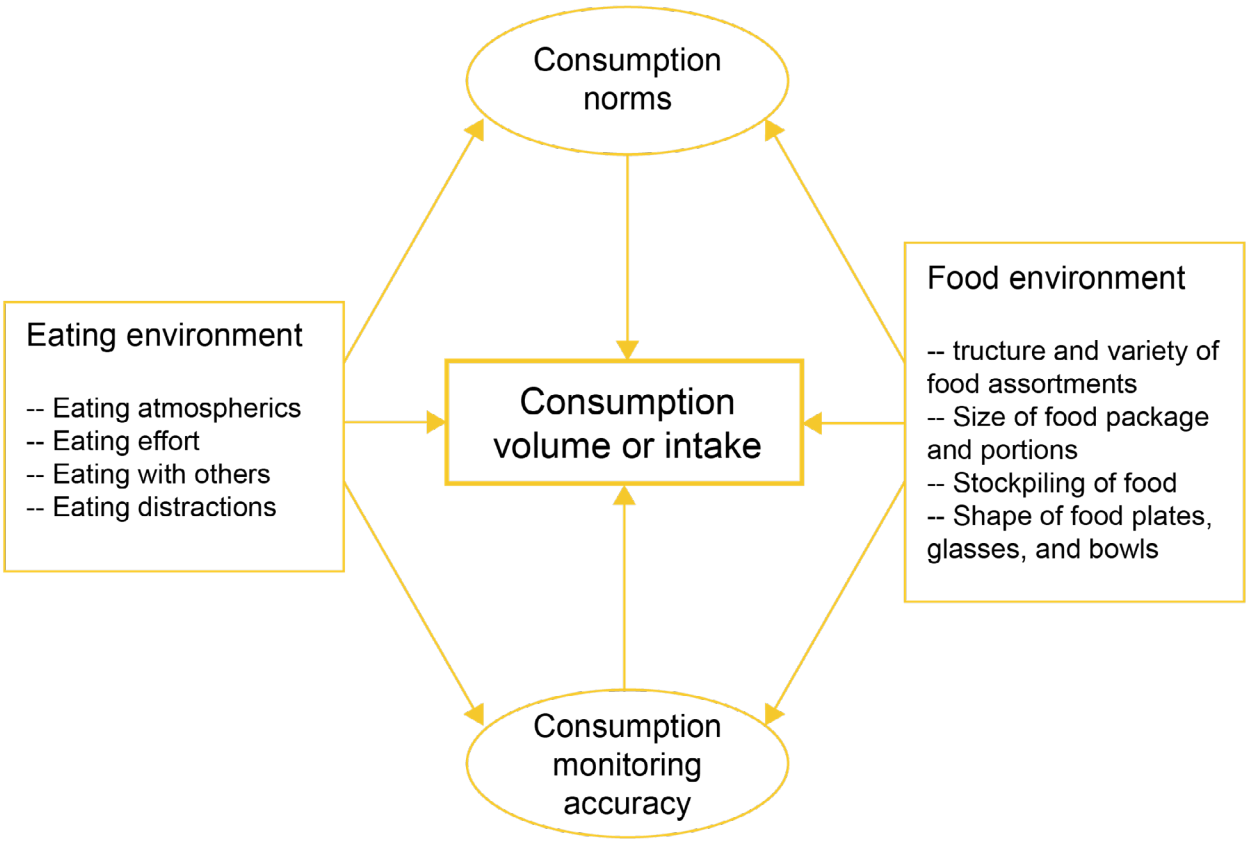


Figure 2-3: Enviromental factors influece eating behavior

2.3 Self-Determination Theory

Based on the user research, Target group in this project were disappointed with past recording experience and lack of motivation for recording their eating behaviour. Thus, theories related to motivation is chosen to help the design process. Self-determination theory is a theory of motivation and personality, involving people's internal growth trends and three innate psychological needs: autonomy, competence, and relatedness (Ryan & Deci, 2000). Competence reflects the need to feel volitional; Relatedness reflects the need to feel capable of achieving desired outcomes; Autonomy reflects the need to feel close to and valued by important others, to have a sense of belonging with peers, family, and community.

Motivation

Motivation is an important aspect of self-determination theory. The theory proposes a self-determination continuum, which ranges from amotivation to intrinsic motivation according to the level of self-determination. Intrinsic motivation is defined as the execution of an activity out of its intrinsic satisfaction, not out of some separable result. Extrinsic motivation is a structure that is applicable when completing certain activities to achieve certain separable results. Interest, enjoyment, and satisfaction can evoke intrinsic motivation, which is highly autonomous and keep for a long time. Moreover, extrinsic motivation can be enhanced by external rewards and punishments, which has low autonomy but can work for a short time. (Figure 5)

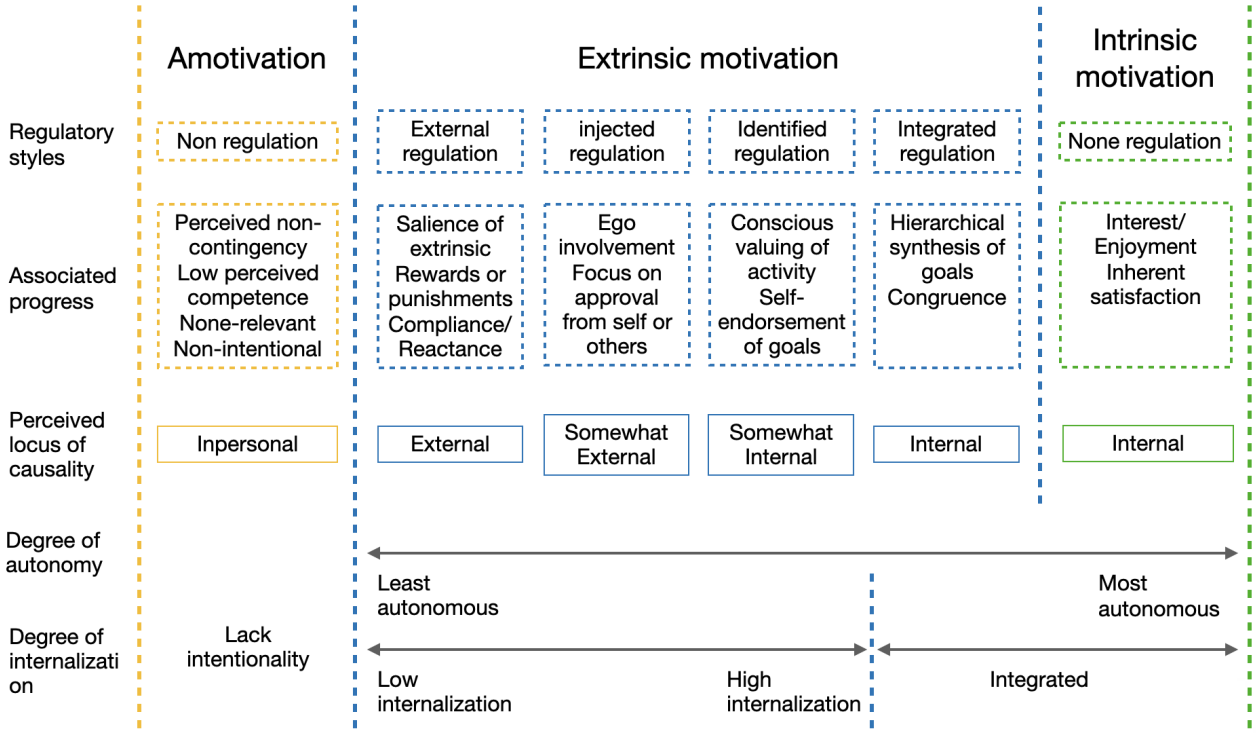


Figure 2-4: motivation theory

2.4 Theories of Engagement

2.4.1 User Engagement

Because my assignment is “Engaging young adults who live alone to record and understand their eating behaviour”, do some research on engagement could provide me with better direction and inspiration for the design phase.

Significance of user engagement

Kim, Paulos, and Mank- off (2013) identified two stages of how people adopt technology: in the first stage, interest, engagement and fun are the main motivations, whereas in a later stage the instrument is integrated into daily routines (Huang et al. 2015). User engagement is a quality of user experience characterized by the depth of an actor’s investment when interacting with a digital system (O’Brien, 2016). Moreover, engagement is more than user satisfaction: it is believed that the ability to engage and sustain engagement in digital environments can result in positive outcomes for citizen inquiry and participation, e-health, web search, e-learning, and so on. Figure 6 is the proposed model of engagement and its attributes.

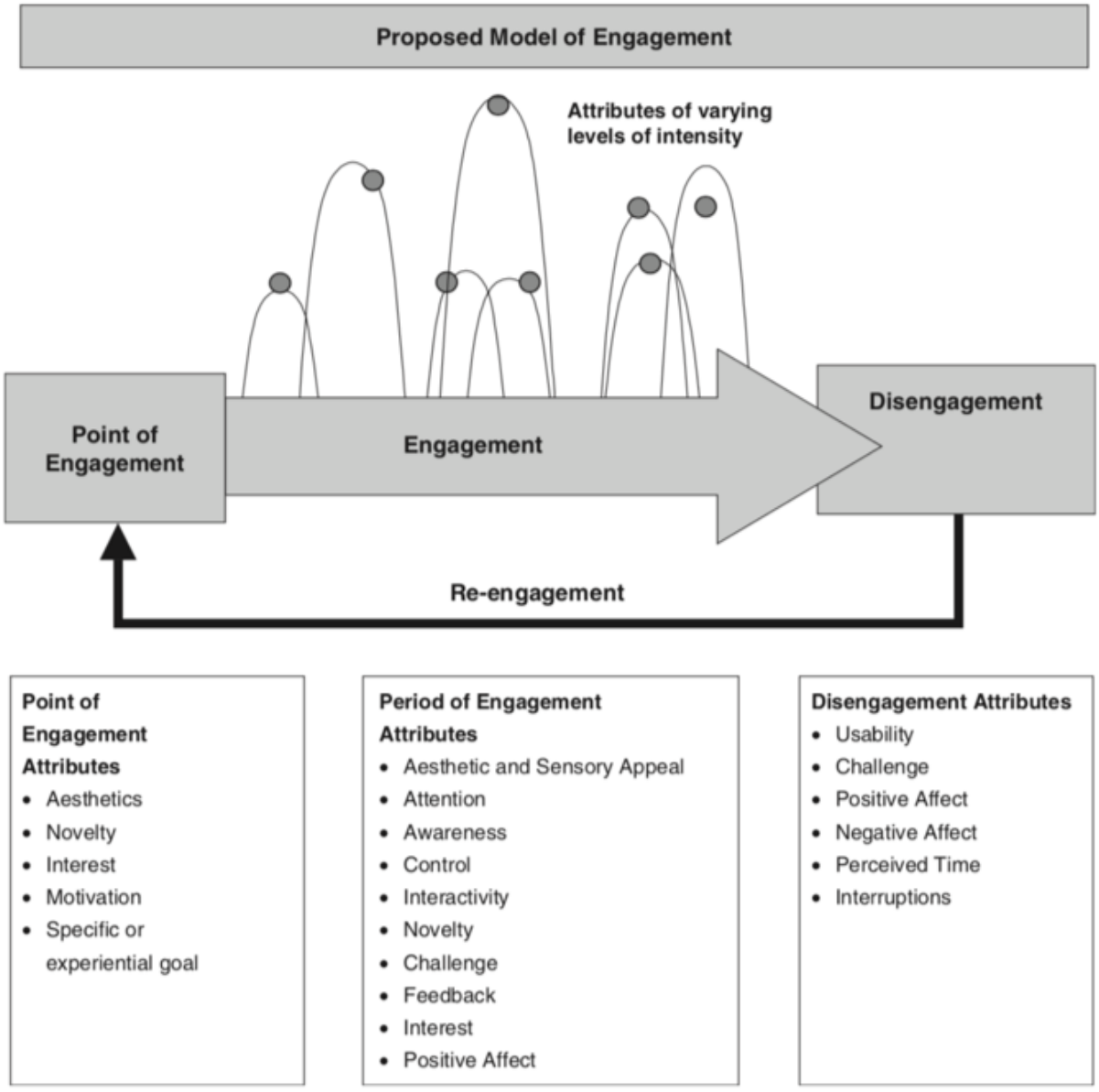


Figure 2-5: Proposed model of engagement and its attributes

User engagement factors

O'Brien introduced a survey to measure user engagement comprised of six factors: Perceived Usability, Aesthetics, Novelty, Felt Involvement, Focused Attention, and Endurability (O'Brien & Toms, 2010). Figure 7 is the path model of user engagement factors in interactive systems. This user engagement model provides an opportunity for the novel design of self-reporting strategies addressing what is relevant and how is attractive to report in relation to eating choices.

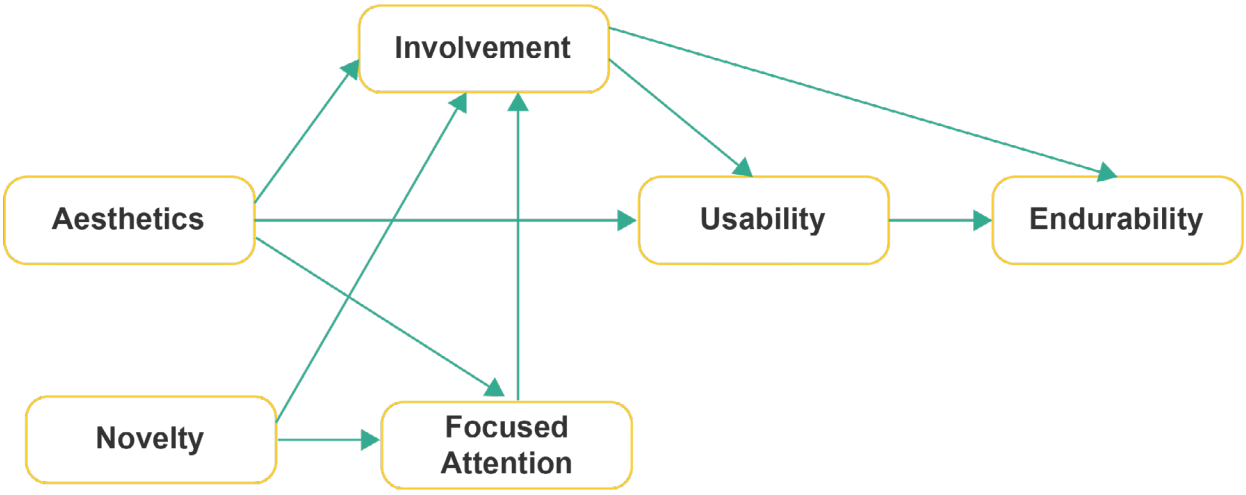


Figure 2-6: Path model of user engagement

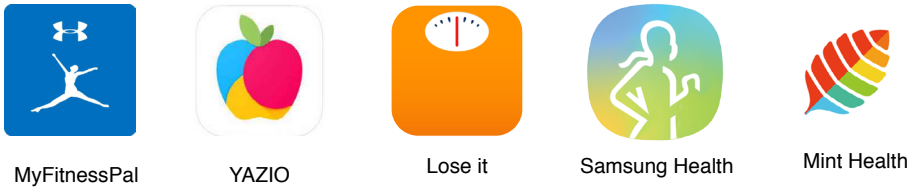
2.5 Benchmark

In order to have a basic understanding of the mobile applications currently available on the market and use them as the basis for the design phase, we first conducted research on representative food tracking applications to understand their workflow and typical functional features.

Workflow

After used 5 popular food tracking apps, I found that they all have the same workflow for new users. (figure 8)

1. Input body statistics (age,cheight and weight)
2. choose your recording goal(lose weight, contain weight, or gain muscle)
3. The system set the maximum calories for each day based on self-information and goal
4. Users record daily food intake, and obtain macronutrient decomposition and calorie calculation
5. User check self-progress (weight based) and goal completion.



Popular eating behavior self track apps on market

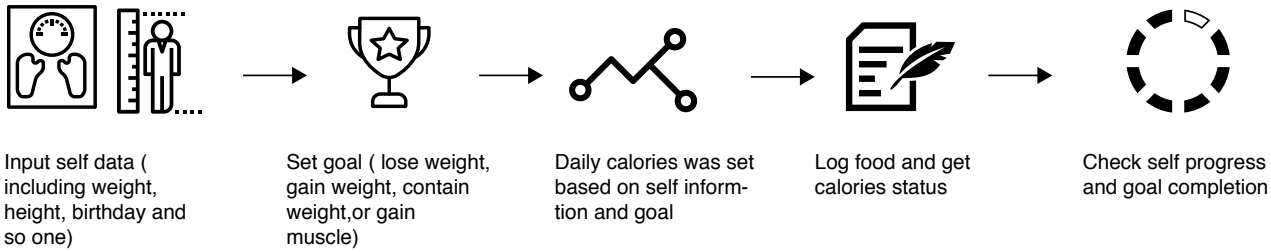


Figure 2-7, workflow of the app researched

Functional Features

The criteria are based on The most popular smartphone apps for weight loss: a quality assessment. (Chen & Cade, 2015) The six apps most frequently mentioned in user interviews were selected, and a benchmark analysis was conducted to see what features were contained. All of these apps mainly focus on weight management, include the function to record diet and food intake (self-monitoring). The overview of results in figure 9 shows that all these apps give users feedback and suggestions on diet. (Including Receipt and nutrients recommendation; They all try to simplify food input steps and provide multiple input methods, such as barcode scan, voice entry, search in the Prefabricated database; Reminders were used frequently to trigger users to record food intake every day; Social support and visualized behaviour change process could meet the need of relatedness and give users a feeling of achievement. These apps are all targeted on people who have clear report aim, such as weight loss, muscle gain, etc. However, These could only be effective for people who already had the motivation to lose weight or change eating behaviour, there was still a lack of persuasiveness fo young adults who do not have intrinsic motivation.

	BMI Formula	Energy Require-ment Calcular	Calorie Counter	Recom-mends intake nutrients	Recipes	Pictures of food	Calendar	Online social support	Remind-ers to log meals	Weight/en-ergy intake progress graphs or charts
Myfitnesspal	1	1	1	1	1	0	1	1	1	1
YAZIO	1	1	1	1	1	0	1	1	1	1
Lose it	1	1	1	1	1	0	1	1	1	1
Samsung Health	1	1	1	1	1	0	1	1	1	1
Mint Health	1	1	1	1	1	0	1	1	1	1
Myplate	1	1	1	1	1	0	1	1	1	1

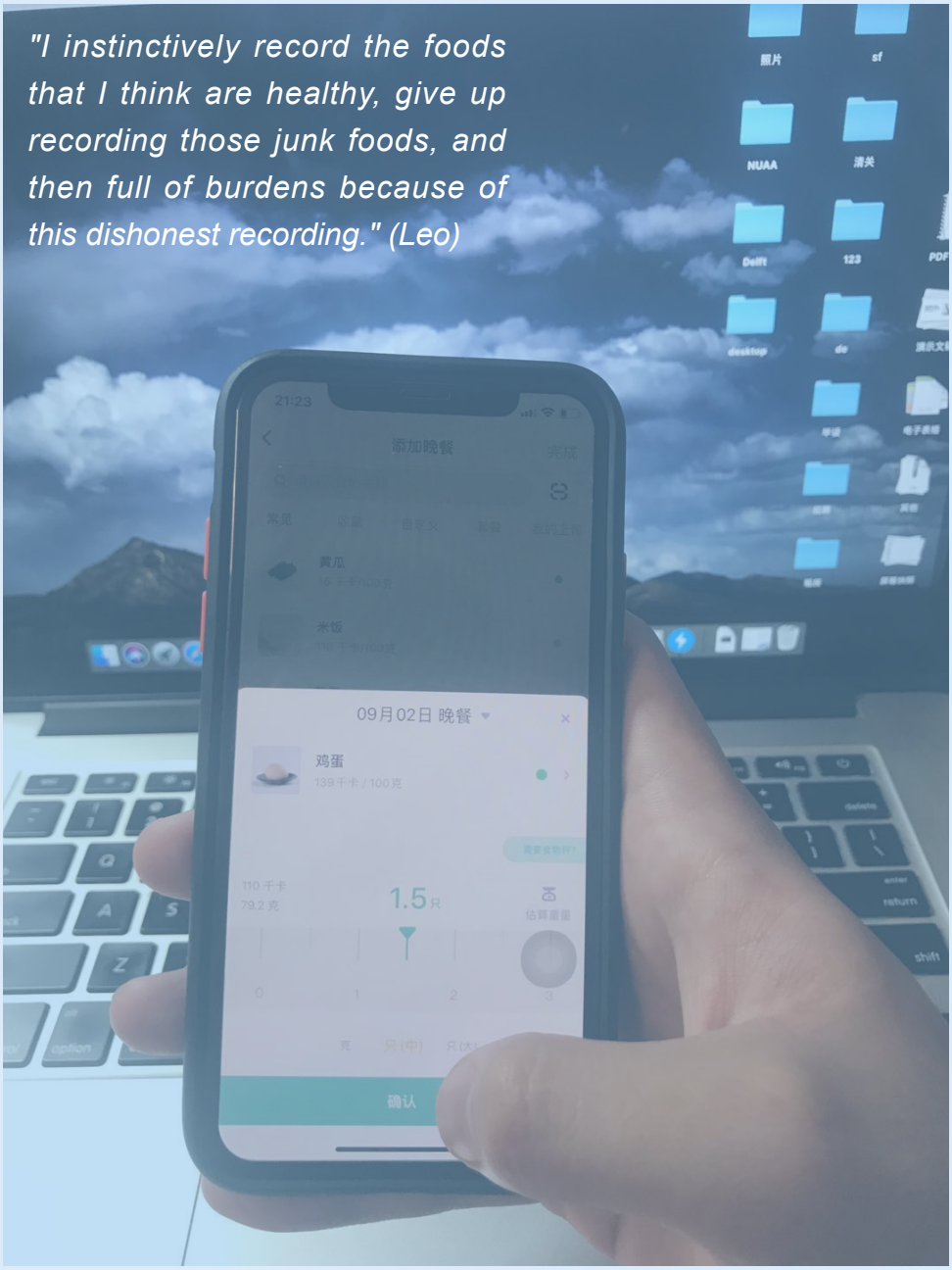
Figure 2-8: Results about basic function according to chen's criteria

Main takeaways

1. Data from self-tracking system provide greater insights than the information observed from people's sense. It has been highlighted that the data that most PI instruments collect are siloed (Rapp and Cena 2014). This limits their applicability, narrowing the vision on the user's 'self', by focusing on separated aspects of her life.

2. Internal factors, including biological and psychological determinants, and environmental factors are relevant in managing food behaviour. When determining leverage points for interventions, environmental factors are changeable entry points for intervention, which are meaningful in managing food behaviour for young adults.

3. Self-determination theory gave me inspiration for engagement strategies. To make users motivated and remain engaged for a long time, factors that can arouse users' intrinsic motivation, such as enjoyment and interest, need to be prioritized; and factors that arouse extrinsically, such as rewards, can only cause a short-term engaged experience.


"I instinctively record the foods that I think are healthy, give up recording those junk foods, and then full of burdens because of this dishonest recording." (Leo)
21:23
添加晚餐
完成
常见
自定义
09月02日 晚餐
鸡蛋
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110 千卡
79.2 克
1.5只
估算重量
确认

3. User Research

In this chapter, in-depth user research activities, including interview, questionnaire and generative session were conducted to gain young adults' experience of collecting data of their food intake, what are young adults values when deciding what to eat and what to report. The results of contextual interviews, online questionnaire, participatory session, sensitizing booklet were analyzed to understand the characteristics of the target group, factors young adults value when deciding what to eat, the general process of using food diary apps, their perception of such app and the current experience of tracking eating behaviour. The persona was created based on research insights. The insights will also be concluded as the supporting argument for the next step, conbined with the literature review in last chapter, to refine the design brief.

3.1 Research Activities

3.1.1 Online interview

Goal:

The online interviews are planned mainly to gather insights on the following aspects :

1.Eating habits of target group

2.What influence their food choice

3.Tools they used to record their diet

4.What effect did these tools have on their eating habits

Methods:

Due to the break of coronavirus, the interviews were arranged online. Participants were at their home. A structured format was chosen to make the conversation with online participants smooth and possible to understand the target group more comprehensive.

