Reducing food waste from online grocery shopping.

A digital intervention to help consumers buy less excessively.

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Abstract

With more than half of all food waste taking place at home, a transition in our consumer behaviour is needed if we want a future with less waste. While supermarkets and food producers have strong incentives and have the tools to reduce waste on their side, consumers seem to be less concerned about wasting food. However, they are also caught in a complex web of conflicting goals and desires that stand in the way of behaviour change. Food waste is a result of avoiding time and effort, being unaware of its consequences, and experiencing a moral obligation to be a good provider. This desire to provide our partners, families or guests with good and enough food suppresses our moral intentions to reduce waste.

Changing behaviour requires confidence in the ability to do so. For family providers, this means feeling confident in being a good provider, and in their ability to minimise overprovisioning. To bridge this vision and the design phase, an interaction vision was developed, stating that interacting with the design should feel like a safety net, discovering new things, and learning by doing. This translates into a design that is reliable, spontaneous, and intuitive.

Building on the findings from literature, interviews, and other exploration methods, several design iterations were made based on the following principles: to facilitate creative meal planning and the use of leftovers, to elicit our aversion to wasting money, to provide space to express identity, and finally to align being a good provider with buying enough.

The final design is a service in the online grocery store that enables family providers to put meals on the table that deliver the right amount of food without compromising their desire to provide well. It involves creating personalised meal plans tailored to the preferences of the family members, as well as suggestions for substituting larger products for smaller ones. The qualitative test suggests that the intervention can successfully help providers to buy less and achieve behaviour change in the long term, mainly by reconsidering the items in their shopping basket. Through this design, this project explored a sub-solution to the systemic problem of food waste, specifically aimed at online grocery shoppers and their good provider identities.

Preface

I used to be careless with food waste when I was younger, but this was with food and cooking in general. I was well taken care of and there was always an abundance of food at home. I was not really interested in learning about food, and how to put together a nice meal, and so I did not learn how to plan for appropriate amounts. This changed when I left home to go to university. Here I was confronted with the need to manage all food-related matters myself and to cook for seven other household members. I immediately noticed how much I had to throw away because I lacked the skills to manage food. As I started to develop flavour, cooking and storage skills over the following years, I also started to waste less. From personal experience, I know that reducing household food waste goes hand in hand with a good relationship with food.

I did this project because I was interested in how we can gradually help consumers in their journey of learning to waste less. Household food waste is a massive global problem, but the main change has to come from consumer behaviour. As behaviour change is a very complex subject, I am well aware that this project is more about setting a direction towards less waste, than it is about designing the one solution to eliminate it. Nevertheless, this topic provides a great opportunity to design something meaningful for our future.

It was also a chance to use my experience as a user experience designer at the online supermarket Picnic, which gave me an advantage in understanding the context. In the design phase, I have used the Picnic app as a platform to apply my concept. I would like to thank them for this opportunity as it has made my design project much more convenient and allowed me to design a realistic concept.

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1 Introduction

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1.1 Background

With a third of all greenhouse gas emissions traceable to the food system (Clark et al., 2020), it plays a crucial role in seeking for solutions to limit the rise of the global temperature to 1.5 - 2 degrees Celsius (Paris agreement). The food system alone may already cause a rise of more than 1.5 degrees Celsius between 2051 and 2063 if nothing changed (Stenmarck et al., 2016). Luckily, there are many opportunities to reduce the footprint of the global food system. Besides changes in dietary consumption and efficiency in food production, reducing food waste by half could reduce greenhouse gas emissions of the food system by 27% (Stenmarck et al., 2016). While in itself this is not enough, it should be seen as a significant part of the solution to this wicked problem.

Household food waste

While food waste is a systemic problem that needs to be approached from multiple angles, households are the largest contributor, as half of the food waste in the EU is estimated to take place in this context (Crippa et al., 2021). However, this does not mean that consumers carry responsibility solely, as food spilling behaviour is influenced by retailers and producers, for example by bulk promotions or large package sizes (Schanes et al., 2018). Household food waste is a result of accumulating decisions along the journey of planning, shopping, storing, preparing, eating, and managing leftovers (Schanes et al., 2018). Examples of these decisions are how much groceries are bought, how groceries are stored and what people do with their leftovers (Aschemann-Witzel., 2015).

The good provider identity

The 'good provider identity' is a recurring theme within the literature on household food waste drivers. This identity refers to the goal to be a good parent or partner, by providing the household with an abundance as well as proper food (Graham-Rowe et al., 2014). It is suggested that this identity conflicts with the intention to reduce waste, by modifying our moral norms (Wang et al., 2021). In other words, we tend to waste more food when we are providing for our partners, families or guests.

1.2 Project introduction

With this project, I focus on overprovisioning, which is the behaviour of buying too much, and that results in food waste. In my analysis, I mainly look into buying considerations during the planning and shopping for groceries. The goal of the project is to investigate how design can help consumers minimise the amount of excessive purchases in the online grocery store.