Participants:

There are 4 participants in total joined the online interview one by one. Two of them are female, and the other two are male. The age of the participants is within the range of 18-25. Two of them are European student, the other three are Chinese.

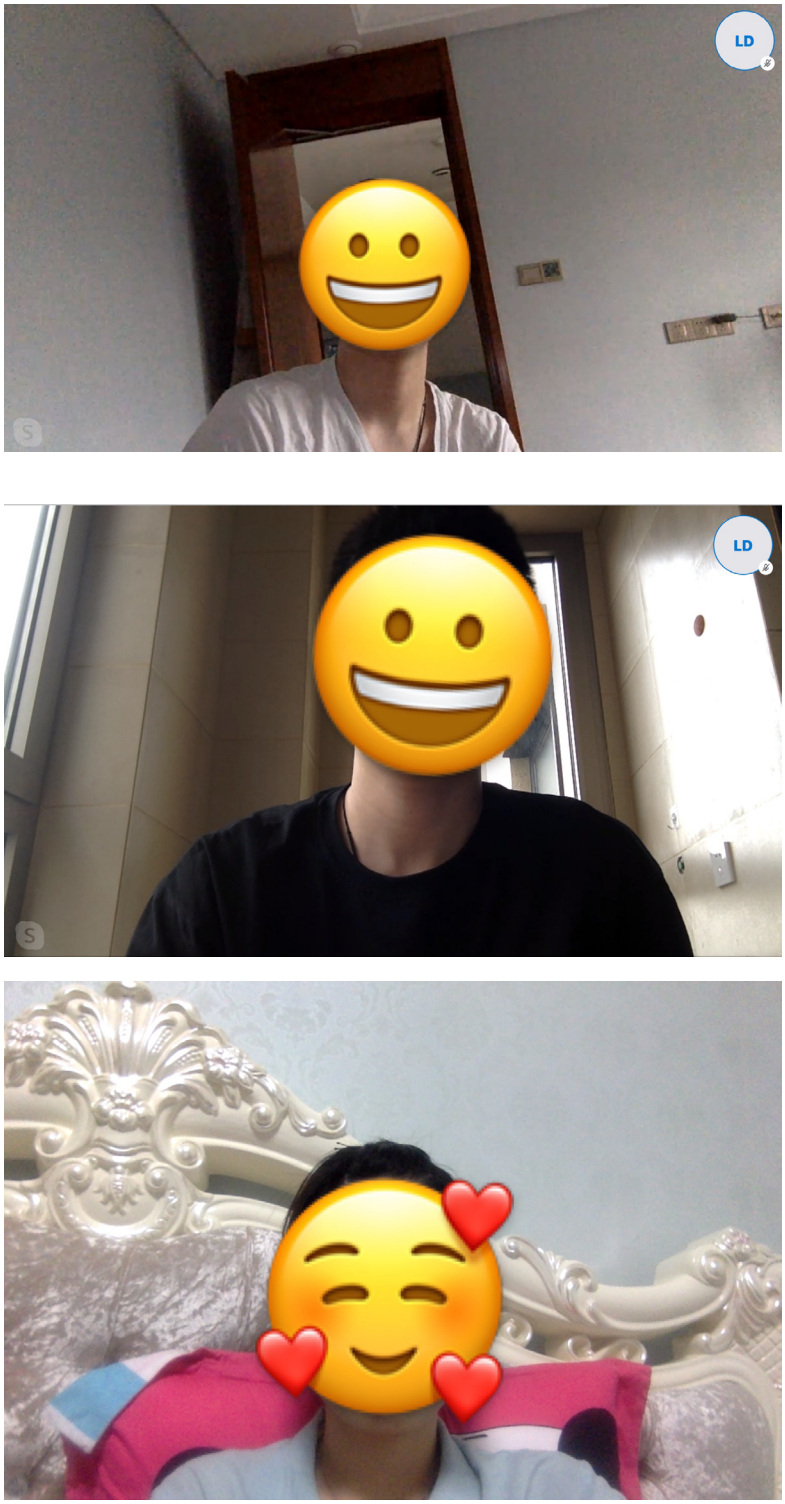


Figure 3-1: Screenshots of interviewees online

3.1.2 Generative Session

Goal:

1. Gather insights on the target group's overall highs and lows throughout the food journey, to see potential areas for design.
2. Get a deeper understanding of the target group's self-tracking experience:

Is there any pattern for them to use the food diary app on the market?

How do they feel during the food tracking journey?

Why do they have these emotions during the experience?

Procedure:

Standers et al. (2008) described the co-creation session as an effective tool to collaborate designer, researcher, and user for insights generation. In this project. the session was held in a studio, there were five participants, one facilitator and one recorder. All the participants received a booklet one week before the session and they were asked to spend 10-15mins per day to fill in the booklet. In this way, they were sensitized, and the booklet could also be used to make a food journey map. In the session, participants were first asked to discuss their eating behaviour, and then their food recording experience and ideal solution.

Participants:

There are 5 participants in total and all of them have the experience of food recording. Two of them are female, and the other three are male. The age of the participants is within the range of 18-28. All of them are Chinese and work full time.

Figure 3-2 : Materials used for generative session

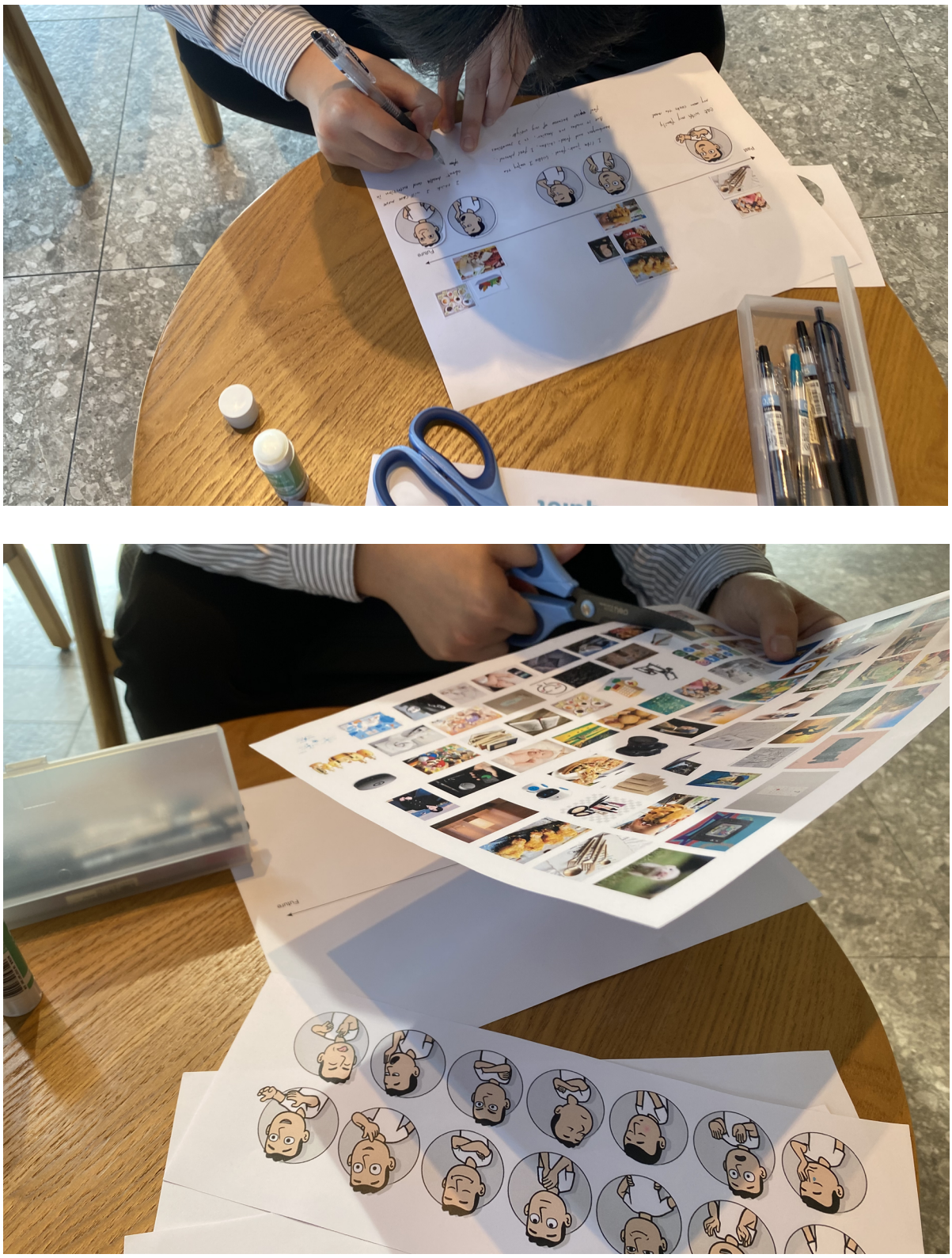


Figure 3-3: Photos took during the session

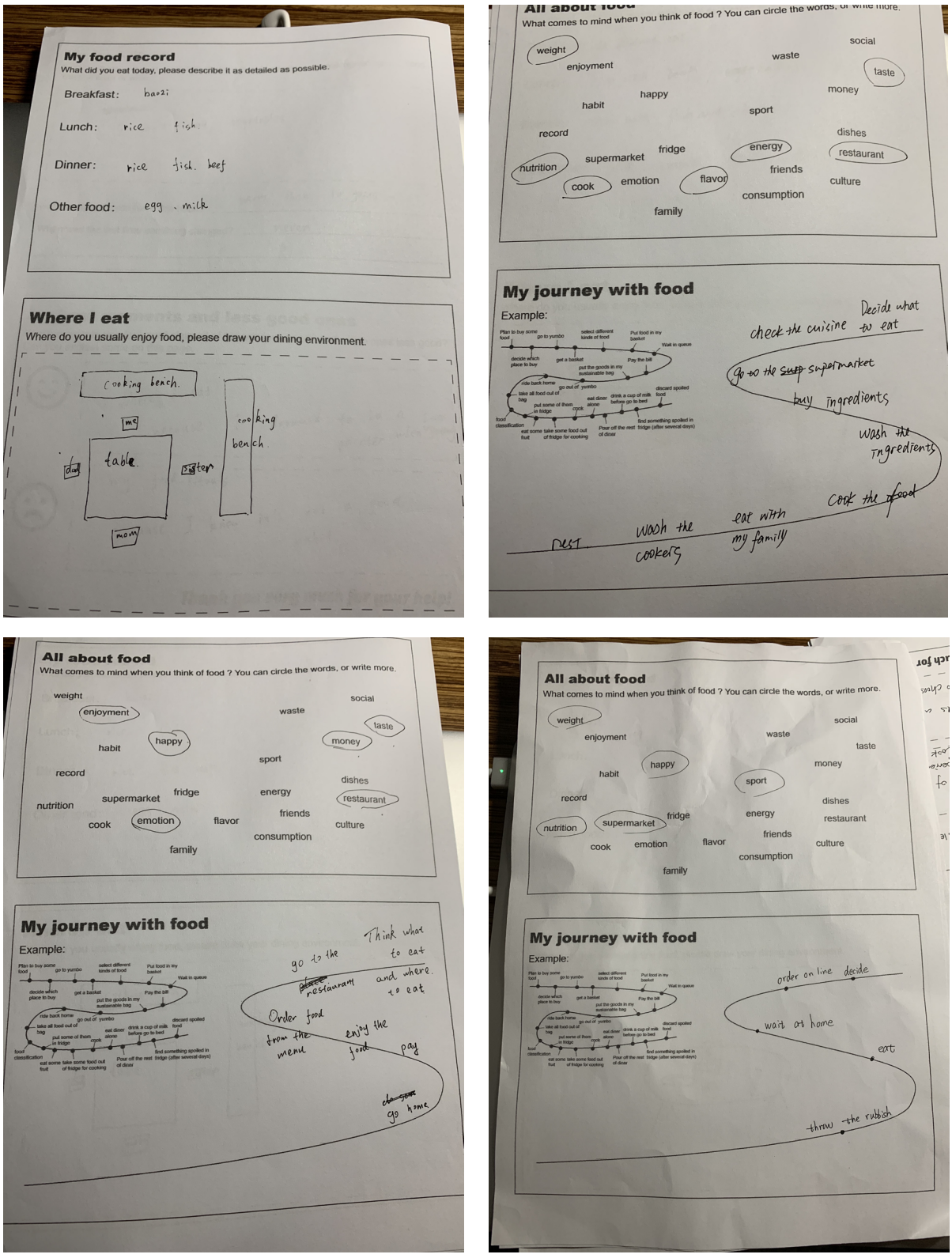


Figure 3-4: Sensitizing booklet finishey by participants

3.1.3 Questionnaire

Goal:

1. To confirm whether the above findings apply to more people in the target group
2. Is there any other neglected factor influences their food tracking experience

Method:

After gaining a basic comprehension of the target group and the context, an online questionnaire was designeds to gather quantitative data from users. The 103 complete answered questionnaires were received via WeChat. Some questions related to past tracking experience were only answered by 51 participants.

3.2 Research Results

3.2.1 Characteristics of target group

Feel a sense of discontinuity

From the interview, we can see that most of the young adults have just stepped into work. Whether in diet or life, they feel a sense of discontinuity. In terms of life, they have just left their parents or classmates to start living alone, and have not yet established other stable interpersonal bonds. In terms of diet, when they were at home, parents were responsible for their dietary health; and when they were at school, there was also a special canteen to manage their diet. When they step into work, all this is gone, they are responsible for their diet, and they are faced with various food choices. Therefore, they feel a sense of discontinuity and loss.

Relevant quotes

"When I moved out of my parents' house and started my own life, I was very excited and felt that I was free. But after a month, I found myself ordering takeaways every day because I did not even know what ingredients to buy when I wanted to cook."

"I have been working for half a year, but still feel a sense of loss. We are very busy at work and it is difficult to be friends with colleagues. My parents live in a city that is 6 hours away by plane. I only go back to my parents' home once a year."

"When we were in college, the school canteen provided us with a healthy set meal. The restaurant outside doesn't."

Frustration from past recording experience

Many of the interviewees have the experience of food recording, they tried different kinds of food recording tools. For instance, using food diary apps, mark what they eat in a notebook, save a picture of food in albums. However, all of them never insist on using one kind of recording tool for more than three months. (The reason why they couldn't insist on the recording will be discussed in chapter 3.2.4)

Therefore, they called their past experience "failed report", and they do not have a strong motivation to try a food diary app again.

Relevant quotes

"I have used more than 20 self-tracking apps to record different objects. I can even say that I am an expert in the use of these apps. Although I never used one such app for more than one month."

"I usually take pictures of my diets and put it on my ins. I stopped sharing because I moved to a new apartment and the table didn't look good. I didn't want to take photos with it."

"I have to say I am frustrated with such an app, and I will think twice if someone asks me to use a new one."

Under heavy pressure of work

In China, many young adults are engaged in 996 jobs (996 jobs means you have to work from 9 am to 9 pm and work six days a week), especially the Internet industry. They spend most of the day in the company and work in front of the computer for more than 10 hours per day. They don’t have much time to think about their diet and other aspects of life. For them, life is for work. High-intensity work makes it difficult for them to care about their health.

Relevant quotes

"I'm very tired every day, so I basically don't cook. You can't imagine this kind of pressure."

"I often feel that work is torture, but there is no way to escape from it. Unemployment is a nightmare that hangs over every ordinary Chinese young man."

"I haven't been really happy for a long time"

3.2.2 Food journey in the context

Based on the analysis of interview and booklet, we can get the food journey map in this context, to see potential areas for design.

Eat takeaway food

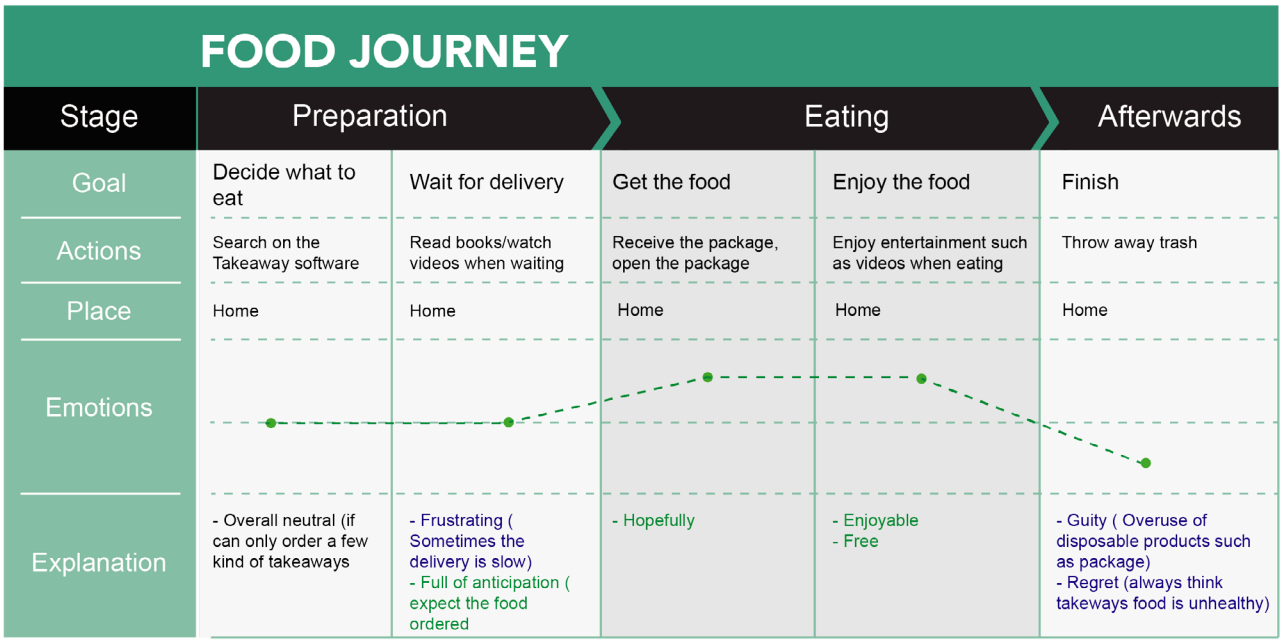


Figure 3-5: Food jouney map_eat takeaway food

Eat at restaurant

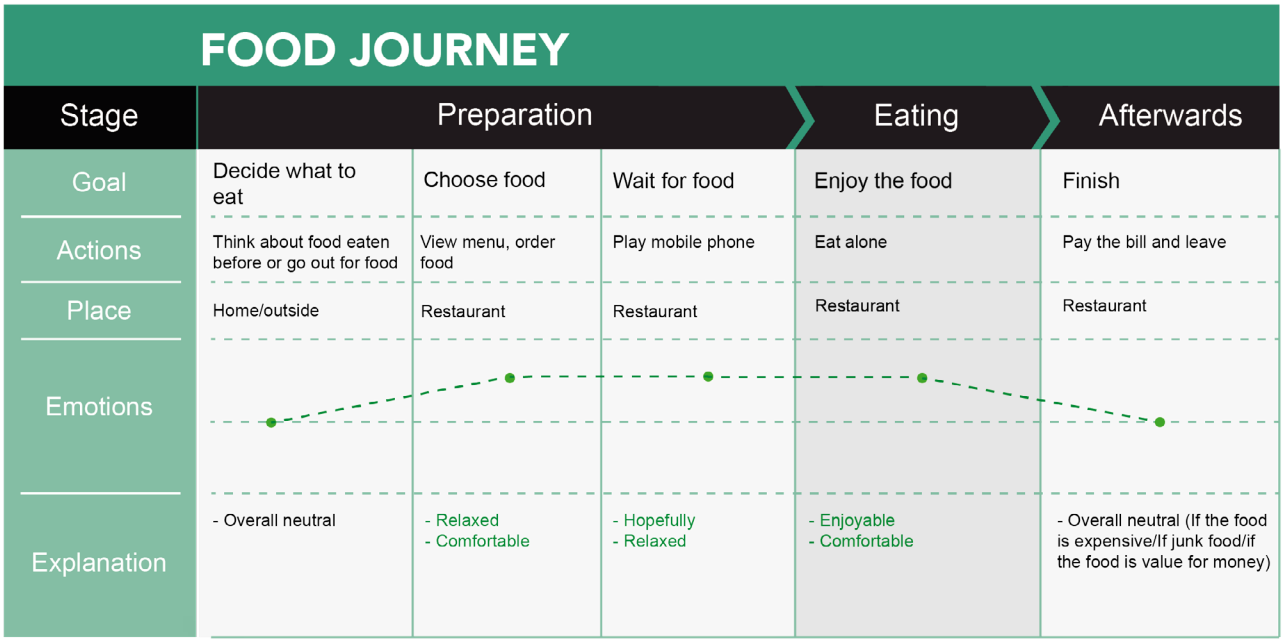


Figure 3-6: Food jouney map_eat at restaurant

Cook at home

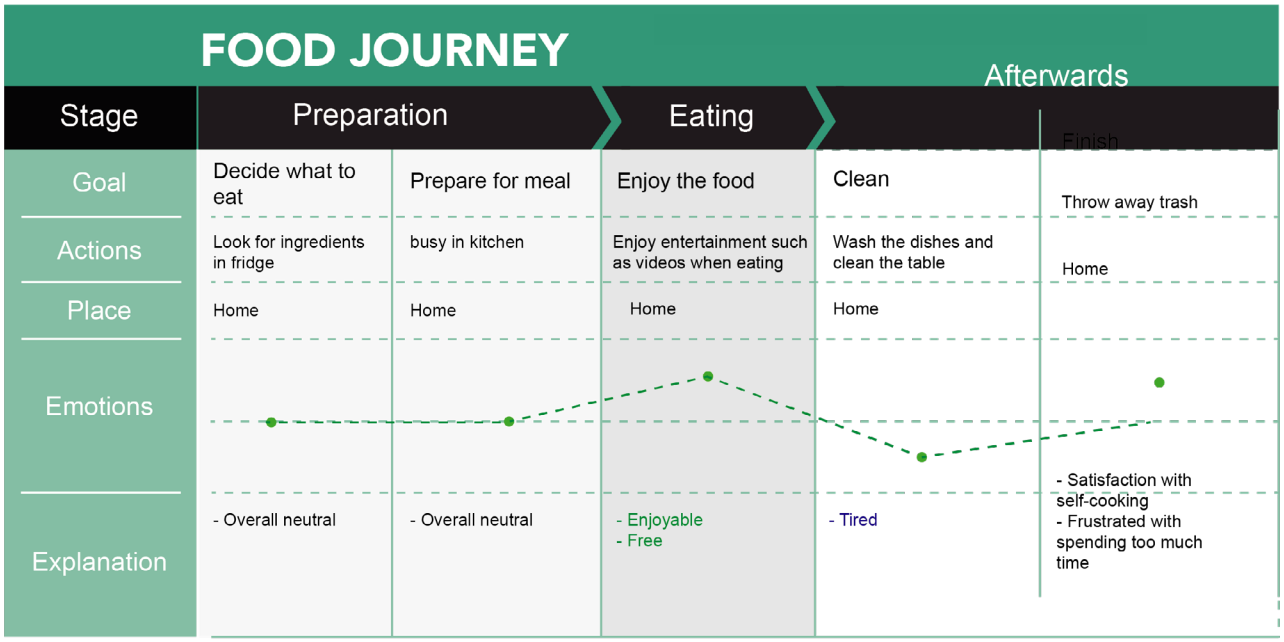


Figure 3-7: Food jouney map_Cook at home

3.2.3 Factors related to their eating behaviour

According to the observation, interview and questionnaire, we can get the top four factors that influence people's food choices: Flavor, location, companion distraction, mood and sleeping quality. The following will explain how these factors affect their food choices.

Flavour

The palatability of food is always the first factors that be considered when people decide what to eat, which is linked to sensual pleasure people can directly get from eating food.

Location

From the interview, we learned that eating places could be divided into three types. Home, restaurant, office. When they eat in different places, the food they choose is very different. For example, one participant said “When I eat in the office, I often choose to order some unhealthy takeaway. Because the office environment makes me feel stressed, I just want to eat junk food to reduce pressure.” Following are photos I took in the context where my participants eat their lunch.(figure 18) Location belongs to the eating environment, which is the most frequently mentioned factor influencing people's food choices in scientific research. (Brobeck, 1948)

Relevant quotes

"Flavor is definitely decisive. People who can’t eat spicy food will never eat hot pot, while the hot pot is my favourite food in the world"

"Where to eat is usually directly related to what I eat. In the workspace, I will choose to eat takeaway food; in the restaurant, I will choose to eat set meals or other expensive food; at home, takeaway food or cook myself (but I really rarely cook).

"When I need to save time, I will eat in the office, which avoids wasting time on the way to the restaurant; of course, I will eat convenient food to save time."

"When I eat in the office, I often choose to order some unhealthy takeaway. Because the office environment makes me feel stressed, I just want to eat junk food to reduce pressure."

"When I eat at home, I usually invite friends over, because the convenience food bought in the supermarket is too big.“

"At home, lying on a comfortable sofa, turning on my favourite drama, cooking a bowl of snail noodles, this is a very happy picture I can think of"

Companion

In the interview, the companion is the most often mentioned factor, and in the questionnaire survey, the companion is also the second influencing factor for food choice (The complete questionnaire results are in the appendix). Many people mentioned that their lunch is usually eaten at the company. If a colleague proposes what food to eat, they will generally eat the same as their colleagues. In terms of food consumption, they are also affected by the companion. For example, one interviewee mentioned “I am a person who eats food slowly. When I eat with my colleagues, if he or she finishes eating, I usually stop eating. In this case, I always eat less than when I was alone.” It has been established that the presence of other people influences not only what is eaten, but also how much is eaten. (Clendenen et al, 1994). A person eating alone was likely to eat either much more or much less (on average) than when eating with a larger group.

Relevant quotes

"I like to eat with other. When I eat with my friends, I pay less attention to the food itself while more attention to the person who eats with me"

"When I go to a restaurant alone, I will order dishes strictly as much as I can eat. But when I go with friends, we usually order more. In order to reduce waste, we have to eat very hard and even have stomach upsets."

"You know, in Chinese culture, AA is rare. When you eat with friends or colleagues, one person usually has to pay the bill. As the payer, in order to show his politeness, he usually has to order a lot of dishes."

"At company dinners, I usually eat very little food, and I don’t know why, but at a table with many people, it’s usually like this."

"Eating pizza with colleagues is our company’s tradition. When someone in the company makes a mistake, his punishment is usually to invite everyone to eat pizza.”

Distraction

The distraction factor was initially observed when I was doing research in the company. Many young people in the company like to watch videos on the computer when they eat food, and in this situation, they tend to eat fast food. This has been verified in subsequent interviews. According to the literature review, book reading, TV watching, sports events and other distractions might cause people to ignore the internal signals of satiation and continue their eating (Poothullil JM. 2002). In a controlled study, it was found that people who ate lunch while listening to a detective story consumed 15% more than those who had lunch in silence (Bellisle F, Dalix A-M. 2001).

Relevant quotes

"When watching Korean dramas, you must eat fried chicken and drink beer, otherwise happiness is halved haha
Of course, as soon as I eat fried chicken, I also start Korean dramas on my computer."

"I always read the newspaper during breakfast, otherwise I won't be able to squeeze out 10 minutes to read today's news"

"Personally, I eat very little while watching a TV show, and I don't know why, but it is true."

In conclusion, the flavour is the first factor that be considered when people deciding what to eat and eat how much; location, companion and distraction are three most often mentioned factors related to eating behaviour. Among these three factors, companion and distraction are respectively related to location. For example, when they eat in the office area, they usually eat food alone and usually using the computer while eating. However, when they eat at the restaurant, they often have several companions and eating without distraction. Combined with the conclusions we got in the literature review "the changeability of the factor should always be considered when determining leverage points for interventions.", The factor "Location" will have a higher priority in subsequent design.

Overlapping with the factors from literature review

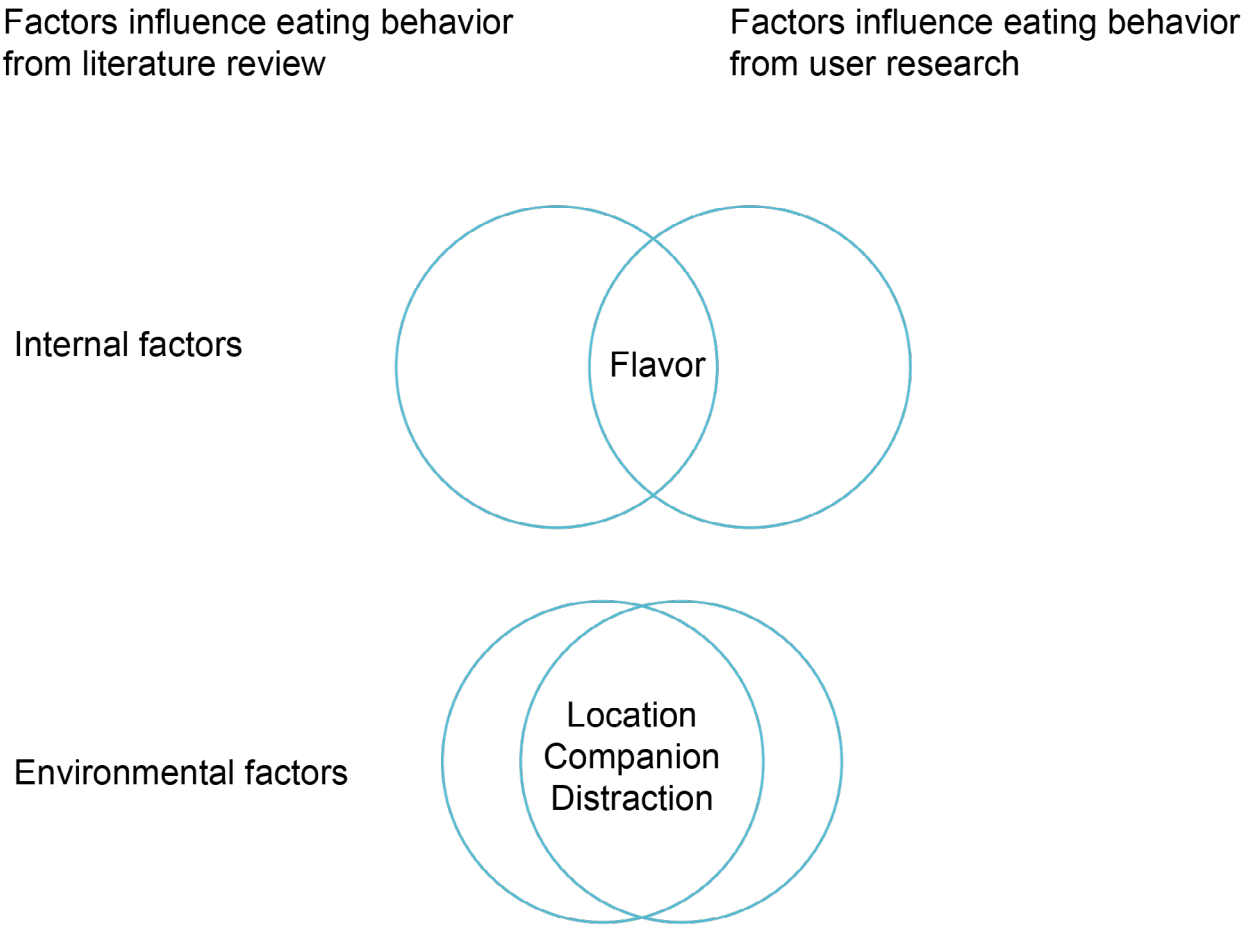


Figure 3-8: Overlapped factors from literature review and user research

What does it mean for my project?

In my later design, I should provide more knowledge on how their eating behaviour is affected by these four factors rather than calculating calories.

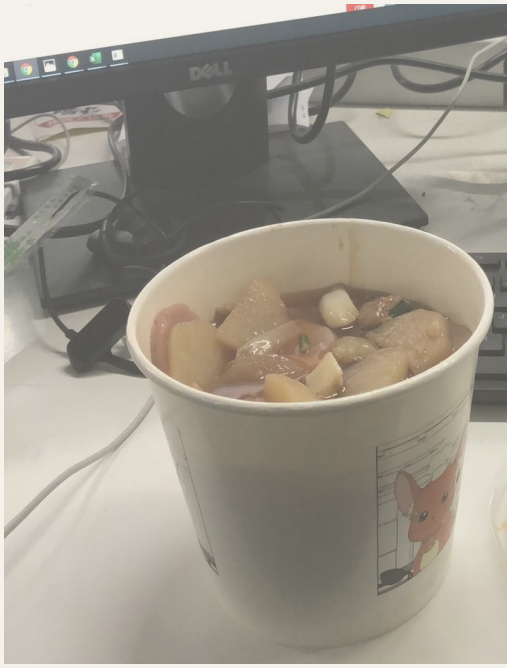



Figure 3-9: photos

took in the context

3.2.4 Past food tracking experience

From the questionnaire results, we got that above 50% of participants have experience of food tracking. Based on the interview with them, we can understand in-depth why they chose to use the food tracking app, why they gave up using such apps, and what was their purpose in using these apps.

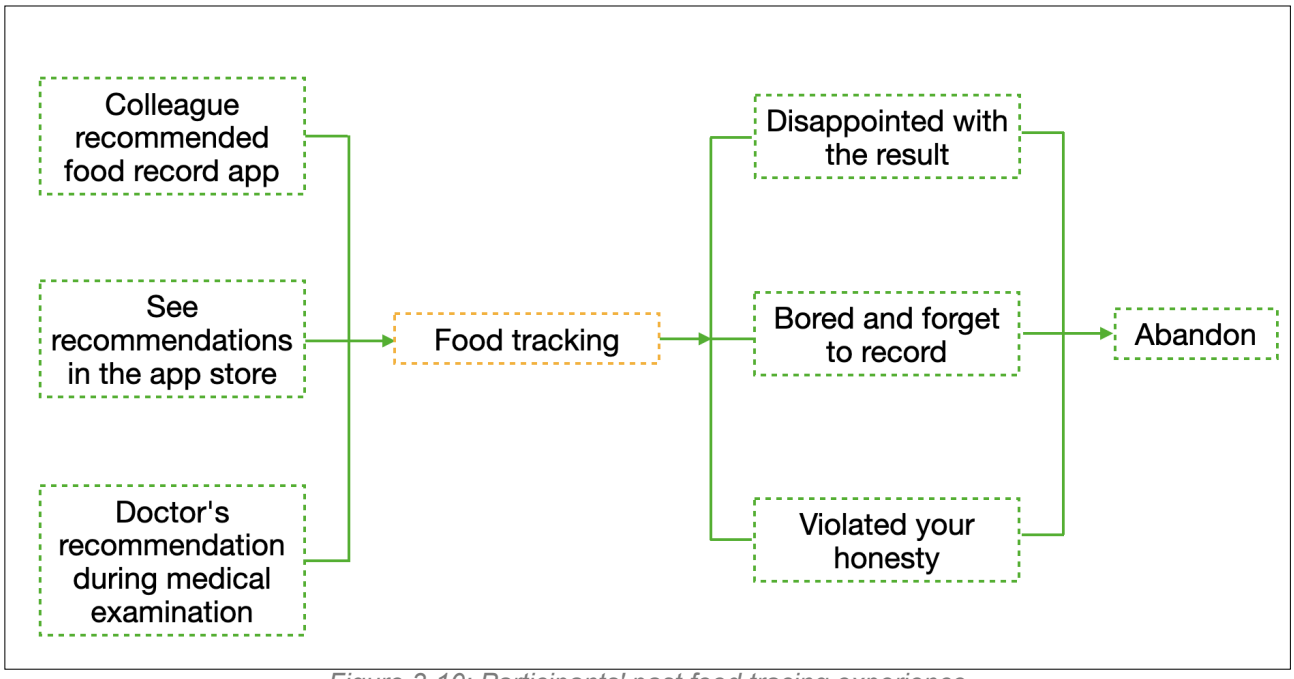


Figure 3-10: Participants' past food tracing experience

Why food tracking

From the questionnaire result, more than 50% of participants have the experience of food tracking. Under the question "Why did you choose to record your diet", I got a variety of answers. Only a small number of people were asked by doctors to record food because of physical health problems, and the more common reasons were"to keep in shape", "to record my own lives" "to share life with other." Specifically, the Top 3 reasons are: Record my own lives & Keep a photo of food in the album as the memory of life; Keep healthy, record food to see if the diet is healthy; Share with friends

One participant said: "I used to take pictures of my dinners and save in the album every day. However, after I moved to a small apartment. I never took pictures again because the tablecloths there were not good-looking."

Negative aspects of past tracking experience

Do not get value of recording

They do not get the value of recording food. Food diary apps usually try to use users' weight to confirm the calories they should consume, and then use the calories to measure if their diet is good. However, my target group has different requirements than weight loss, their recording goal is not something that can be measured by weight change and calories intake.

Hard to collect data

It is difficult for them to keep track of calories and nutrients because 1) data may rely on subjective estimation; 2) data may rely on subjective ratings with no standard for entering data; 3) data may be hard to find. For example, one plate of Chinese food always contains more than 5 ingredients, its hard to record every ingredient and measure their amount.

Bored and forget to record

At beginning of the recording, they have a slope of passion. However, it declines in keeping up the food recording. They are motivated in the first few days and then the passion seems to fade away, they feel bored with the repeated recording actions and then forget to record.

Disappointed with the measuring

They can't see physical changes while the apps always want them to measure their physical change, especially weight change. In this way, they did not see any changes brought about by food recording and cannot appreciate the meaning.

Disappointed with the reflection

suggestions given by the app are perceived as little value. Participants express difficulty to apply them due to factors such as the environment around. One of my participants said, "A week later, I even became disgusted with recording food, because it kept reminding me to eat more vegetables this week, and the company's dishes today offer no vegetables."

Lie during recording

People instinctively want to make the food that they record on the app looks healthy, but you obviously eat unhealthy food. In this way, some people will deliberately incorrectly record the amount of food or even record junk food as healthy food. This kind of action will put pressure on them because they violated honesty.

What does it mean for my project?

- Positioning the design as a supporting tool for users to gain knowledge and insights of eating habits, rather than a regulating and measuring tool.
- In later design, provide a reflection that the user could easily understand and take action.

3.2.5 Persona

Based on the findings from the user research activities, Characteristics can be identified to generate a Persona as the representative for the target group. Attitude towards food diary app and the goal of tracking are deemed as important dimensions.
The participants recruited for the user research activities all belong to the young adults who feel a sense of ‘loss’ and ‘discontinuity of their identity’, which mentioned in the literature review.
The information of occupation, age, bio in persona is just a simple representative and does not indicate all target groups

Name: Viki

Age: 23

Occupation: Game develope

Bio: Viki is a new employee in an internet company, and she lives alone in her studio. She likes to socialize, but the intense work makes her have little time to socialize. She is accompanied by a cat (because dogs usually need to walk out, so most Internet workers choose to keep cats instead of dogs).In her free time, she likes to play MOBA games with friends.
Personal Value: Freedom to make her own food choice; Have a good relationship with colleagues and friends.
Things affected food choice: Flavors, companion, location, Distractions, mood
Food tracking tools used: Mint health, Myfitnesspal, take photo
The goal of recording: stay healthy (track food to understand eating behaviour and make the behaviour healthier), mark life (what you eat is your beautiful memories), share what she eats with friends.
Attitudes toward food diary apps: hard to keep using, sometimes under pressure

I don’t want to lose weight, and I don’t like weighing. My purpose of recording food is just to know what I eat (Maya)

4. Design Vision

After a series of literature review and user research, the context of the project has been revealed. The insights from the users indicated the design opportunity. In this chapter, a refined design brief will be explained. More specifically, it includes design goal, desired interaction and design requirements.

4.1 Design Goal

The design goal formulated at the beginning of this graduation project is:

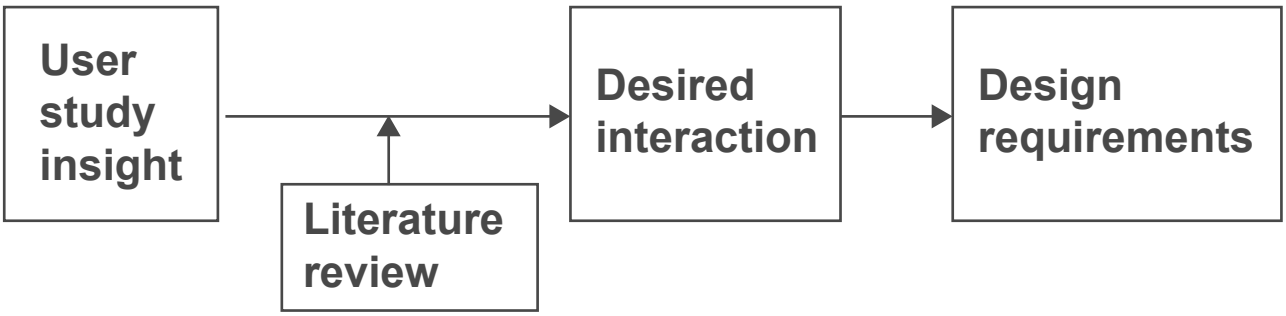
Engaging Young adults to record and understand their eating behaviour.

During the research, it became clear that the target group could be reduced to those young people who live alone and are busy with work every day because they are in the stage of "discontinuity of their identity". During this period of time, it is easy to develop good or bad eating habits, and the habits at this stage will affect their later life. Thus, the redefined design goal is:

Context
The context of the design is mainly for personal use in everyday life, because we would like to stimulate the target group to actively using such food diary apps.

Engagin
alone and v
understa

g young adults who live
work full time to record and
nd their eating behavior.



4.2 Interactions

4.2.1 Current interactions

During the user research, I found the current diary app dilemmas for young adults.

To understand and empathize with their experience, I detail their food behaviour and self-tracking activities in the following story:

…Moe works for a well-known internet company. He usually chooses to eat with his colleagues in the company canteen, or order takeaways to the work area in workdays. He will consider going to the restaurant for dinner on weekends.

One day, at noon, he hurriedly went to the company cafeteria with his colleagues for lunch, and then opened Mint Health (a food diary app) to record the lunch. The system allows him to choose the specific ingredients he eats, but the Chinese food he eats contains more than a dozen ingredients. After he chose a few randomly, the system asked him to choose the consumption of each ingredient, in grams. This stumped him even more...

In the evening, because of overtime work, he ordered McDonald's takeaway and ate while watching the video on the computer. After eating, he opened the app and wanted to record. When recording, he found that today's calories have almost exceeded the system setting. If he continues to record five chicken wings, it will definitely be marked as a failure day by the app. at the same time, the system keeps reminding him not to eat junk food. Therefore, he chose to change the recorded number of chicken wings to one. This made him a little uncomfortable because he violated his integrity.

A few days later, the system asked him to measure his weight to determine whether his recent diet was healthy, although he did not care about his weight. After that, he gave up using the app and felt it was useless to him. In total, I found three reasons why their tracking experience is like that.

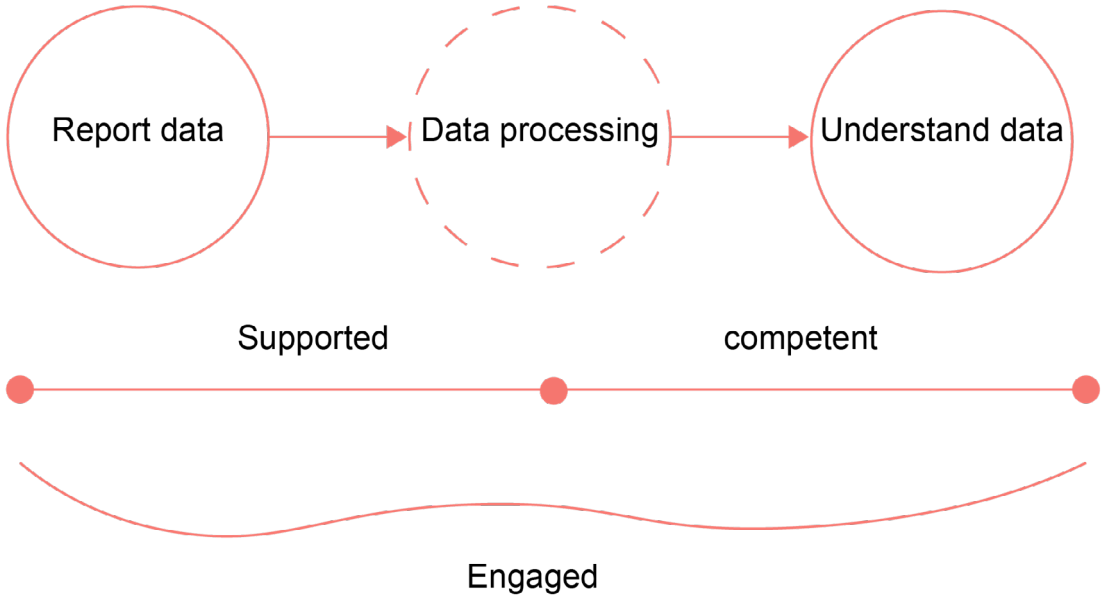
Reason 1
People lack the motivation to do these because they do not get the value of recording food. Calories and weight are not related to their tracking goal.

Reason 2
The result of their recording is “Failure report” according to their perception because they are disappointed with reflection and could not get actionable insights. This feeling further harming their motivation of adhering to the food tracking practice and even make them under pressure.

Reason 3
The data collection is difficult and boring for them because they cannot accurately measure the ingredients they consume, and also they cannot keep engaged after this repeated recording action for a long time.

4.2.2 Desired interactions

The users should feel supported, competent when interacting with the design, and at the same, keep engaged through using.



Based on the research above, I found three desired interactions which are criteria for my design.

Supported

The food logging concept design should make users feel supported when they report their data. The recording process should not be a burden for the user.

Competent

The user should feel competent when interacting with the system by understanding the data that is presented.

Engaged

The interaction and experience of the design should be enagging for frequent and long term use.

4.3 Design Requirements

Interaction	**Supported**	**Competent**	**Engaged**
Requirements	The design should remind users to report their diet; The design should provide easy way for users to collect and record data; The reporting process need little time and little effort ; Consistent flow and information between all touchpoints: logical flow;	Clear categories & explanation of data represent The data represent and the relationship between the data are easy to understand Provide actionable insights of food behavior with contextual factors	The using experience is enjoyable; Keep users coming back to use;

Figure 4-1: Design requirements and interactions

Criteria based on the design goal and requirements

Effort of understanding the design

the system is easy/difficult to understand

Effort of use

the design costs little/much effort to use.

Emotion when use the design

The using experience is enjoyable/under pressure

Ease of understanding the data presented

The data presented is easy/difficult to understand

Notice of contextual factors

The user could/couldn't reflect on how they eat differently in a different location, with different people and different distractions

Likelihood of long-term use:

users will/won’t continue to use the design in the future.

"I really like the design points of recording the location and the people eating together. Food should be tagged!" (Weiwei)

5. Conceptualization

During the conceptualization phase, insights and requirement gained from the research phase were selected and used to generate different ideas. This chapter covers the idea generation process and how those ideas developed into the concepts, which were evaluated by design criteria. From the trials, we were able to better understand what elements of each concept improved the experience, and which did not. Finally, we were able to use these insights in order to converge towards a final concept direction.

5.1 Ideation

The ideation started with a creative session, based on the previous research and design vision. In order to avoid the constraints from the project owner, this session was hosted by another design student, who also studied design for interaction in TU Delft. The session contains two phases, introduction and idea finding.

Next, we clustered the various ideas into categories. and saw that three main themes emerged across the potential design spectrum. The concepts that emerged were:

Build your city
We add game elements into this concept, so the users are interspersed with game progress while recording and viewing data.

Discover yourself
the idea of this concept is to allow users to constantly understand themselves by recording data. The more data recorded, the more information related to their health will be available to users.

Your eating assistant
This concept aims to give the user the feeling that the app is your private assistant, so the user could heir own recording goals and recording content under recommendation.

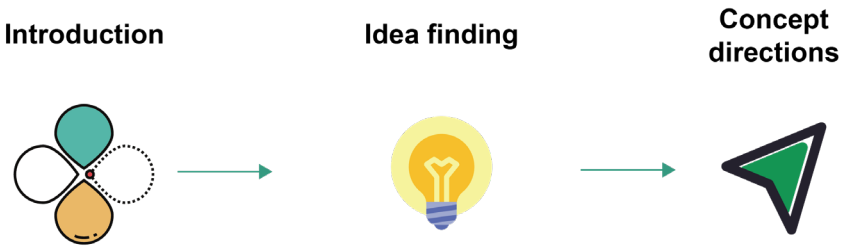


Figure 5-1: Ideation process

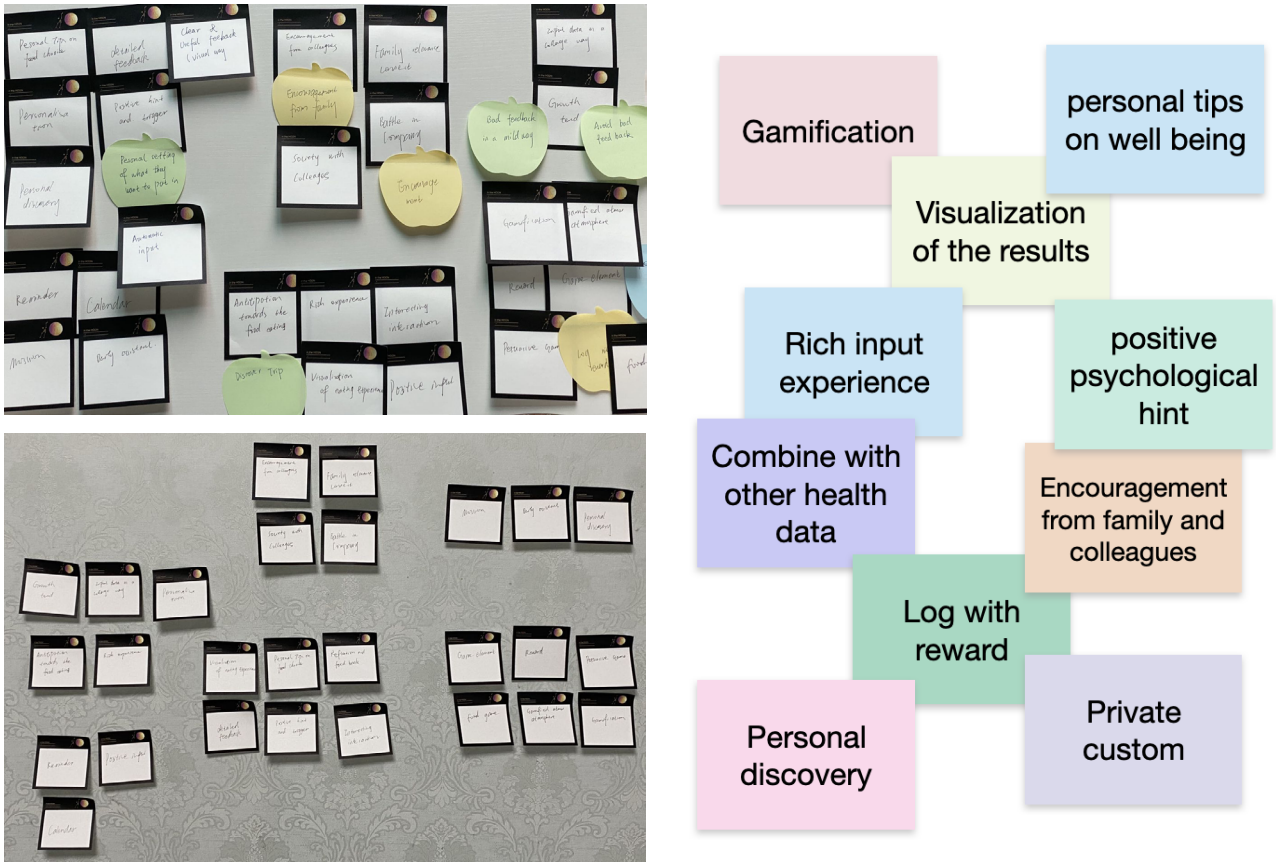


Figure 5-2: Outcomes from "Idea finding"

5.2 Concept directions

Concept Direction 1

Build your city

WHAT?

This concept is about using game elements to motivate users to keep up using the food recording app.

HOW does it work?

1. The main entry approach in this concept is uploading of the food, accompanied by searching for food items as an additional choices.

2. This concept allows users to create their food city and collect different food buildings in their city. Every time they input one kind of food, they will receive relative material for a new building, which is the key mechanic in this concept.

3. There are three ways of data representation. First of all, the food city itself is a display of "what food you have eaten". For example, if you eat more vegetables, you will have more vegetable buildings. Second, the app will provide historical statistics about the food you eat, the location, the companion, as well as distractions. Third, it provides a weekly report of their logging.

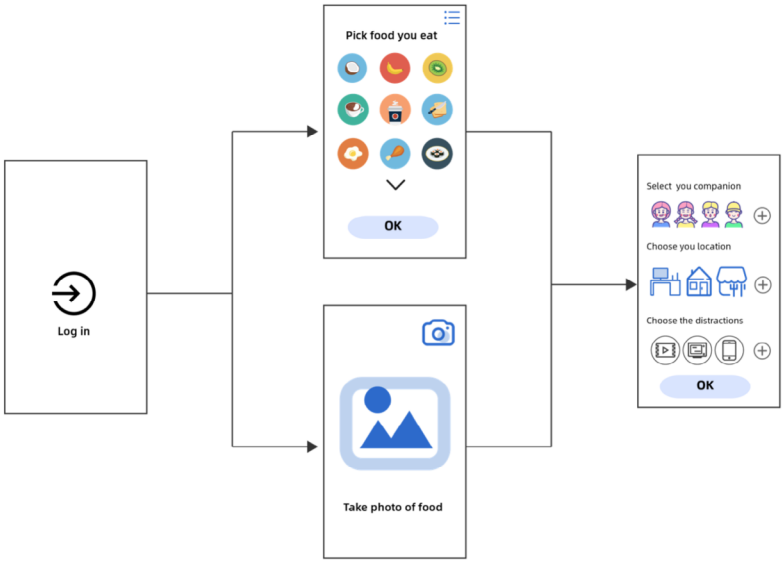
WHY?

Using game design element could increase users' intrinsic motivation, which could make user engaged for a long time.

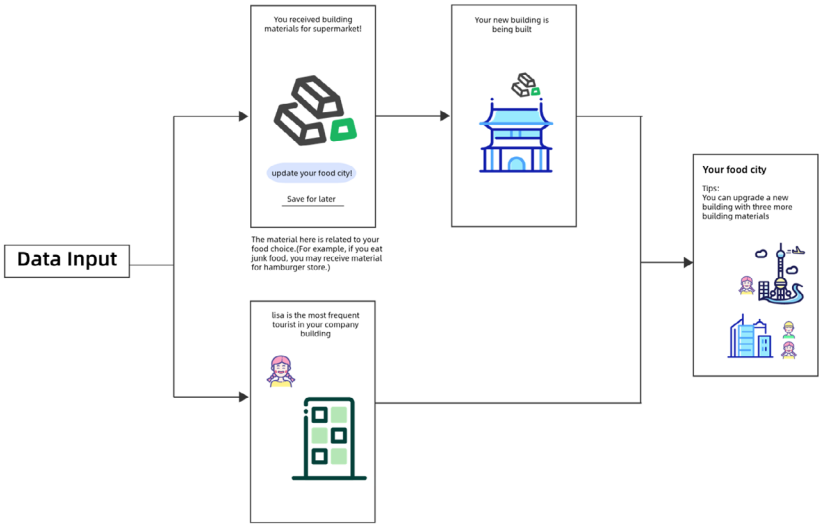
Three types of data display provide users with clear and Multidimensional feedback, which could make users feel competent.

Taking a photo of food as the main entry approach is easy for the user to start using, using icons to represent different choices support users to spend little time and effort in reporting precess. This easy access could make the user feel supported.

Data input



Gamification motivates



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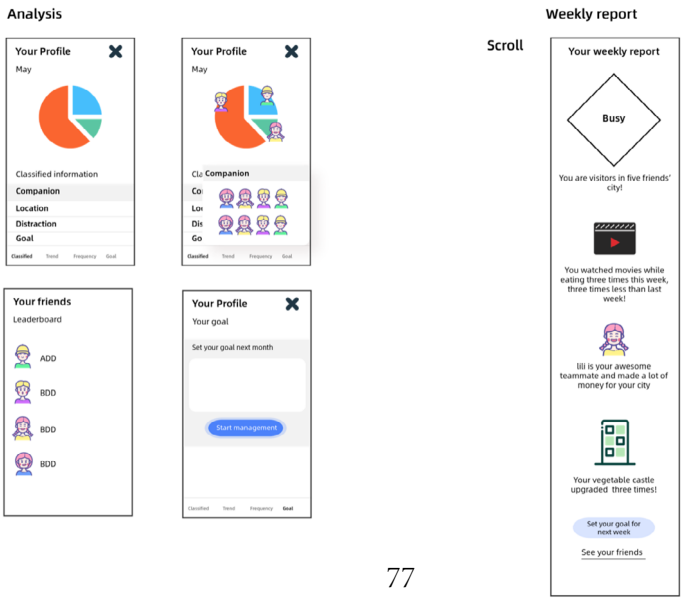


Figure 5-3: Flow of concept 1

Concept Direction 2

Discover yourself

WHAT?

This concept called to discover yourself. As the name suggests, the idea of this concept is to allow users to constantly understand themselves by recording data.

HOW does it work?

1. The input in this concept are users' eating behaviour data (picture of food, location, companion, distraction) and other health data (mood, sleeping quality etc.)

2. The system's output is information related to users' health condition. For example, After a large amount of data is entered, the system can let users know in which mood they prefer to eat healthy food.

3. After recording data continuously for a period of time, users can also share their own dynamics on social platforms and can get encouragement from parents and friends.

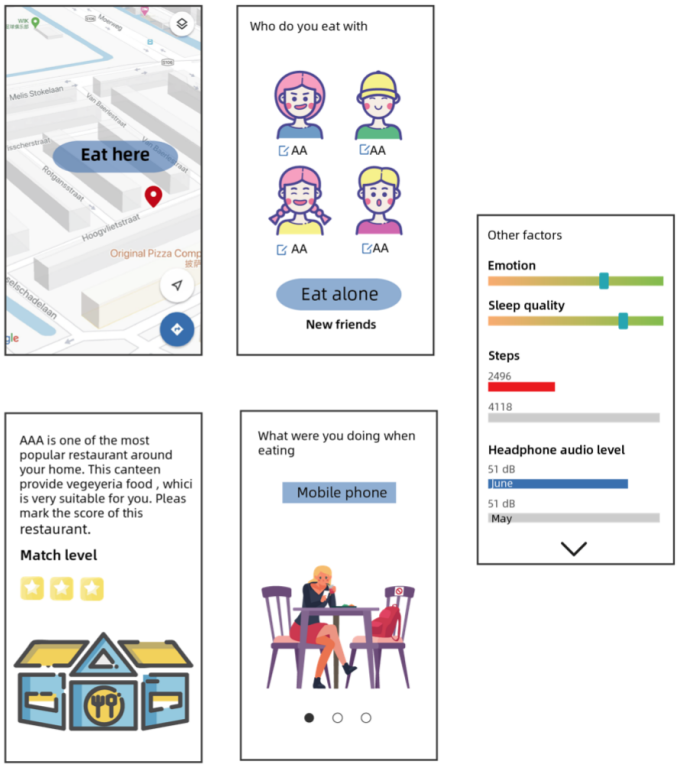
WHY?

The social relationship is regarded as a good element to engage people.

Comprehensive feedback, including food-related and other health-related feedback, could make users feel competent to understand their health condition.

This concept is not used to evaluate your living habits, and not to urge users to set goals, but let users to actively report their ideas about restaurant and people who eat with them, which can make users feel supported.

Data input



Data represent

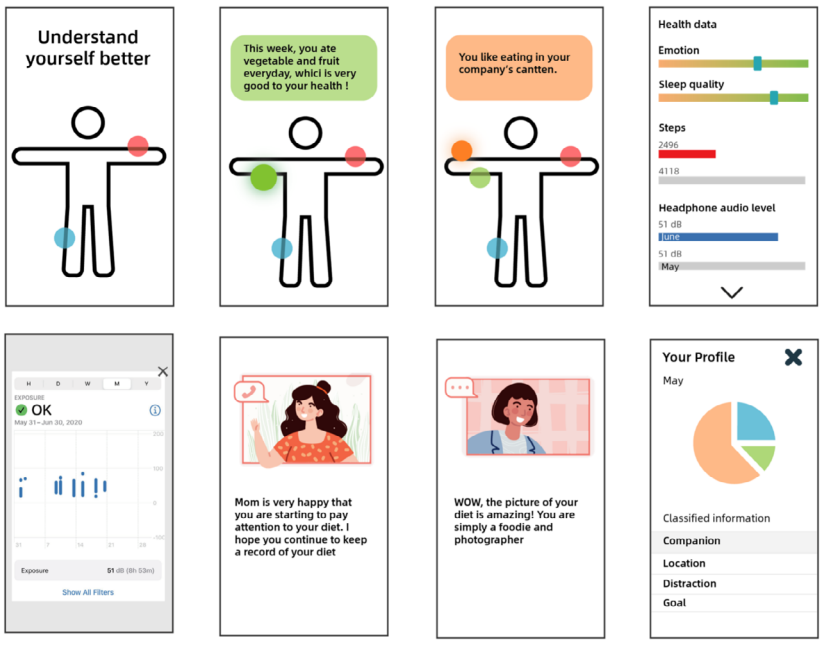


Figure 5-4: example interfaces of concept 2

Concept Direction 3

Your eating assistant

WHAT?

This concept called Your eating assistant. Under this concept, the app is based on your data entry and provides you with meticulous care.

HOW does it work?

1. The user can choose the food-related content he or she wants to record under the recommendation of the system, and the user can also choose the level of detail he wants to record. For instance, record the number of companions or specific people.

2. The system set a series of goals every week for users to select by themselves

3. After the goal was set, it will remind the user on time. If the user achieved the goal they set, they will receive encouragement and personal tips from the system

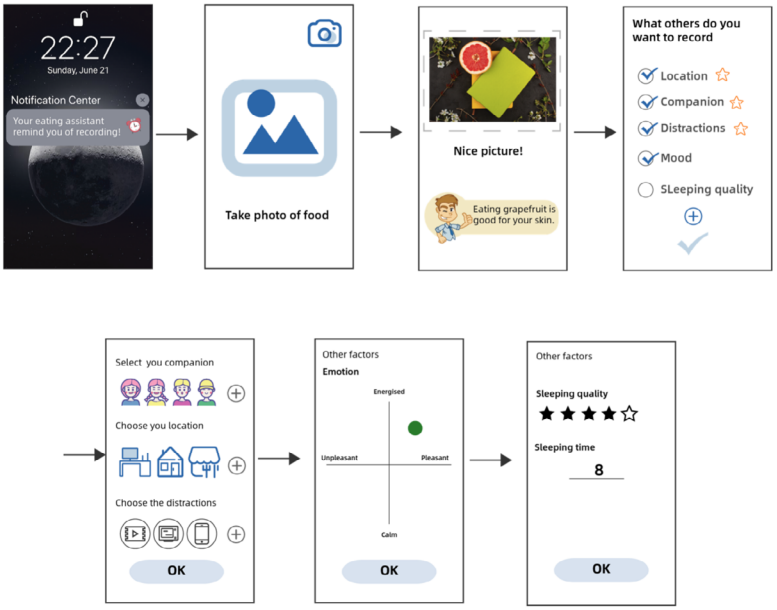
WHY?

Because the goal was picked/set by the user, they will feel more in control and competent to finish it.

"Goal" is a frequently used element in design to engage the user.

Eating behaviours are different and special for every individual, personal tips and encouragement could make people feel that the concept is made for them, and let them feel supported.

Data input



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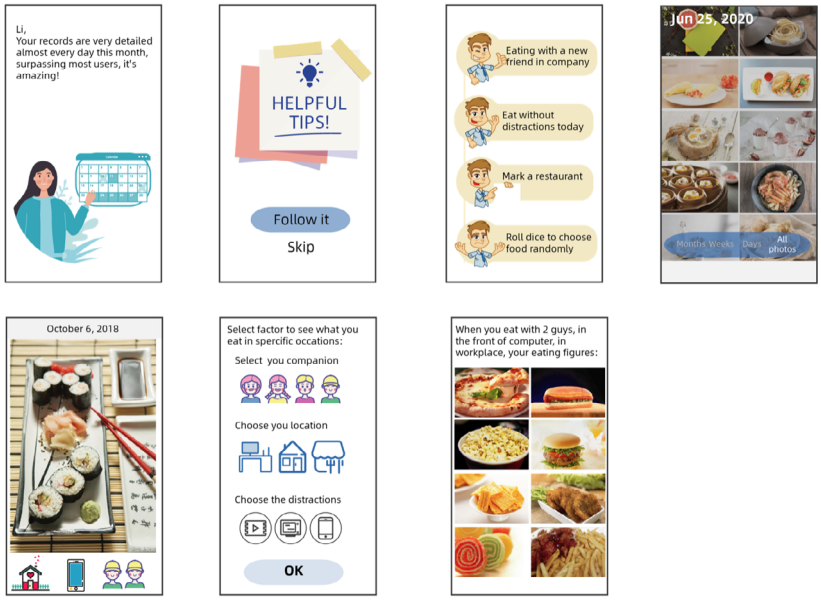


Figure 5-5: Key interfaces of concept 3

5.3 Concept direction selection

5.3.1 Comparative User Test

Aim of test

Aim of the test is for quick iteration, the focus is on overall user experience and determines the important elements. The goal was to use the test results to converge to a concept direction for further iteration

Focus

For the trials, the focus was on user experience and less on usability, since our prototypes were lo-fidelity and in the early conceptualization phase.

Research questions

Patterns

How do participants use the three severe concepts; are there patterns?

Experience

How do participants experience the three concepts?

Use

Which elements are best suited for the context the app is meant for?

Preparation

Digital prototypes on smartphone

Procedure

The three concepts were evaluated by six people individually. In order to avoid the deviation of the results caused by the test sequence, the order of the three concepts will be changed for each test. First, the background information of the project was briefly introduced to the participants. Then I showed them the concepts and went through the scenario of each concept to explain the purpose behind each concept. Participants were encouraged to freely give comments to any aspect of the prototype in the process and ask questions if anything is not clear to them. After they tried the concept, they are invited to have a small interview and finish the questionnaire.

Participants

Six participants were recruited. More details about the participants can be seen in Table 5-6.

Participant	Age	Gender	Ocupation
1	22	Male	Full-time work
2	25	Male	Full-time work
3	27	Female	Part-time work
4	23	Male	Full-time work
5	24	Female	Full-time work
6	25	Female	Part-time work

Table 5-6. Information of participants

Questionnaire

For selecting which design direction was more suitable for my design goal, I used the desired interactions, described and explained in chapter 4, as the criteria to select the design direction.

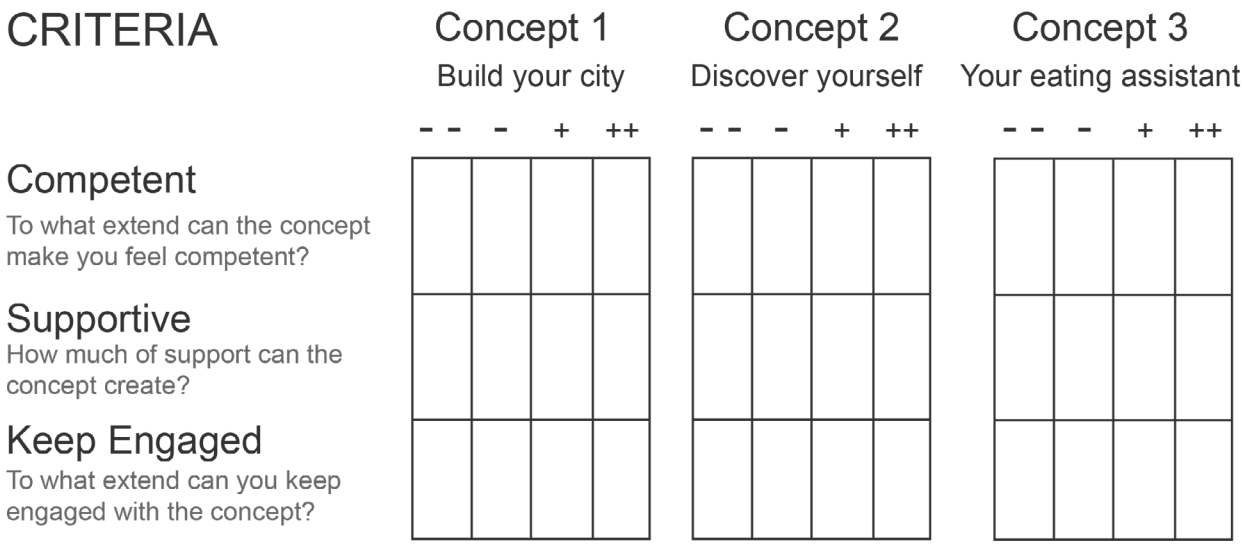


Figure 5-7. Questionnaire content

5.3.2 Test results

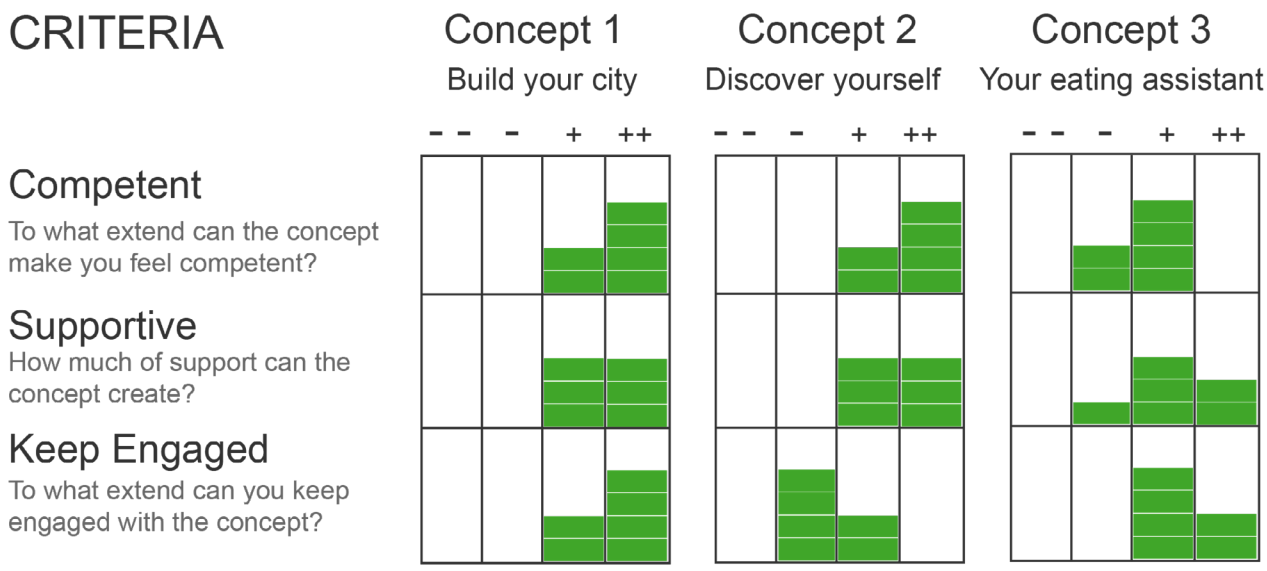


Figure 5-8. Result of the questionnaire

Patterns	Experience	Use
How do participants use the three severe concept; are there patterns	How do participants experience the three concepts	Which elements are best suited for the context the app is meant for
Choosing real location is confusing; Everyone choose the way of taking picture to record food; Participants are about privacy and the safety of their data, especially in the concept which contains social part; Curious about recommendations given by the system;	Without clear instrucations and explanation of the game, the experience became confusing; Putting private data leads to experience that feel uncomfortable and insecure(real location and specific companion); Acctracted to the game concept and feel more enjoyable when compared to the other two concept; Encouragement from the family makes them feel awkward and uneasy. most of my participants do not want to let their parents know their eating behavior;	Game elements and mechanics could motivate them very well; Rich input experience cost too much time in reporting process; Putting their private data in the online society makes feel not good; Positive feedback works well; Family connection does not work; Setting small goals that are easy to accomplish makes them feel confidnt; but its hard for them to decide goal;

5.3.3 Conclusion

Although concept one fits the design criteria more, the other two concepts also have their strength to create desired interaction. As such, it was determined that the elements of these three designs would be combined into the final design. Following are the elements I will keep and the reasons.

Game elements - collect and upgrade buildings

From test results, we found that the game elements could make users keep engaged. This element does not make people feel pushed but naturally promotes engagement by leading them naturally to actions in the game.

The goal provided by the system

"Goal" is a frequently used element in design to engage the user. In the test, we learned that letting users set their own goals makes them overwhelmed and at a loss as to how to start. For example, Lisa said: "Setting a goal is inherently difficult for me." So here, we decided to let the system provide goals, such as: completing the task of recording for seven consecutive days, you can get rewards." This reward could provide extrinsic motivation in the early period od using.

Visual data presentation

Visual data representation can give users an intuitive feeling of their eating behaviour, which could let them feel competent with the results. Compared to promoting a healthy diet for users, this project cares more about that user paying attention to and understanding their eating habits.

Comprehensive feedback

With comprehensive feedback, including the food they take and factors related to eating behaviour, the user was encouraged to reflect on how they eat differently in a different location, with different people and with different distraction.

Easy data entry approach

All the participants choose the way of taking pictures of food to record their meal. As for locations and companions, users tend to record quickly rather than rich experience. This is also in line with the competition in my desired interaction.

5.4 Concept development

Based on the insights, the idea Build your city was worked further into concept Build your food city.

5.4 .1 Prototype 1

Description

In this concept, users can create their food city and collect different food buildings in their city. Every time they input one kind of food by uploading a photo of food, they will receive one relative building, and the level of the building could be uploaded.

The first stage is the input stage. Users capture the food they eat and other factors related to their food choice and consumption. The second stage is when the app analyses the recorded information of food together with the related factors. The third stage is the reflection stage for the user. The app will provide clear historical statistics about the food you eat, the location, the companion you eat with, and distractions. At the same time, the system provides some goals to promote the report. For example, if you record every day for a week, you will get virtual currency rewards. As in my design vision, I don't want users to be pressured on records, so the goal here is only rewards for completion, no punishment for failure.

Technical feasibility

This concept involves a technology, that is, the user uploads a photo, and the system can identify the food in the photo. The feasibility of this technology can be demonstrated in both Kawano and Minija's studies. This technology of identifying items with photos is now also widely used in many apps. For example Foodvisor, Caloriemama.

The main gameplay loop

-Upload a picture of food

-Get new building related to the food in the picture

-The building could work and earn money for you

-Collect a specified number of buildings to upgrade(also cost virtual money)

-Get reword after completing building goals provided by the system

Goals within the game

The goal with the game is collecting more buildings and upgrade them, which means you need to report more to gain buildings and frequently log in to make your city earn money. This is exactly what my design want.

Data input

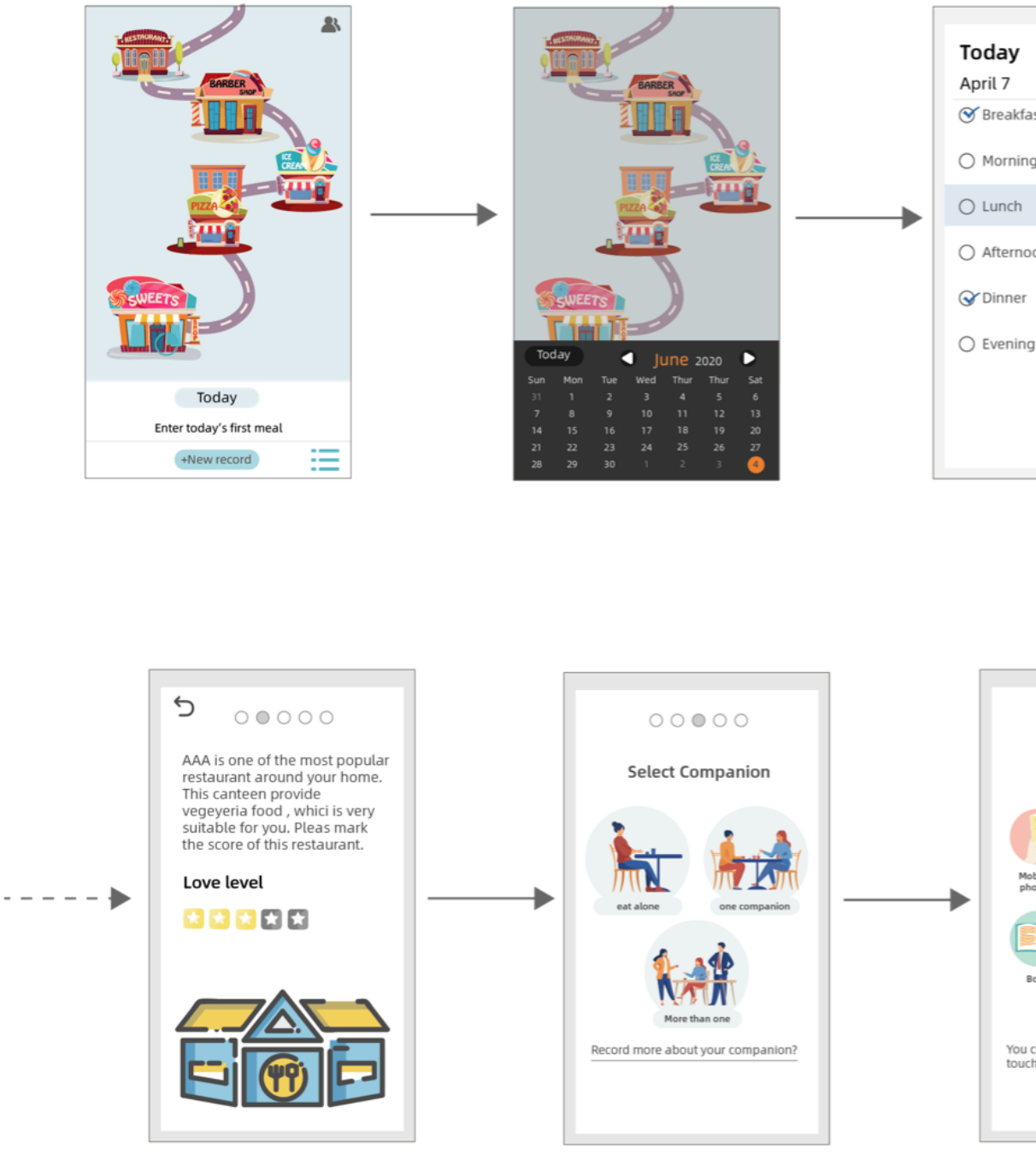
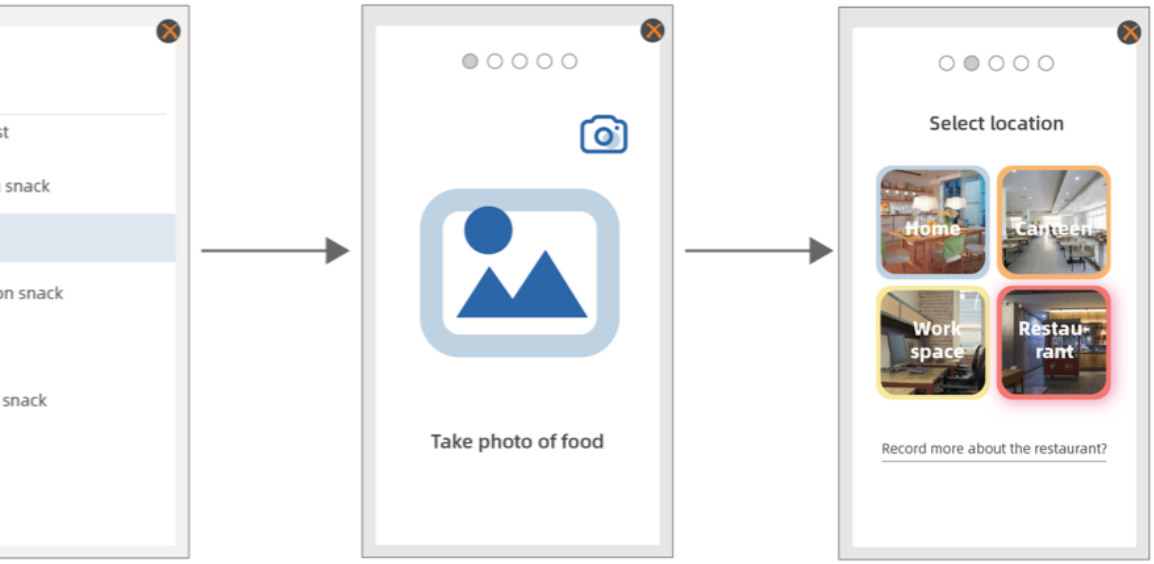
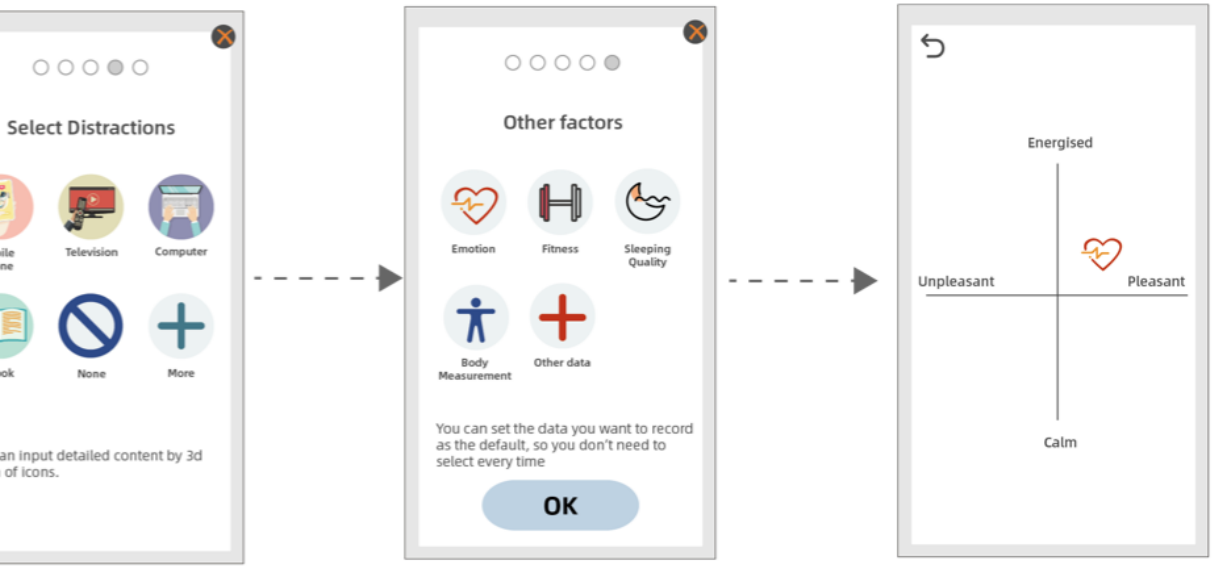


Figure 5-9: D





ata input flow

Data represent

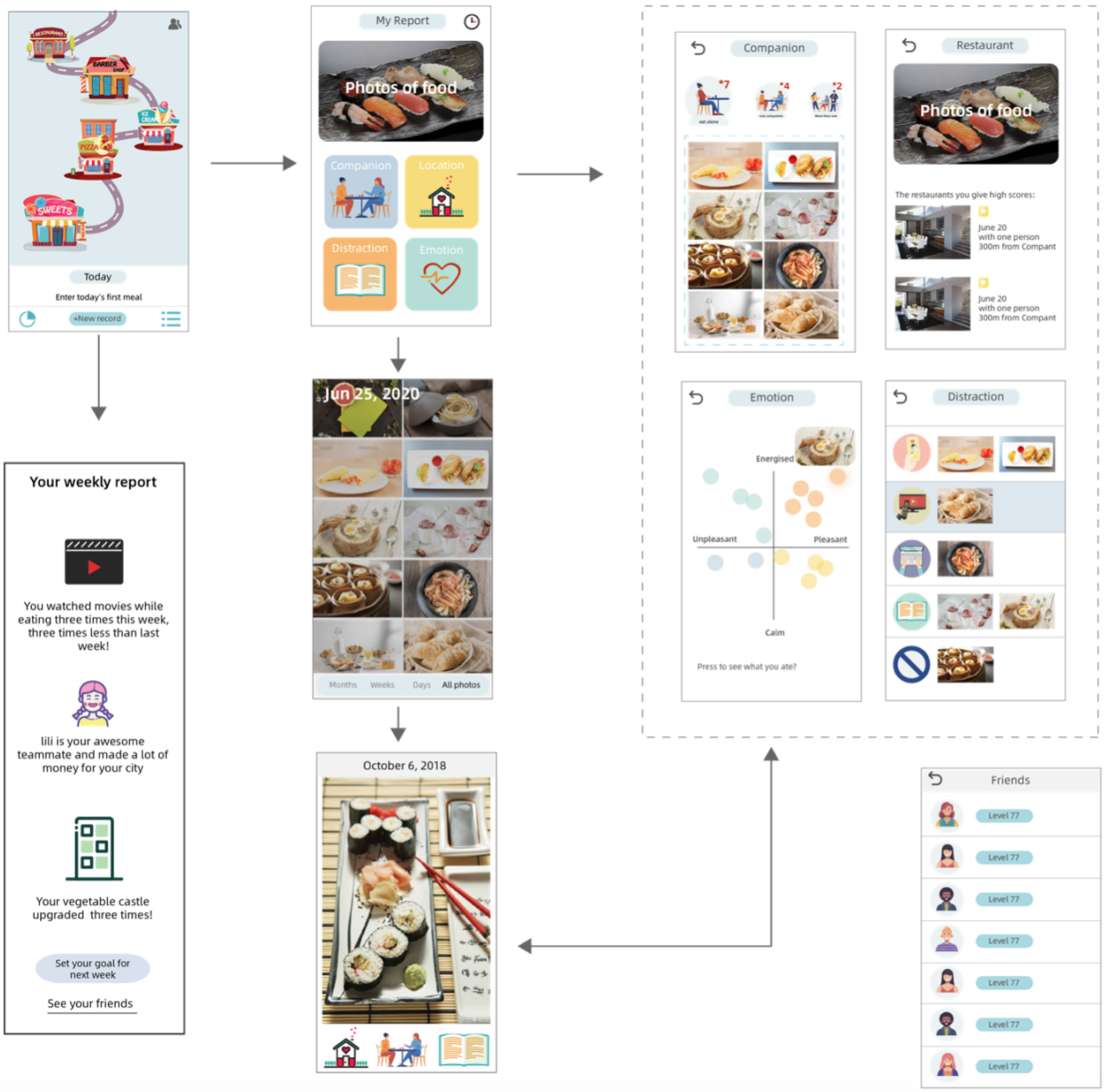


Figure 5-10: Flow of data represent

5.4 .2 User Test 1

Research Question

1. To what extent do the concepts meet the design requirement?
2. What feeling or association do people have from the concepts? Can they feel what the concepts want them to feel? (e.g., be eager to get buildings; feel competent)

Participants

7 random Chinese participants, 4 males and 3 female, mainly aged from 18 to 30.

Procedure

Participants were asked to imagine that they just ate some fruit as lunch with two colleagues in the workspace, and they have two tasks in the test. 1.record the imaged lunch. 2. view data report. During the test, I encouraged participants to think out loud. after trying the prototype, we had interviews and the participants were asked to fill in the questionnaire. (Appendix)

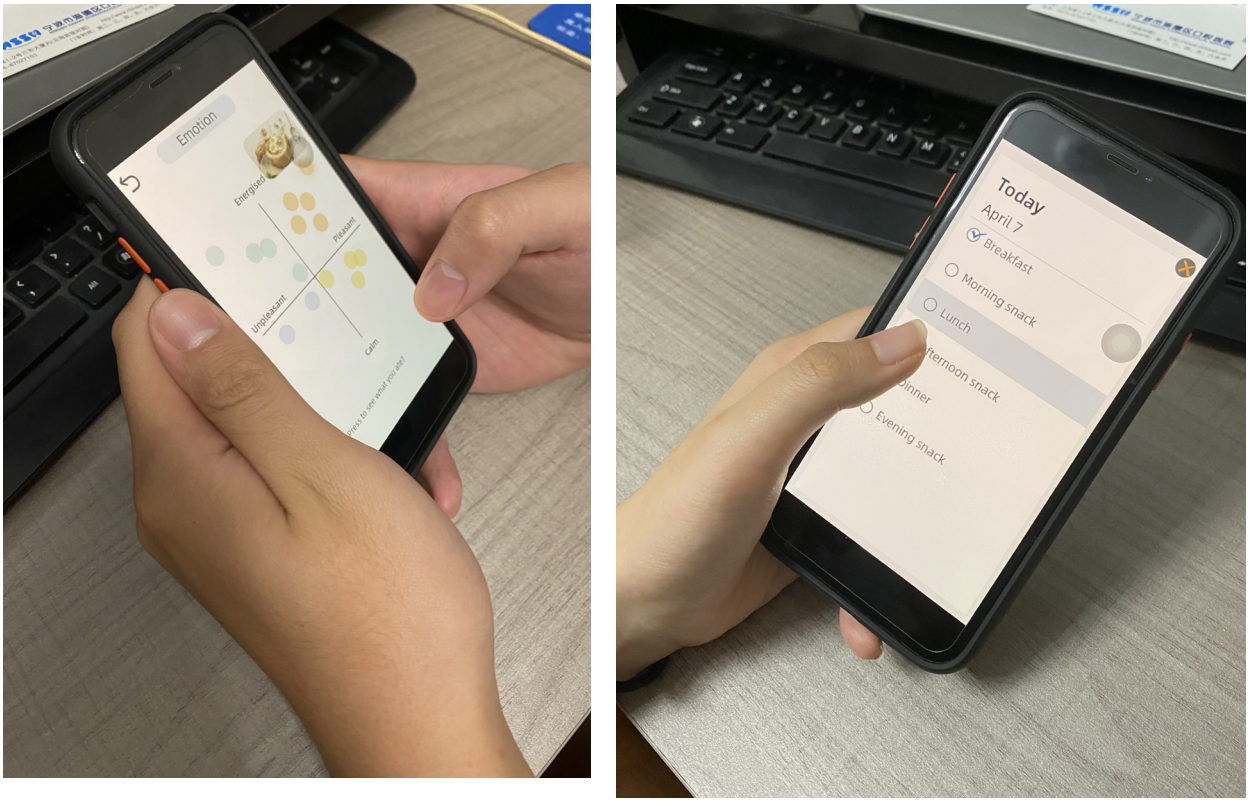


Figure 5-11: Photo took in user test1

Reflection

Figure x shows the result that participants had a positive user perception for most of the questions, except the question about noticing the connection between food choice and contextual factors.

Combined with the interview, we found the key reasons for this result. The users cannot feel the connection between the data. For example, as I emphasized in the research phase, the location has a very important effect on my target group's eating behaviour, but the design cannot make people feel this effect. Therefore, the project will make iterations on this concept. The factor of location, companion and distraction will be highlighted.

These insights lead to the final design, described in the next chapter.

Relevant quotes

1. "I think it's something I've never seen before, so it definitely triggers my curiosity and I would just go with the flow." (talk about the game)
2. "I don't like the input experience. there are so many steps. which make me feel it costs too much time. Although you told me that I only spent 2 minutes."
3. "I don't want to disappoint you, but I have to say that I feel the relationship between food I took and factors influence my choice is not strong."

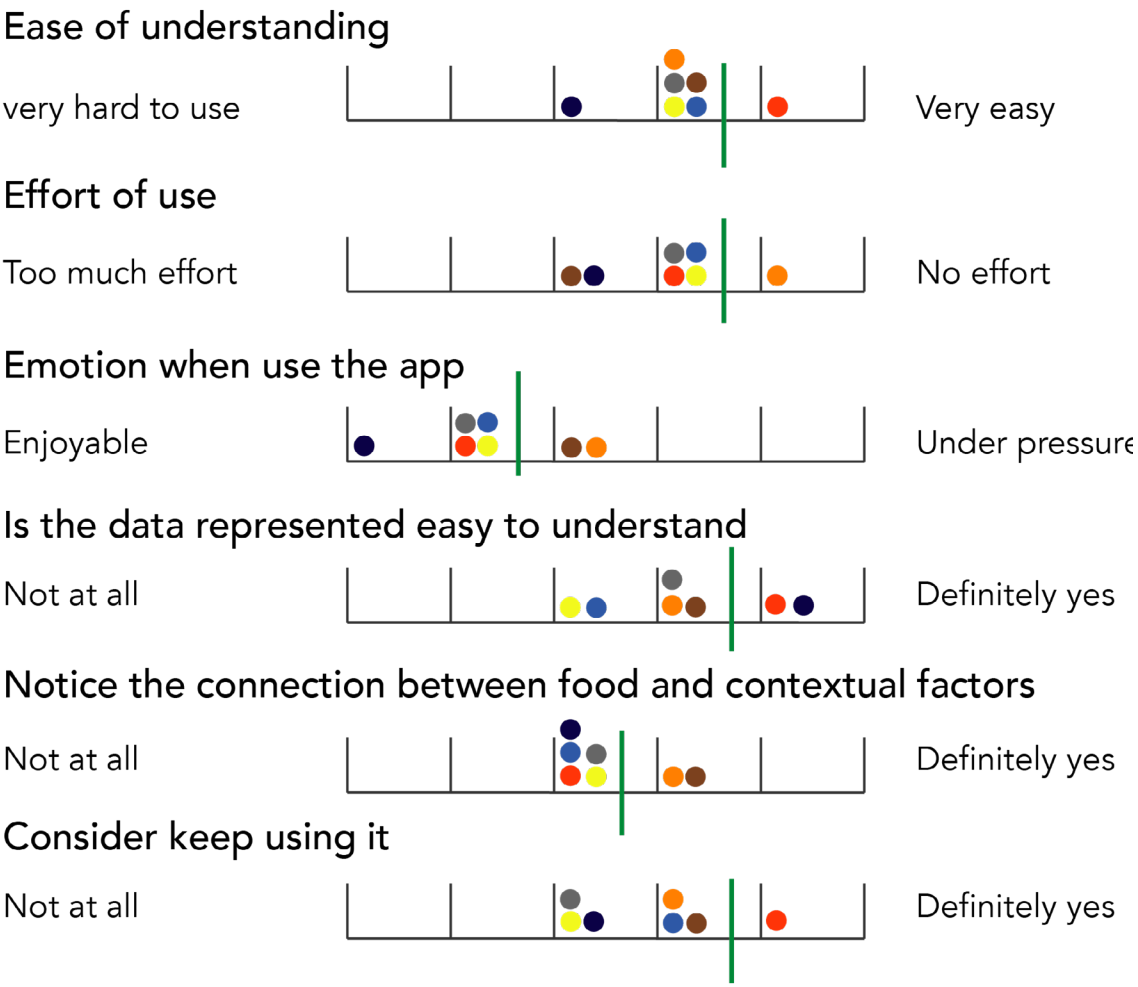


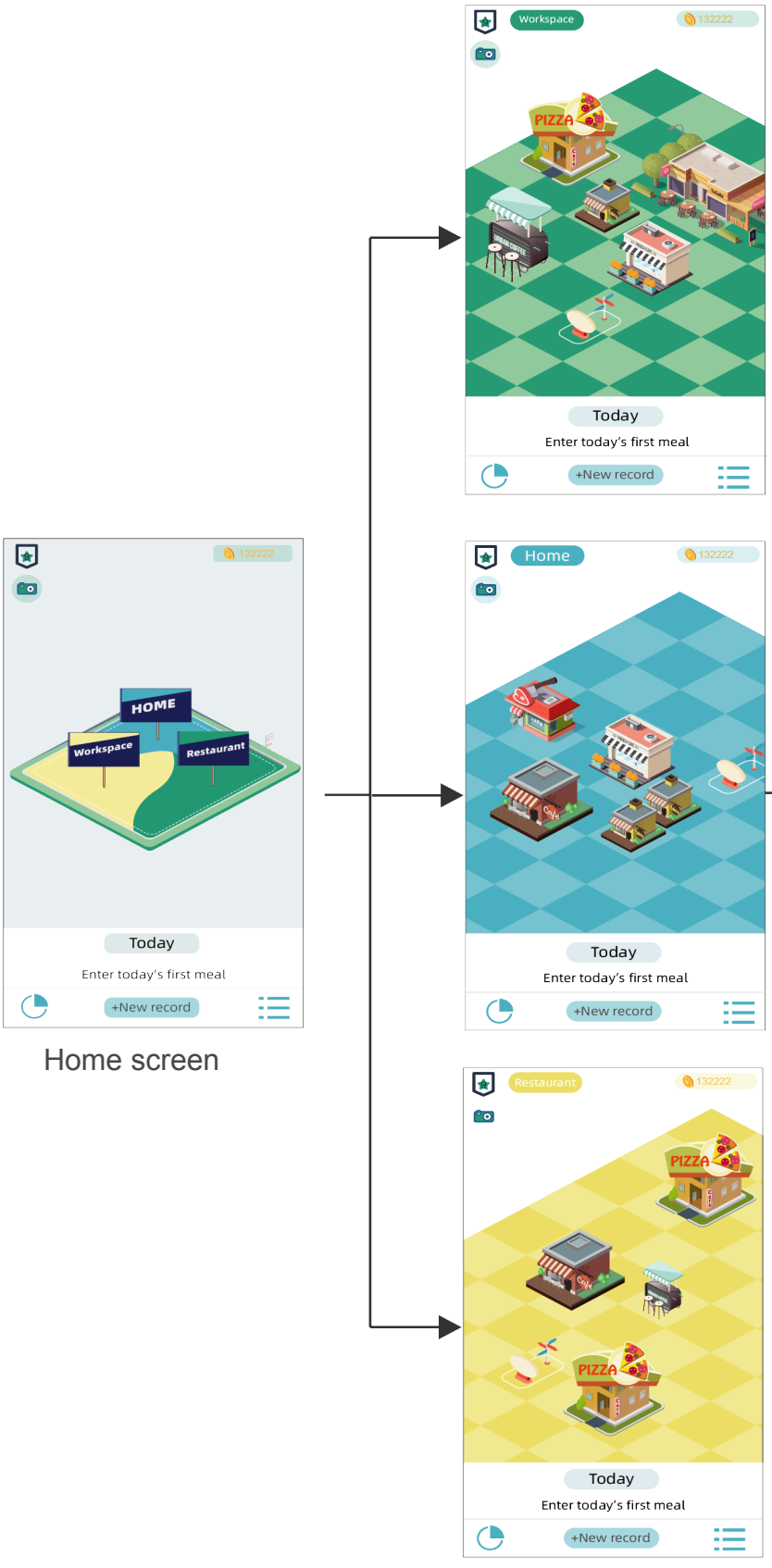
Figure 5-12: Results of questionnaire

5.5 Final concept

Build your food city

5.5.1 Concept overview

Your food city is a new concept of recording people's eating behaviour by including the four main influencing factors of their food choices, especially location, in order to uncover the implicit influences from people they are eating with, eating location, eating distractions. The concept aims to provide actionable insights for the users to gain new knowledge of their eating and reflect upon the new knowledge. Following is a step-by-step explanation of the concept.



These three interfa
different location,
input data at any i
There is always th
new record" at the
interface.

Home screen

The building
the data you
could be upg
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buildings.

Figure 5-13: Ga

aces represent
User could
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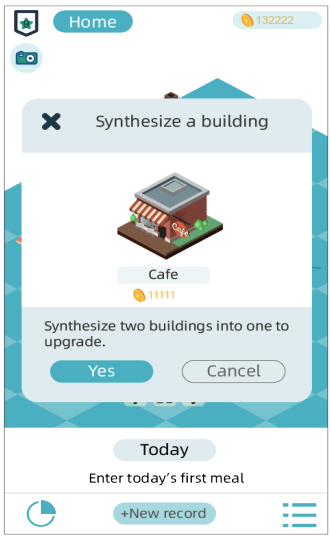
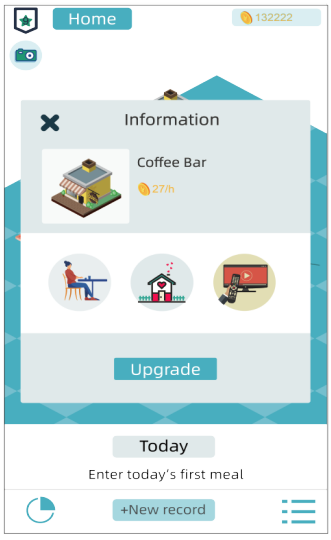
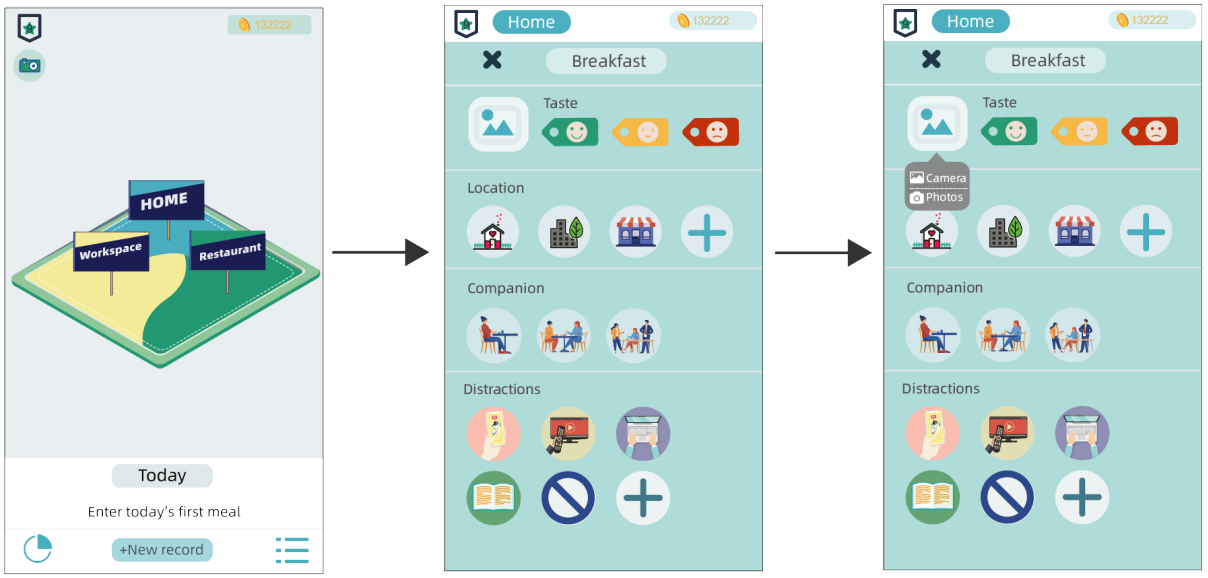




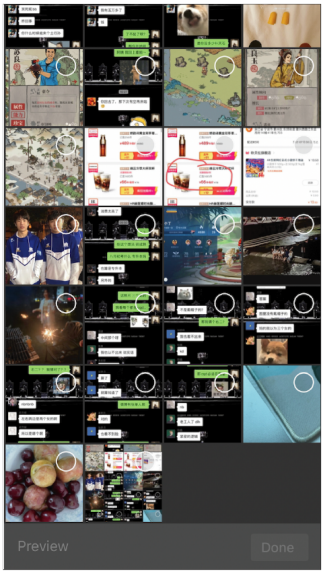
You need to manually turn on the working model of the building. Each click can start all the buildings in the game for six hours. This is the only way to obtain virtual currency besides completing the goals provided by the game.

me elements



The user could choose to upload a photo they took or take a real-time picture, then tag the icons to the photo

Figure 5-14.



After complete the recording, one building will appear in the corresponding district.

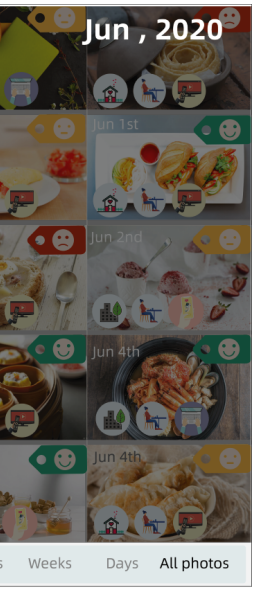
: Data input

Users can search for food photos that meet the criteria by searching for a certain category, such as eating at home; they can also search for their records in the photo bar in chronological order

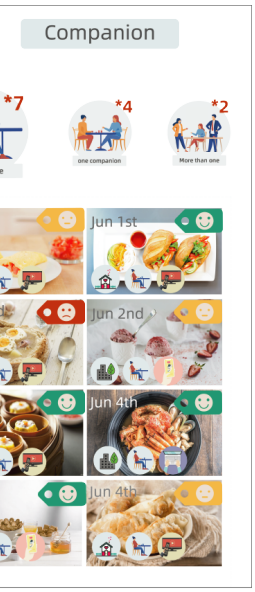
Data represented in two ways, game and report.

Represent in game

Figure 5-



On every photo, the user could see contextual factors related to this photo. Also, if he wants to make a change, it's easy to edit the icon by heavy click.



-15: Data inpput

5.5.2 How the concept achieve the desired interaction

The main decisions for the final design were all made with our design goals in mind; to create an experience that led users to feel engaged, competent and supported.

Following are the explanations about how the concept chieve the desired interactions by using different elements. In the final concept in this project, I focsus more on the interaction of "engaged" when compared to "competent and supported".

Engaging

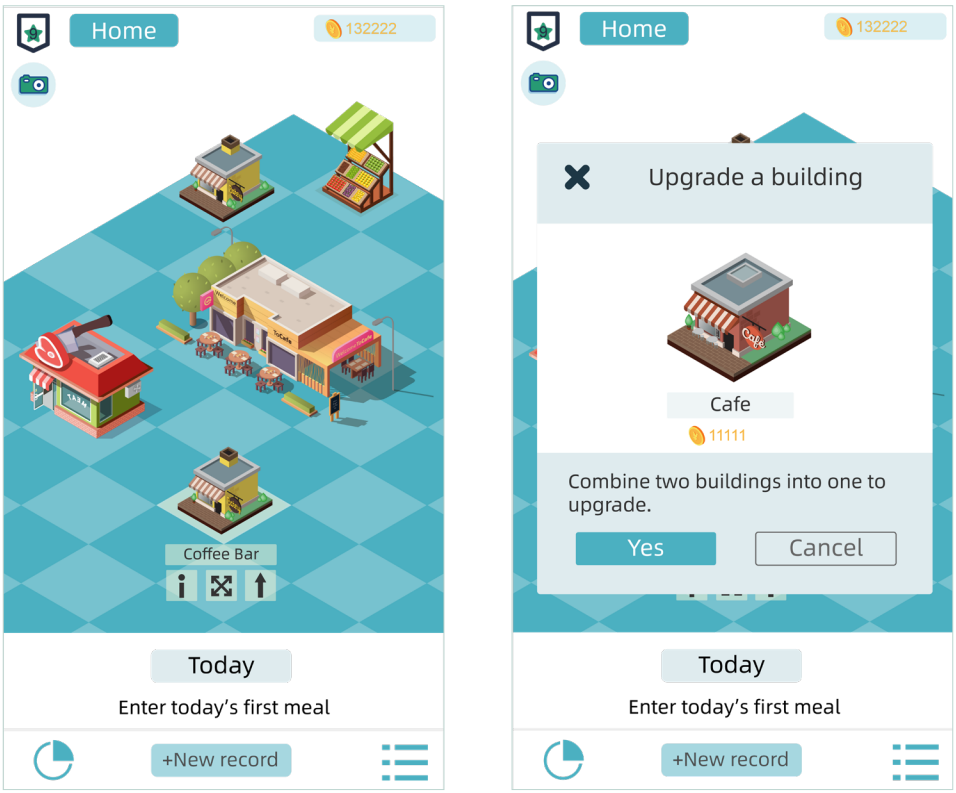


Figure 5-16: interfaces of collecting and upgrading buildings

Collecting and upgrading buildings

The concept using game mechanics and elements to keep users engaged for long-term use.

Collecting and upgrading buildings are the main mechanics here. Every time users record their food in the app, they will get a corresponding building. For example, if you take a photo of coffee, you will get a coffee bar. This coffee bar will contain related factors, such as where you enjoyed this cup of coffee and who you were with.This is completely different from previous food apps, which can attract users to use at the beginning.

In order to increase the interaction between users and buildings, these buildings can be moved and changed. At any time, you can move the building to any location you want. And when you have a certain amount of virtual money and the number of similar buildings that meet the requirements, you can also upgrade the buildings

When the number of buildings reaches a certain amount and level, users can also continuously unlock new areas and unlock different colors to add decorations to new areas.

By leading them naturally to actions in the game, the user will upload photo of food to gain new building and log in frequently to earn money for upgrade. This mechanics could increase users' intrinsic motivation and make user engaged for a long time.

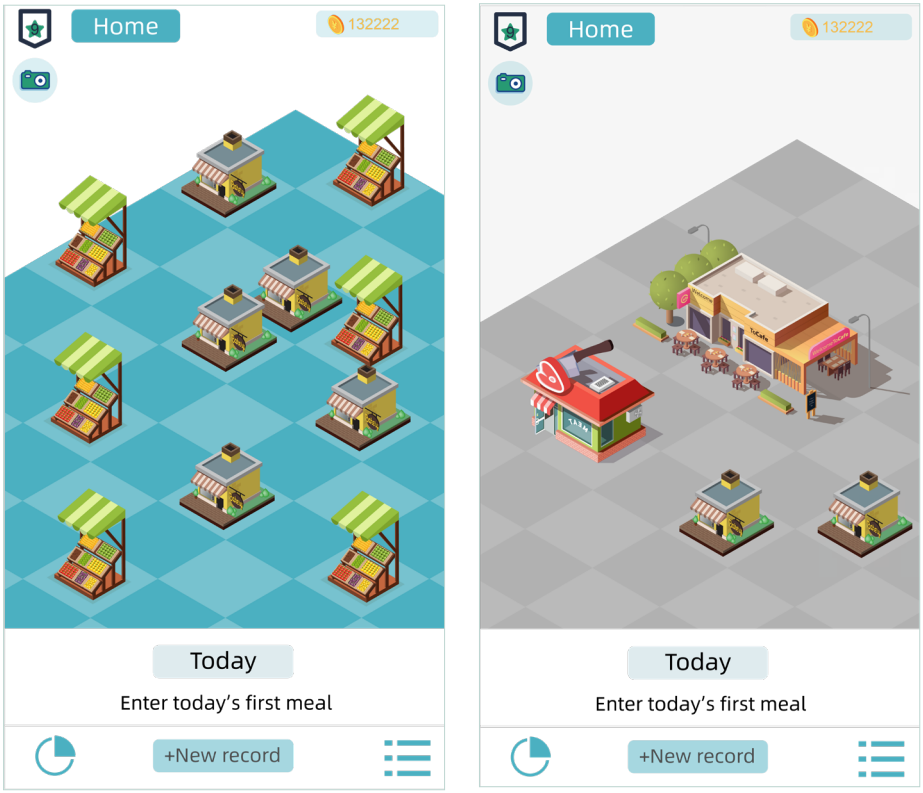


Figure 5-23: Different visual effects of the game

Cue as reminder

To keep users coming back to use. There is a cue in the game. There are two ways that users could get virtual money. one is completing a goal, the other one is making the building work. When you start the construction work mode, the entire city's buildings will make money for you. But after six hours, they will stop working, and you need to log in to the app again to start working mode. The function of this method is similar to the reminder of an alarm clock but combined with the game, it can better attract users to log in.

Figure 5-17: interaface of reminder

Complete goal to get reward

"Goal" is a frequently used element in design to engage the user. In the final concept, goals in the game are related to recording behaviour rather than eating behaviour, because my final goal of this project is engaging young adults to record and understand data rather than change their behaviour. For example, the goal "Construct new buildings for seven consecutive days" means you should log in food for seven consecutive days. Rewards are set to attract users to finish the goal and evoke extrinsic motivation.

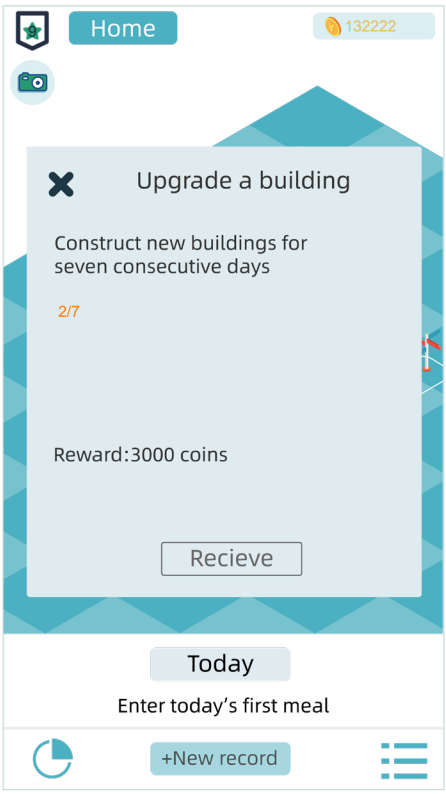


Figure 5-18: interfaces of goal

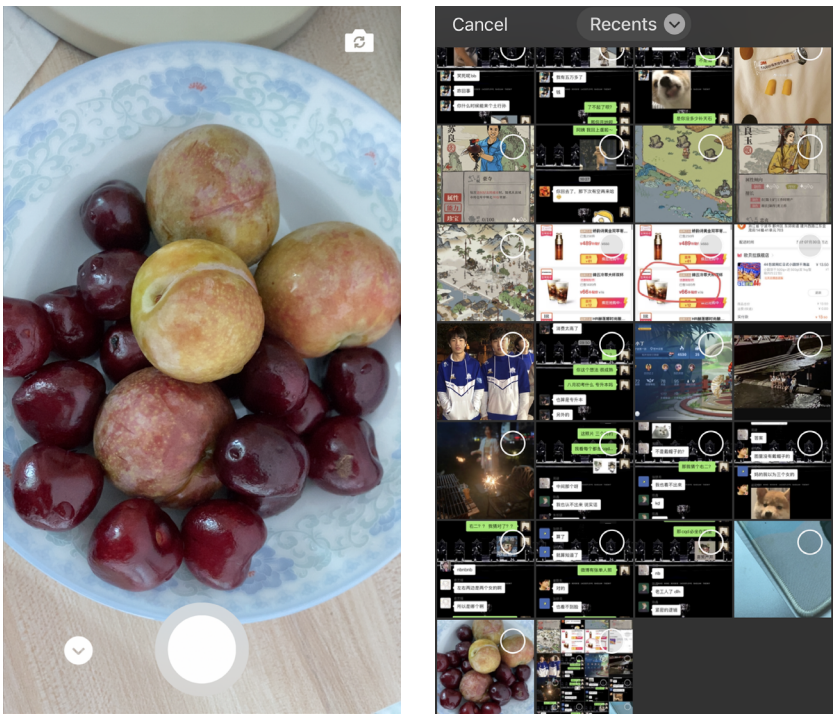


Figure 5-19: Interfaces of food entry

Simple food entry

The concept is taking a photo-based approach to ease the entry of food they are eating. (Figure x) Instead of manually entering the detailed ingredients of the food, the photo of food captures the whole picture of the eating scene, which people can easily recall based on the rich information contained in the photo. Also, the user could also upload the photo in their album instead of taking picture realtime, because many users like to record food and factors uniformly after meals.

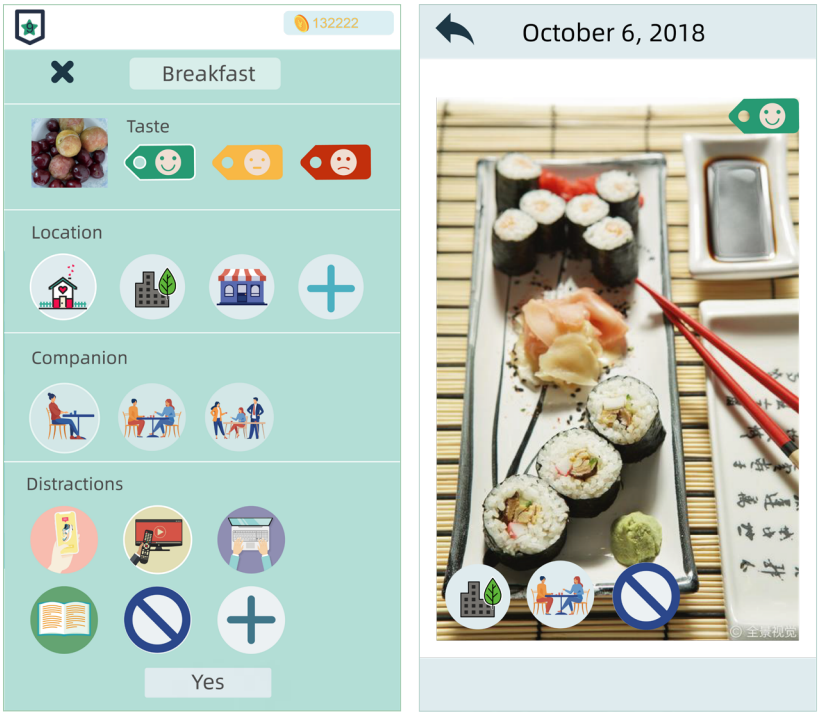


Figure 5-20: Interfaces of food tagging

Tag the photo with icons

The concept provides icons that represent different choices of taste, location, companion and distractions. Users could easily select icons for their photo of food, and do not need to type in detailed information. When they want to change their recording history, they could easily click the icon to edit. Tagging the photo with icons is a consistent and logical flow, and the process costs little effort and time, supporting my target group who are busy with work to report easily. At the same time, At the same time, this way of using icons avoids the unpleasantness caused by users entering their private content.

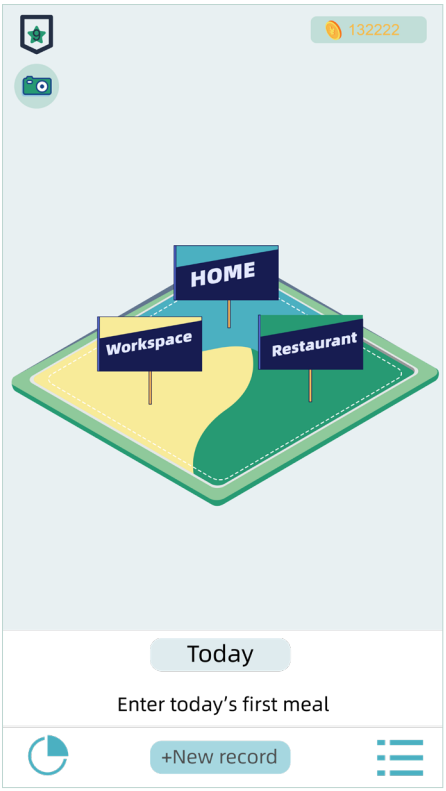
Reflecting on the results

The new insights and knowledge are provided to users in three ways.

1. By checking the results by categories, the user was encouraged to reflect on how they eat differently in a different location, with different people and different distractions.

2. Moreover, according to the research results, location, as the most critical influencing factor, is also prominent in the game design. The game space is divided into three districts: Workspace, home and restaurant. When the user enters different districts, they will see different buildings in this district. Because districts in the game correspond to the eating location in real life, buildings in the game correspond to food in real life, it could trigger the user to pay attention to the relationship between their eating behaviour and location.

3.Using tags, icons representing different locations, companions, and distractions are pasted on the uploaded photos, as well as the introduction of the building in the game so that users can connect the food to these factors when they check the buildings and photos.



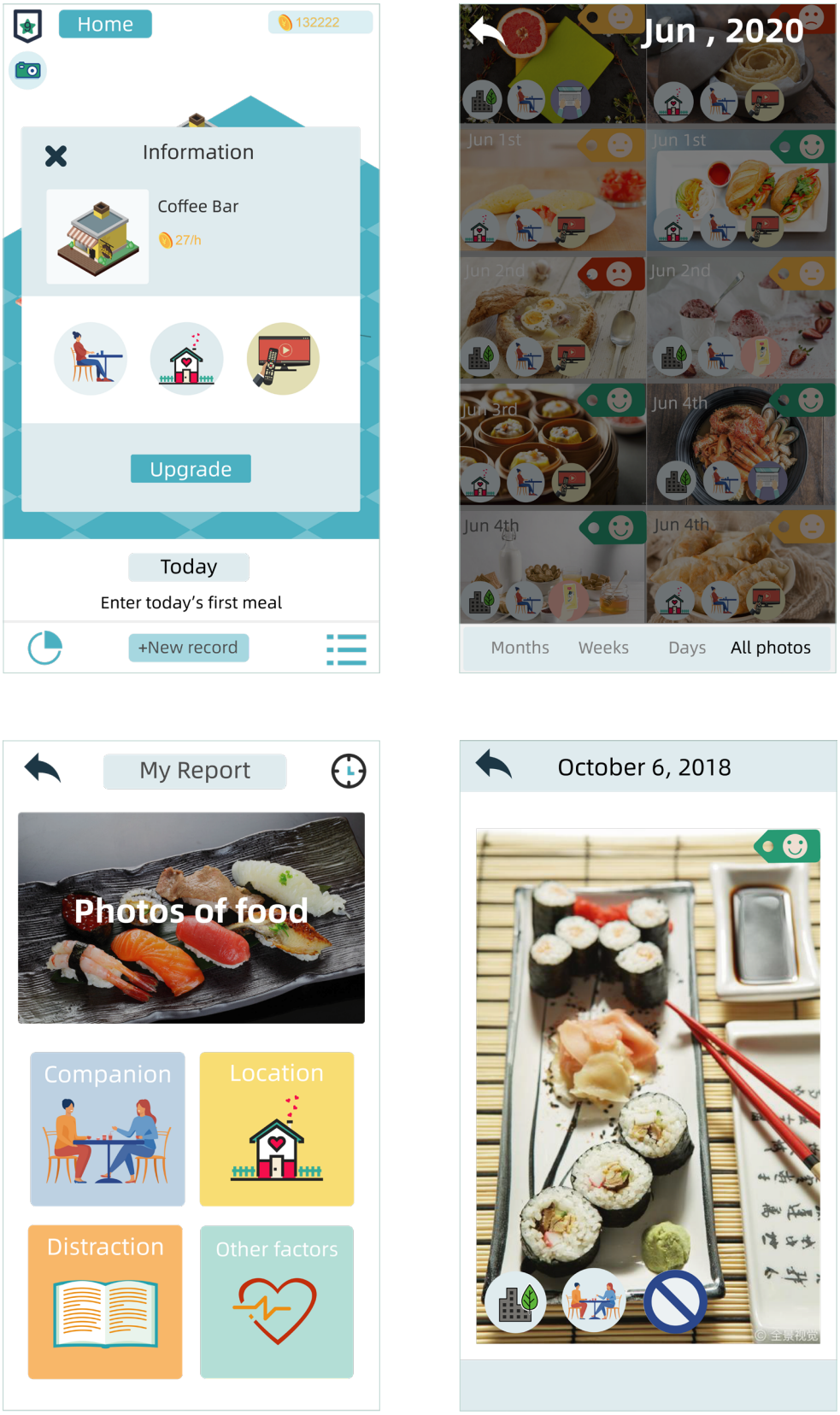


Figure 5-21. Interfaces of different reflections

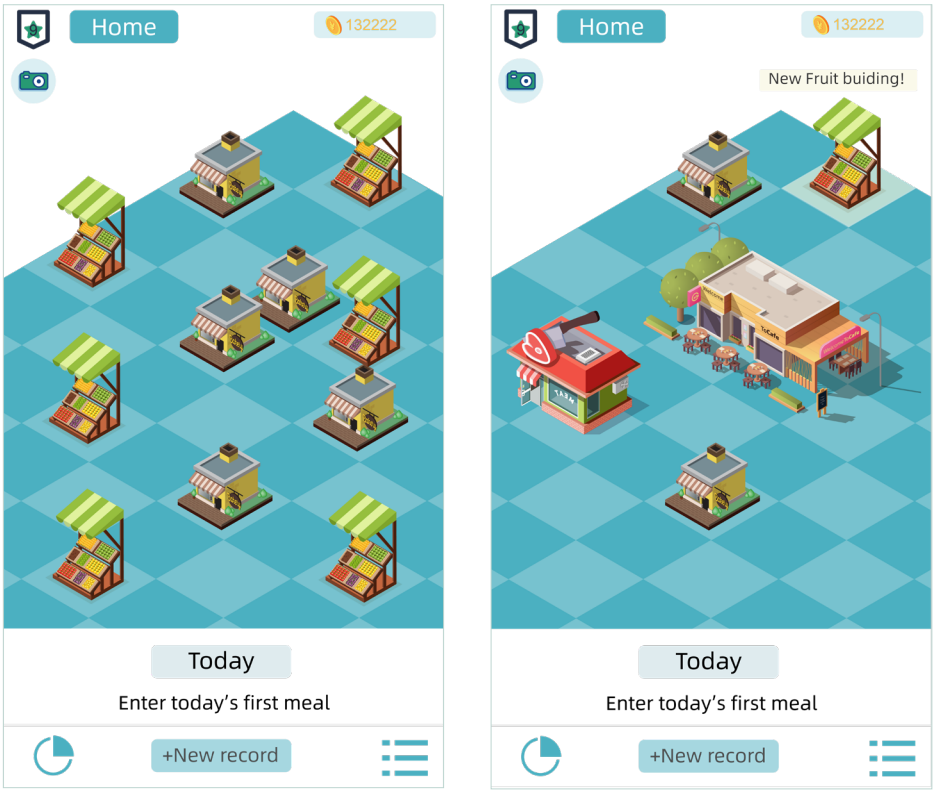


Figure 22: Interfaces of overview of food

Visual overview of food

In this concept, buildings can reflect the types of food, so the more a user eats a certain type of food, the more such buildings will be owned. The same type of building can be synthesized into a new building of the same type, and the prosperity of the building can intuitively show the user's food habits. For example, a user who likes to eat fruits will get different types of fruit stalls when he enters photos of fruits, and these different fruit stalls can be combined into a fruit market, and finally into a fruit mall. The data here is easy to understand and user could feel competent to get the insight.

5.5.3 Workflow

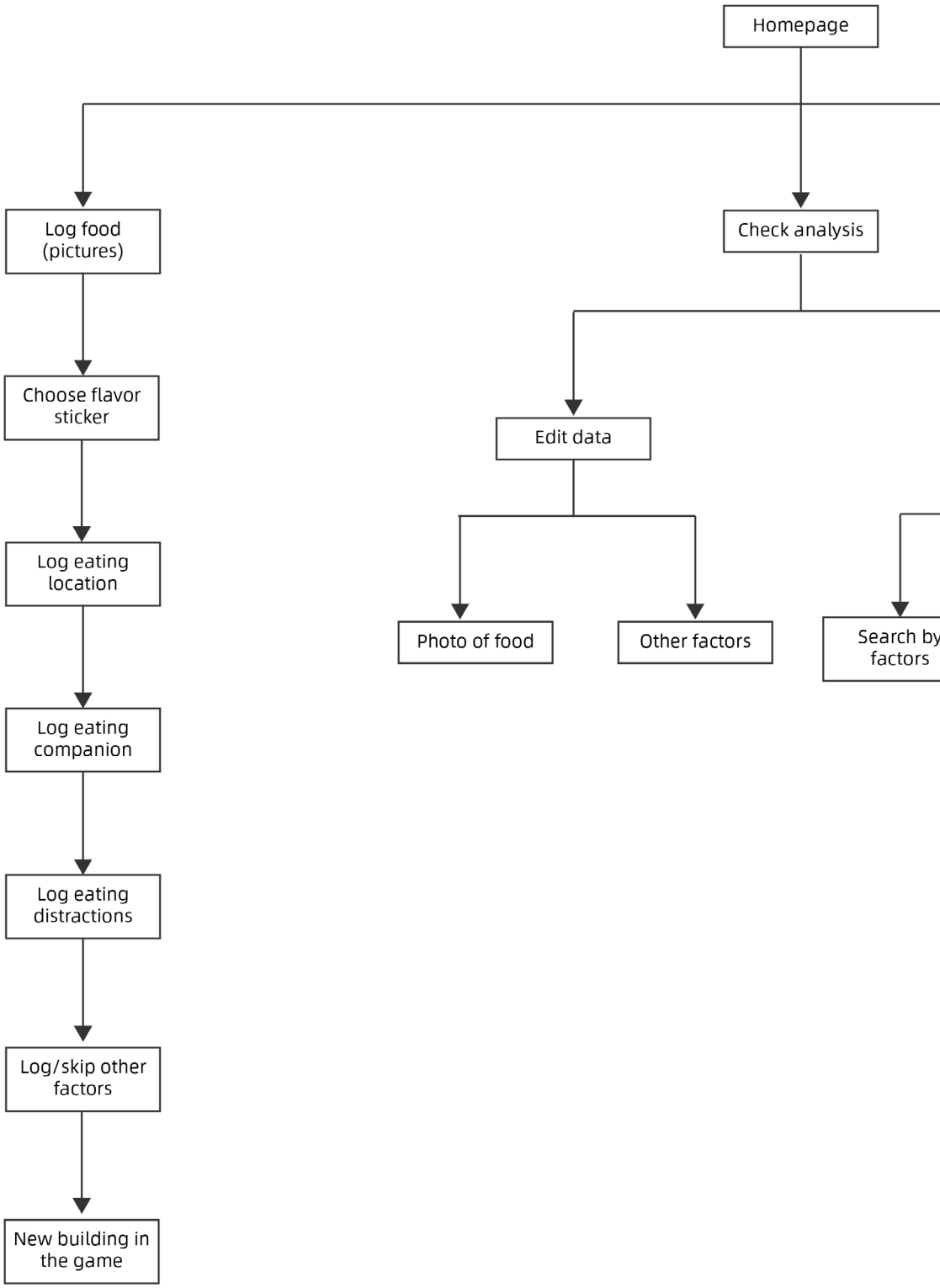
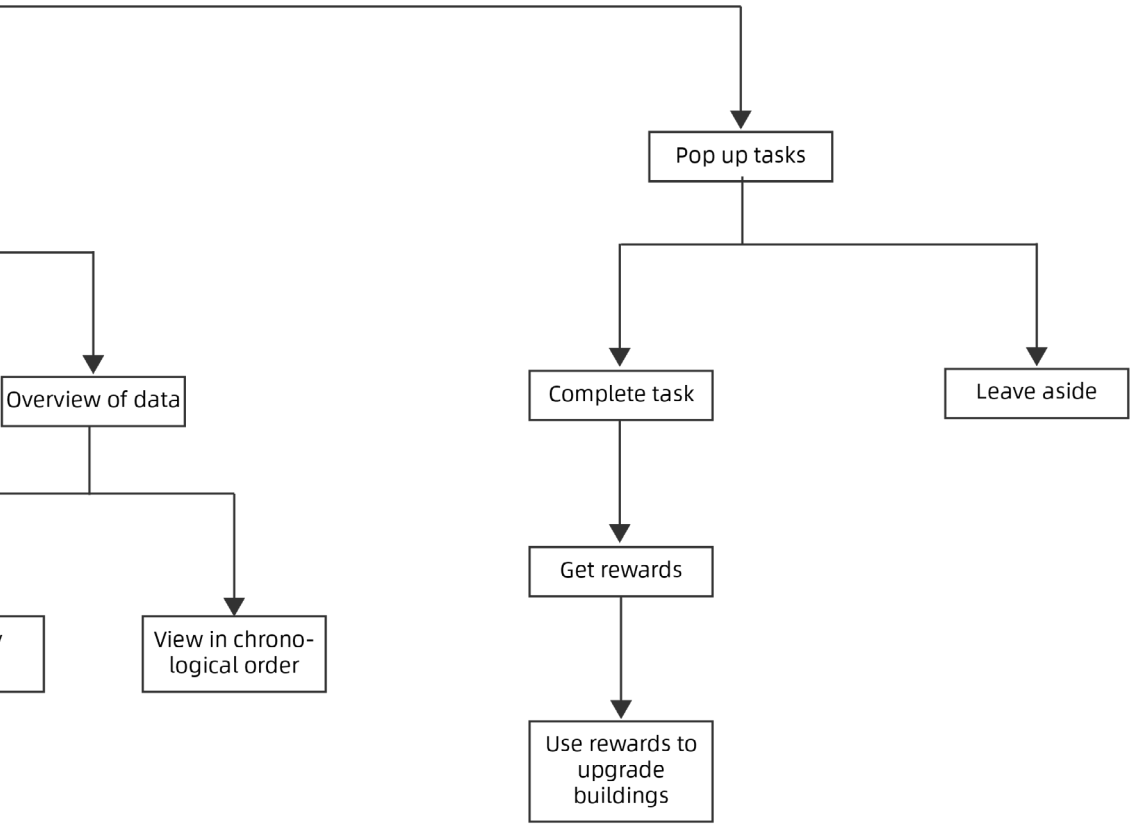


Figure x:


Pop up tasks
Overview of data
Complete task
Leave aside
View in chrono-
logical order
Get rewards
Use rewards to
upgrade
buildings

5.5.3 Scenario of use

In this part, the use of the design is explained through a user scenario. The user scenario is based on the current situations described in chapter 4

…Moe works for a well-known internet company. He usually chooses to eat with his colleagues in the company canteen, or order takeaways to the work area in workdays. He will consider going to the restaurant for dinner on weekends.

One day, after a long time work, she was surfing on the internet. She comes up with the introduction of an app called Build your food city. "This is a food tracking app designed for young adults. Unlike the apps you have used, we do not require you to record calories, and there is no need to strictly control your weight. We aim to provide actionable insights for you to gain new knowledge of your eating habits." Out of curiosity, Jennie starts to use the app.

1. At this time, she planned to eat some fruit as a snack at home. In order to try this app, she took a picture of the fruit and then ate them while watching TV.

2. After eating the fruit, she started to input the data. She first uploaded the photo of the fruit. The system asked her to select icons represented flavour, location, companion, and distraction to tag the photo uploaded. She easily selected good flavour, home, TV, alone, and click the confirm button, the process costed less than 2minuts.

3. After she confirmed the data, a fruit building appeared in the game in the "Home" district, she moves the building to the place she liked in this district. "It's interesting, I want to have more buildings to decorate my city!" she said to herself.

4. Before she exited the app, She did not forget to clicks the building to make all the buildings in the city work to earn virtual money for her for six hours, because she knows that virtual money is a necessary factor to upgrade the building.

5. At that time, there was a message pop up. "Construct buildings for seven consecutive days and you will get 2000 virtual money!" This is a very easy task for Moe, and she planned to complete it and gain the reward.

6. She closed the app and reminded herself to come in and restart working mode in six hours, otherwise, the city will stop working and she could not get enough virtual money to have a fruit market this week.

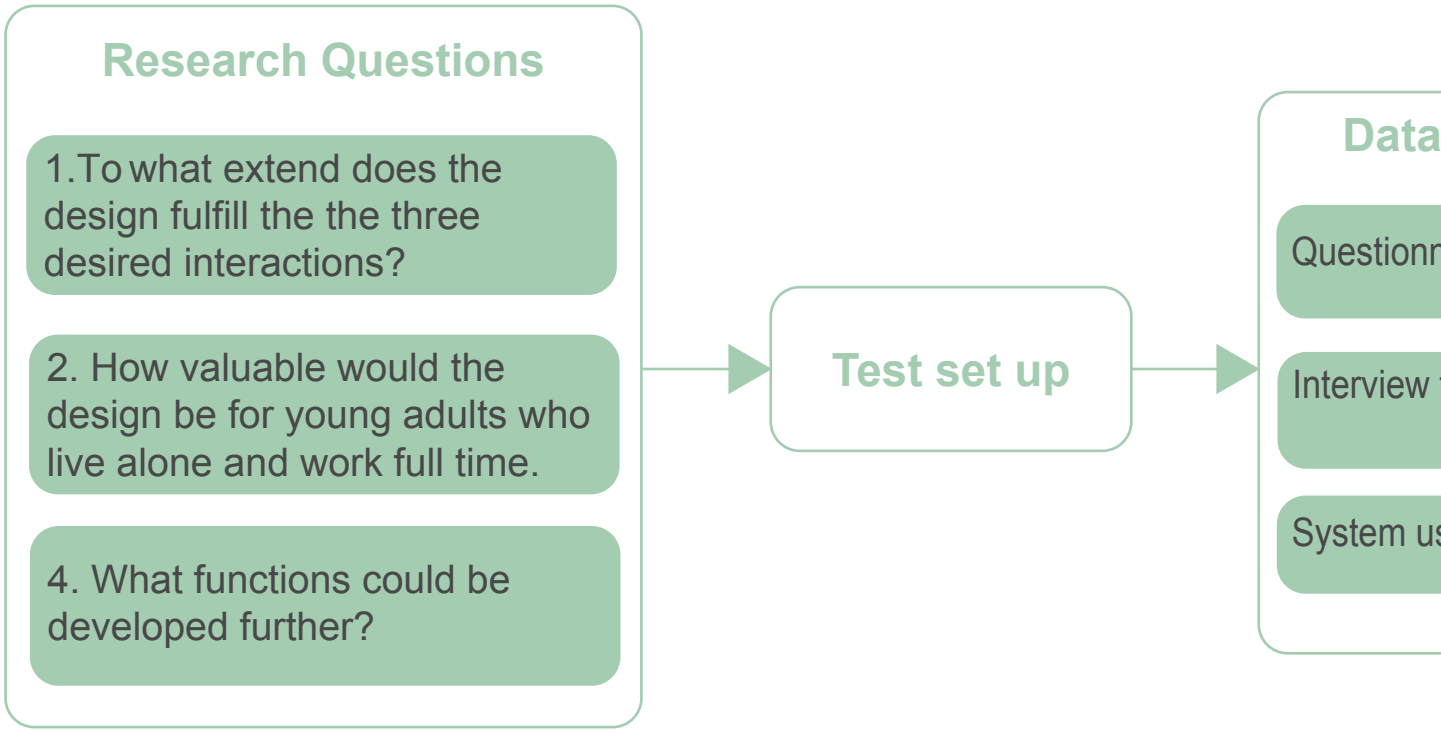
7. For more and higher-level buildings, he naturally used this app for a long time. After several weeks of use, she found that there was a lot of pizza building in the workspace district. she was thinking: Why do I like pizza so much when I eat at the company? Should I change this behaviour?

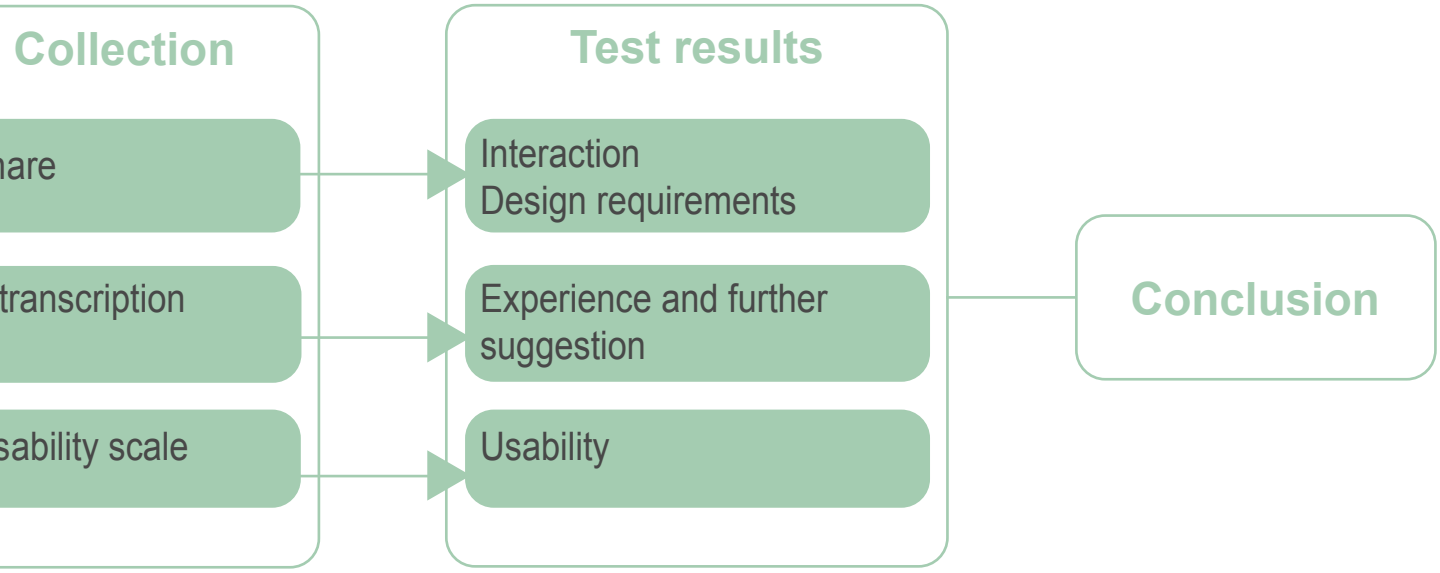
…


"If most people work six days a week, we have no choice at all. Our food even tastes like computers"

6. Evaluation

In this chapter, evaluation tests were conducted for the final concept. The setup and findings of the evaluation tests were described in details. Based on that, the conclusion was drawn and the recommendation was given for further development in the future.


Research Questions
1.To what extend does the design fulfill the the three desired interactions?
2. How valuable would the design be for young adults who live alone and work full time.
4. What functions could be developed further?
Test set up
Data
Questionn
Interview
System us


Collection
hare
transcription
sability scale
Test results
Interaction
Design requirements
Experience and further
suggestion
Usability
Conclusion

6.1 Designer evaluation plan

Since the final prototype is not fully developed to let users really play with, which means whether users will play the game for a long time is not able to be tested, so I choose to have designer tests instead of user test to get feedback on the value of the concept.

Purpose

The main goal of the designer eavaluation is to evaluate the effect of Build your food city by the experience of interacting and the usability of the design. The results were assessed according to the design goal and the desired interaction.

Research questions

- To what extent does the design fulfil the three desired interactions? - competent, - supportive, - engaged
- How valuable would the design be for young adults who live alone and work full time.
- What functions could be developed further?

Participants

3 design students from TU Delft and 3 designers from the internet company. Detail information could be seen in figure x.

Participant	Age	Gender	Tech literacy score(1-5)	Occupation
1	25	Female	5	TUD student
2	23	Male	4	TUD student
3	20	Female	5	TUD student
4	28	Female	5	Full-time work
5	30	Male	3	Part- time work
6	25	Male	5	Full-time work

Table 6-1. Information of participants

Digital prototype

The digital apps were made interactive with a program called Adobe XD. Participants could use the app by mobile phone or ipad.

Procedure

I did a one-on-one session with all of the six designers. First, there was an introduction of the project background and how the design goal was drawn from the research. A concept video was made to tell the user story from encountering the design in the workplace to using the design and to show how the design goal is achieved. After these, the interactive prototype created in Adobe XD was shown to the participants with a detailed explanation. The participants were invited to give comments during the session. In the end, there was an interview session to ask for feedback and suggestion according to research questions.

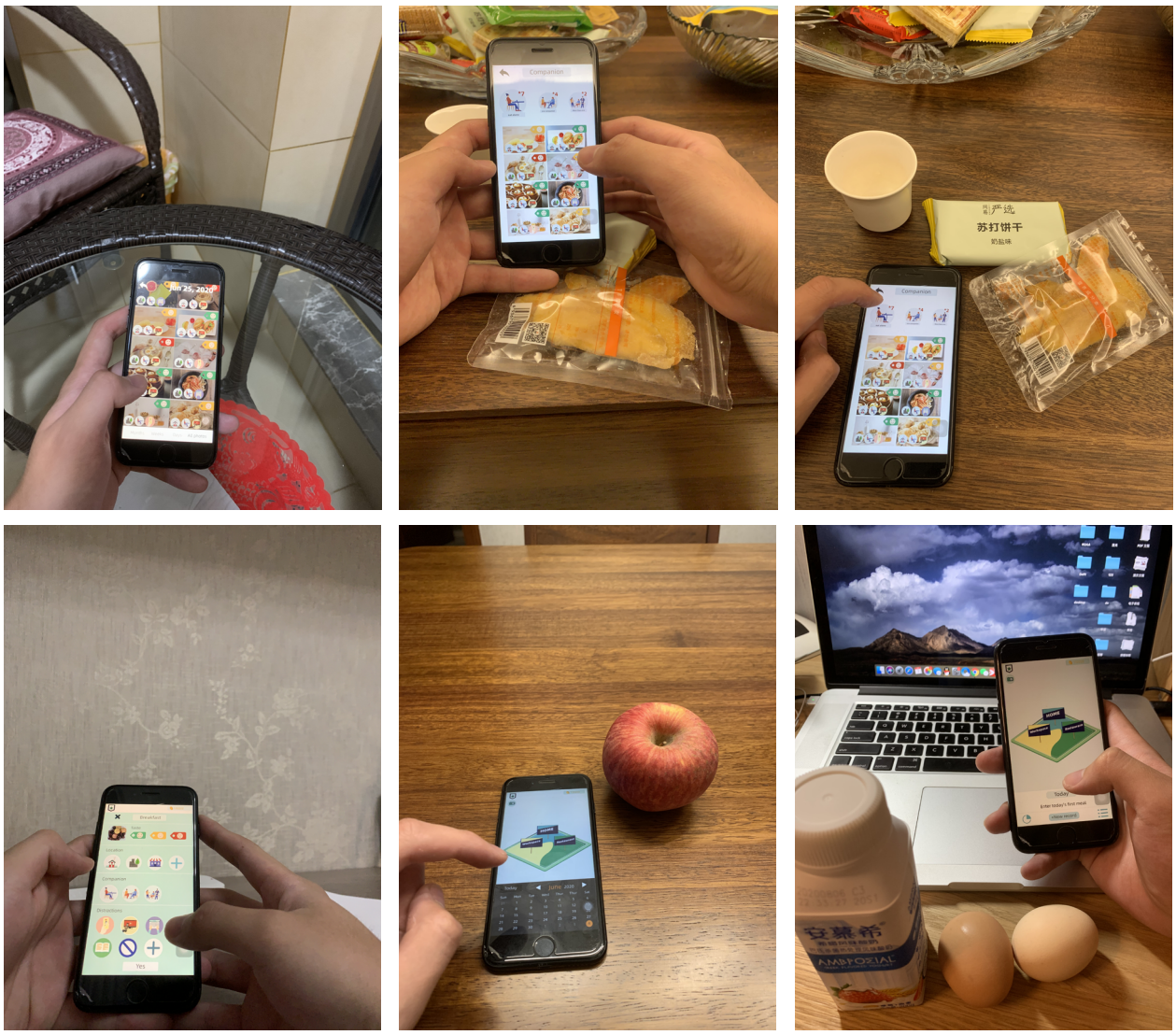


Figure 6-2. Photo took in the evaluation session

6.2 Results of evaluation

To what extent does the design fulfil the three desired interactions? - competent, - supportive, - engaged

Engaged

The concept was considered attractive to play for its rich functions. The elements "collection" "upgrade" "Goal" works well. What surprised me was that the participants all think that it is a very bright spot to replace alarm and remind users to log in to the app by turning on work mode to make money. One game designer suggested that in order to make people play the game for a longer time, it could create competition between users, and "competition" is a strong element to create engagement. I think that if I want to introduce the "competition" element in my design, I need to think about a lot of things. For example, eating habits is a personal context, how to introduce social competition into the personal context; To what extend does the user want to expose their behaviour; What content to compete for, etc.

Supportive

The concept is easy to understand and start using. Taking a photo-based approach is a good way to ease the entry of food they are eating. The designers mentioned that this measure has the following advantages: 1. The user only needs to spend very little time. 2. Avoid asking users to choose the amount of food, types of ingredients, such questions are difficult to answer and are regarded as barries in PIS.

Relevant quotes

"The idea of collecting more buildings to decorate your city is good for adding entertainment, and entertainment could generally evoke engagement"

"Have you ever think about adding competition to your game. Competition could evoke high engagement, especially PvP(Player versus player)."

"Love your idea of the work mode to keep the user coming back to use. This idea adds functionality without affecting the continuity of the game, and even adds a touch of fun to the game."

"As a game designer, I must say that all games are to create an immersive experience, whether it is deep immersion or shallow immersion. Engagement is an attribute of the game itself. I'm glad you introduced game elements into your design, I think it brings the soul to your design"

"I am not a person who has rich experience in playing the game, so sometimes these game-like things are complicated for me, but what you designed is very clear to me. I think the mechanics and game elements are very easy to understand and to use"

"I like the design of "tagging your food with a sticker." this action makes me feel like I am back to the moments

3. Taking good-looking photos to upload is also a record of life, and it is pleasant to users. Tagging photo with icons is an easy way for the user to select and input food-related factors easily, while also clear when they check and edit their tracking history.

Competent

Participants could understand the information on all pages: the introduction/ information of the buildings; checking the results by categories, the icons represented on the photo of food. They can also easily connect the factors to the food they eat, especially when they search for categories. The participants all agree that the users will pay more attention to the factor "location" compared to taste, companions and distractions. When talking about if users could make use of it in their real life. Designers think that after long time use of the concept, the users could gain new knowledge of their eating, but its hard to say if they will adapt their eating accordingly.

Relevant quotes

when I choose what to eat."

"Uploading photo of food not only costs little time but also make the recording process more direct, it doesn't ask me to answer questions like "What kind of ingredients did you eat"

"Of course I will notice that I eat very differently with different locations, companions and distractions."

"I think you want users to care much about location. Every time I log in the app, I will see that I eat differently in a different location."

"I think you could add a weekly report in your design and provide some food-related knowledge to users. For example, the health benefits of the food they eat this week"

"I think I will know myself better after using such an app, not only about food. For instance, I will find that I am always in the company and working every day because my lunch is all recorded with working space."

How valuable would the design be for young adults who live alone and work full time to report and understand their eating behaviour.

For my target group, who are under high pressure of work, my design using lots of game elements to make the recording experience relaxed and enjoyable, not add burden to them.

The design introduces a new perspective to manage eating behaviour--not on the results of the food consumption, but on what factors making them arrive at that results. The design let users uncover the implicit influences people are receiving -- eating location, eating companion, eating distraction. It differentiates itself from the prevalent calorie-centred approach among the digital applications on the market. Because for my target group, calories are not their original intention of food recording, my design is more in line with their expectations for food tracking.

The features that can be developed further will be discussed in the Recommendations later.

Relevant quotes

"Before this, I really did not think about it and did not sure if I want to know or don't want to know, like completely unaware of that, now this app is starting a switch that I become curious about that "

"After a long time use, users will realize some problems. For example, I will find that I always eat more when I watching TV. Then I will avoid eating when enjoying TV or avoid watching TV when enjoying food."

"Since the idea behind the concept is to introduce a new perspective to manage eating behaviour--not on the results of the food consumption, but on what factors making them arrive at that results. People who are not designers or researchers may feel confused at the beginning. If I were you, I will add some other game elements at the beginning to help them notice the features of your design."

"I will try such an app if I see the introduction in the app store. This means a game for me, so it will of course not add pressure to me."

Participants were invited to evaluate the product with the experience rating form at the end of the test, which can be found in the Appendix. The results of their ratings are summarized in figure x. The desired interaction qualities formulated in Design Vision part are all achieved from the evaluation form. The other criteria presented in the experience rating form are also generally met.

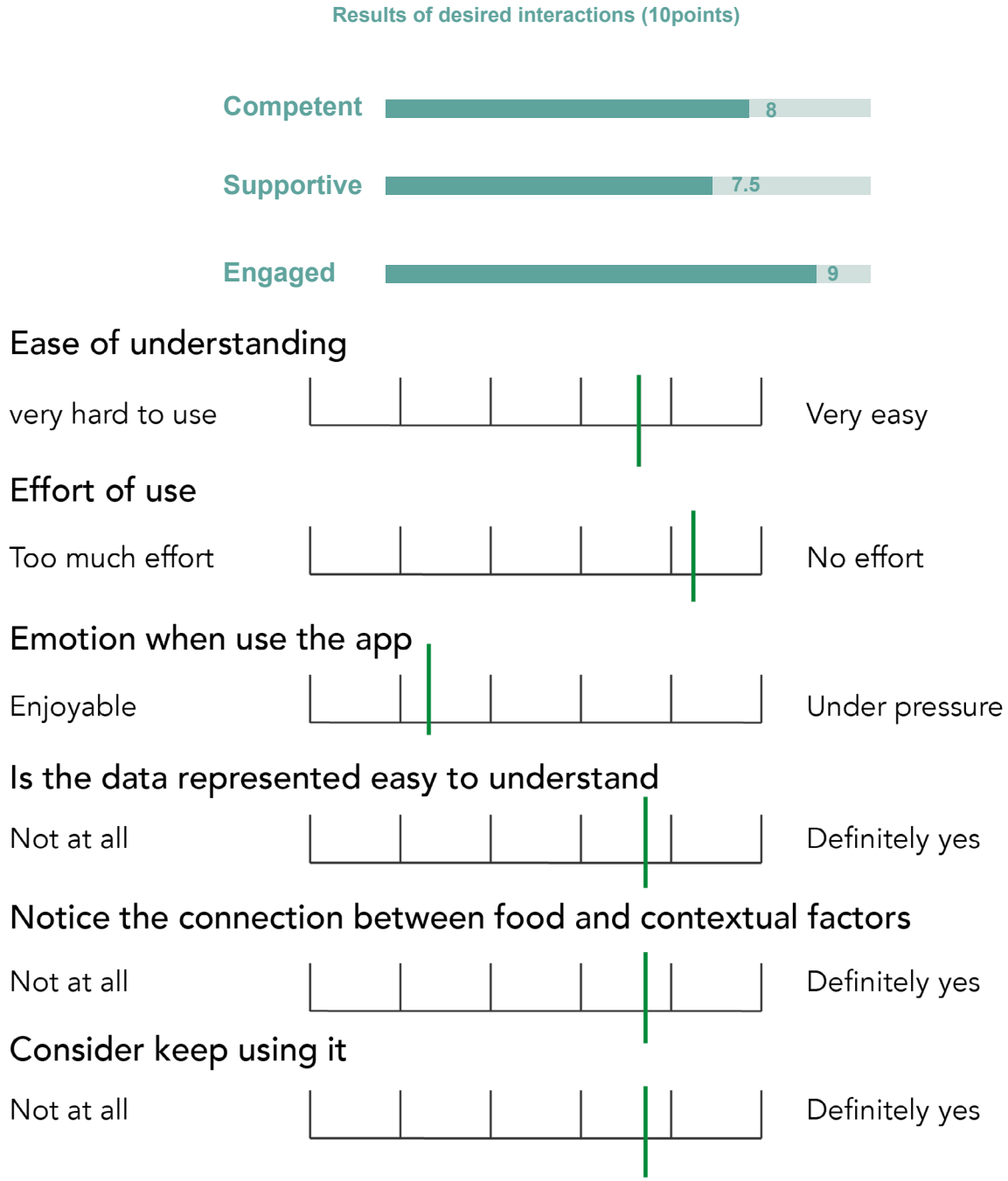


Figure 6-3. questionnare results of evaluation test

Each participant filled out a System Usability Survey (SUS) to measure their usability perception at the end of the user test(Sauro, 2011). All participants had a positive user perception for each of the ten questions. The results can be seen in figure X. The learnability score was 93.8 and the usability score was 85.8. Overall the design scored well, with a SUS score of 86.7, converting to a percentile rank of 85~89%. This means that our design has higher perceived usability than 85~89% of all products. (Lewis & Sauro, 2009)

Participants	q1	q2	q3	q4	q5	q6	q7	q8	q9	q10	SUS Score	Usability	Learnability
P1	4	1	5	1	4	2	4	1	4	1	87.5	84.4	100.0
P2	4	1	4	1	5	1	5	1	5	2	92.5	93.8	87.5
P3	4	1	5	1	4	2	4	1	4	1	87.5	84.4	100.0
P4	5	2	4	2	4	3	4	2	4	2	75.0	75.0	75.0
P5	3	1	4	1	4	1	5	1	4	1	87.5	84.4	100.0
P6	4	1	4	1	4	1	5	1	4	1	90.0	92.5	100.0
Average											86.7	85.8	93.75

Table6-3. Score of SUS form

Conclusion

In general, the final concept Build your food city meets the goal of engaging young adults who live alone and work full time to record and understand their eating behaviour. Elements in the design contribute well to make users feel supported, competent when interacting with the design, and at the same, keep engaged through using.

However, there are limitations to the evaluation. First, the evaluation test is based on short time use and the participants needed to imagine their experience of using the application on a daily basis, so their experience described during the test could be different from that of using for a longer period. Second, participants in the evaluation are all designers, for the further development of the concept, more tests should be conducted with other types young adults.

“Having a cup of coffee in the sun for fifteen minutes is a luxurious treat for me” (Moe)

7. Recommendations

The final concept outlined in chapter 5 has potential to make users feel supported, competent and engaged. That being said, there are some recommendations that should be considered. In this chapter, recommendations for study methods are concluded, for a more comprehensive understanding in the user experience of food tracking. Additionally, design recommendations of the concept are illustrated for fuerther explore.

7.1 Recommendation for study method

More sample

In this study, only six to seven participants were invited in every test. Thus, the test sample was too small to be representative. In addition, the background of all the participants were too similar (almost 50% of my participants were students in TU Delft, and many of them are designers), and this might influence the holisticity of the test results. Also, although the SUS score were positive, it only included data from six participants, is a summative evaluation, focused on the overall outcome of the experience. Thus, formative data results should not be overlooked.

Test in real scenario

Because the concept could not be played in real context, all the tests in the project were did in a studio. This might have led to the results that most participants pay more attention to the data input process when compared to data representation, because the data in representation stage is not completely in line with their habit. If there is a chance in the future, The concept needs to be completed as a real app which enables users to play in a real-world context for some times.

Long term test

Another fact that should be taken into account is that Whether you can stick to this app for a long time requires a long term test. Currently, my evaluation only asks participants whether they will keep using for long times. However, there is a gap between willingness and actual behavior, long term test is needed.

7.2 Recommendation for final design

Provide tips/hints

The design could add tips and hints for first time user. When users can't link their eating habits with contextual factors, add hints/ tips to help them better understand and get knowledge.

More integration with the food and contextual factors

For further design steps, the game can integrate with not only location, but also other factors, companion and distraction. For example, the amount of people you eat meal with could be the amount of visitors in your city.

Add competition

Competetion is a good element in game design to continually engage people, and competition with others could also add social part to the design, which could also create long term engagemnt. In further development, I wll consider to add game elements such as competition to creat a deeper engaged experience.

7.3 Reflection - If the design used for behavior change

**Lead to healthy eating behavior and health consciousness*

Although the final goal of this food diary app is to form self-reporting habit rather than form better eating behavior. It is still worth considering that how/if the app could encourage users to change their eating habits after long-term use.

Option 1 - Music

Music affects human beings in various ways has probably been presumed as long as people have played music. People's mood will be affected by music, and emotional changes will affect behavior. (Bruner, 1990)

Under this option, I set background music for the game. When the user's eating behavior tends to be healthy, the music is happy; when the recorded diet tends to be unhealthy, the music is sad.

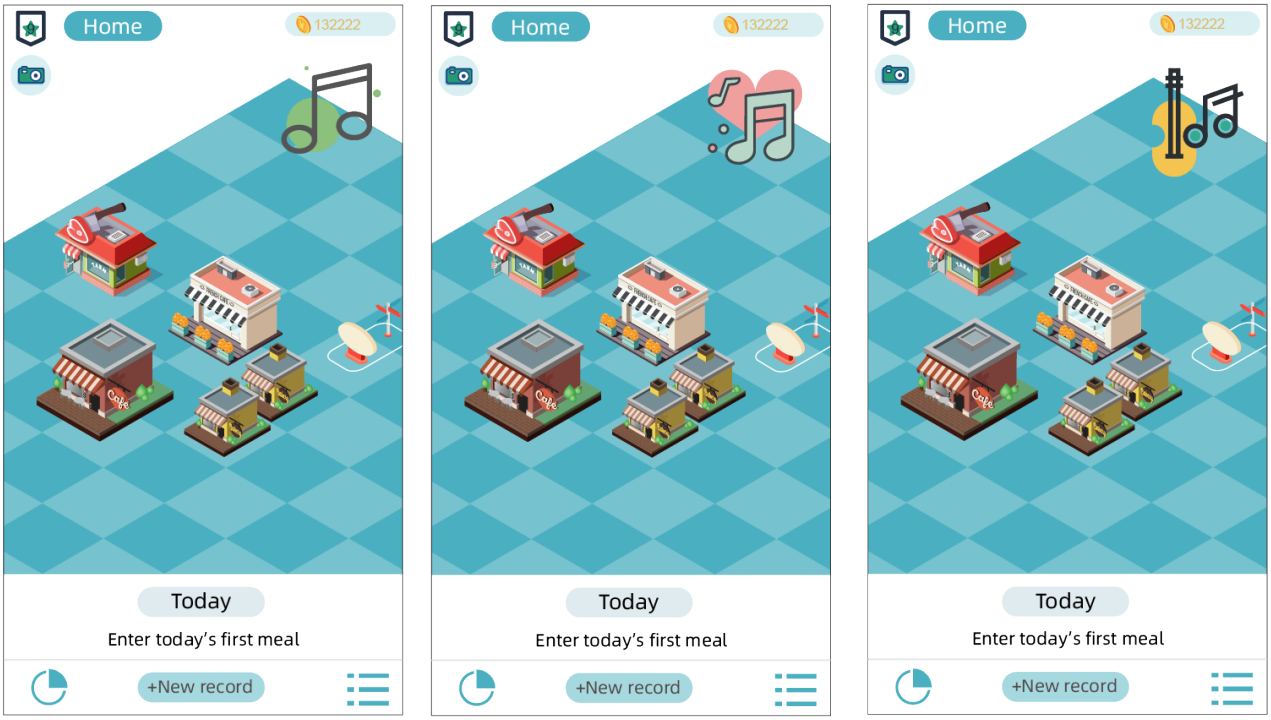


Figure 7-1. Interfaces of option 1_music

Option 2 - Color

Under option 2, Users can independently choose the background color for their food city, and as the level increases, more color choices will be available. However, if the user records unhealthy food for a long time , the color of the city will be grayed out . Only by recording a certain percentage of healthy food in the following days can the color be restored.

Figure 7-2. Interfaces of option 2_Color

Option 3 - System Goal and reward

Under option 3, the system will provide a series of small goals according to the user's eating habits. When the user completes one of these goals, he can obtain a new building (and the building can only be obtained by completing tasks, not by recording food). After obtaining the building, Users can place the building freely in the city to add style to the city.

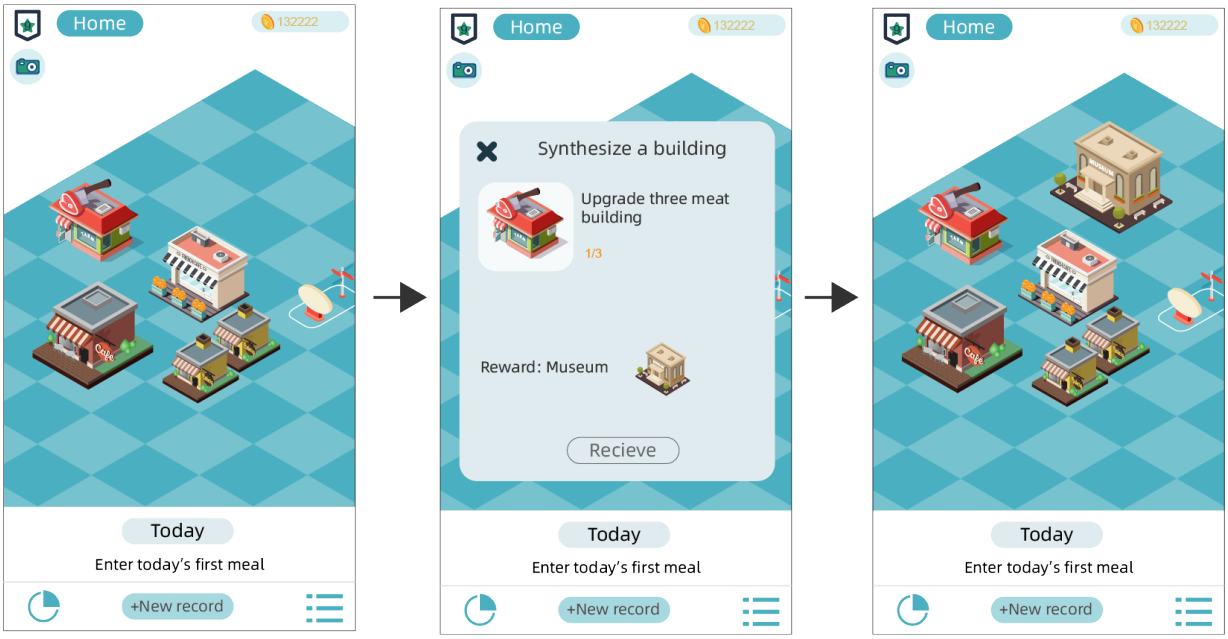


Figure 7-3. Interfaces of option3_Reward

Option 4 - Set your own goal

Under option 4, the user should set their own goal every month and divide it into 4 small goals every week. If the user completes the goal, he or she could get a reward - a memorial building. After obtaining the building, Users can place the building freely in the city to add style to the city.

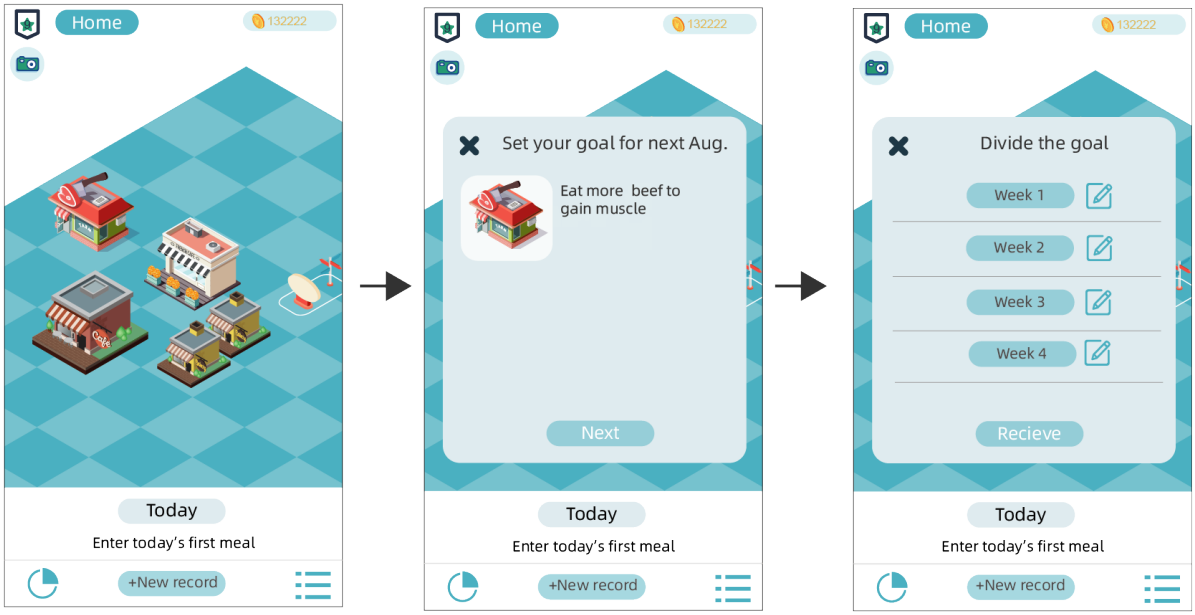


Figure 7-4: Interfaces of option 4_Set your own goal

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