From Excess To Enough

This graduation project has its origins in the research project *Transition from Excess to Enough* (FETE) from the universities of Wageningen, Groningen and Delft. It has provided a vision for a food system that minimises food waste by catering for 'enough'. Looking at an interdisciplinary level, the envisioned food system provides value to consumers, retailers, and producers, as well as society. This approach ensures that all stakeholders can benefit from a food system that combats food waste. (Reframing Studio & FETE, 2021)
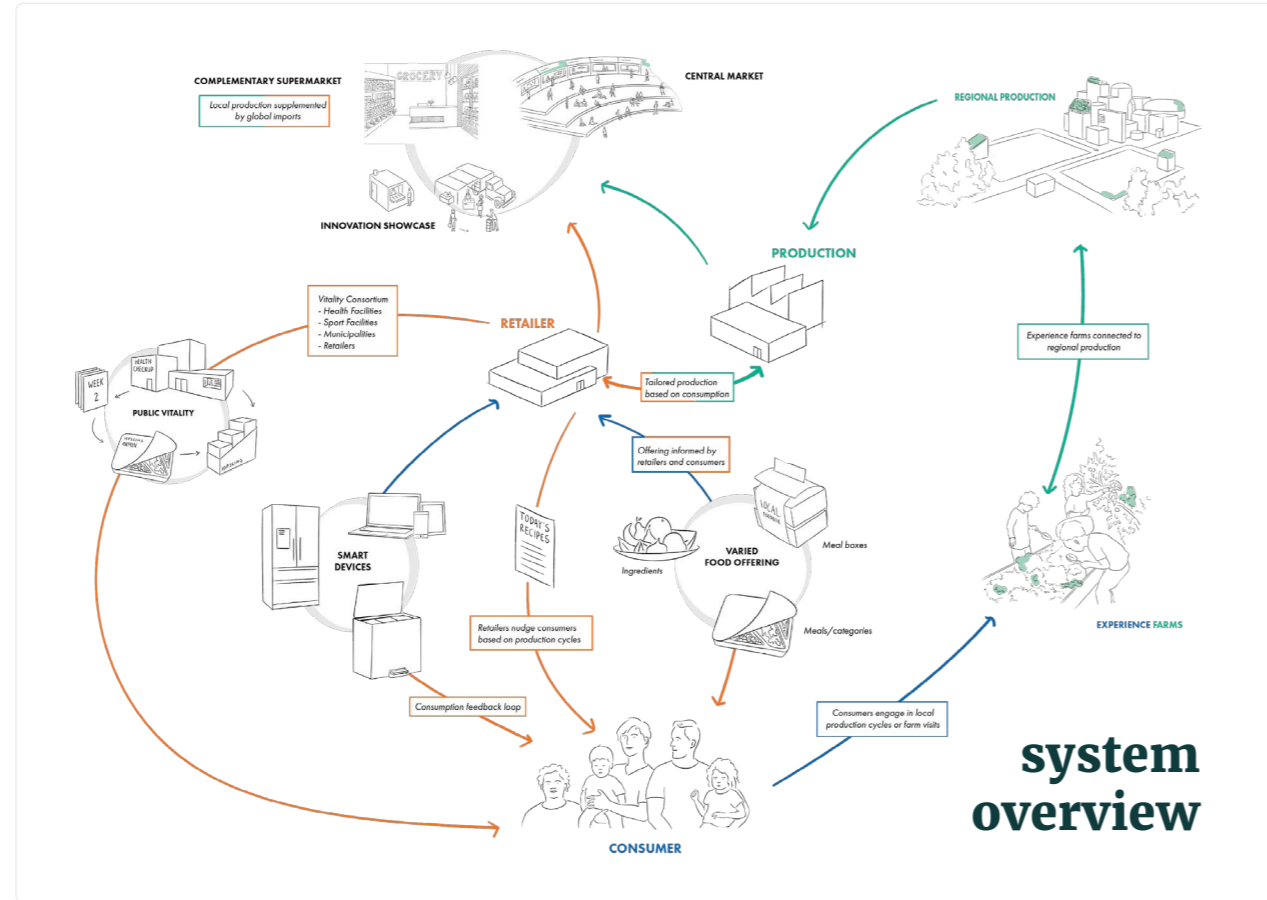

Figure 1 System overview of FETE's future vision

University of Groningen

The specific reason for initiating this graduation project is the research carried out by PhD candidate Amber Werkman. Her research is about the role of the good provider identity in food waste. Based on the current research, she hypothesised that this identity has a positive effect on food waste and that it is mediated by excessive purchases, variety seeking, and over-preparing. By performing multiple studies, she found that a stronger good provider identity led to more food waste by means of excessive purchasing. A mediating effect of variety seeking and over-preparing was not found (See Figure 2). In a follow-up study, a digital interactive prototype is needed to investigate the effect of various messages on excessive purchasing. This graduation project will provide Werkman with a qualitatively evaluated design that can be used in her quantitative study.
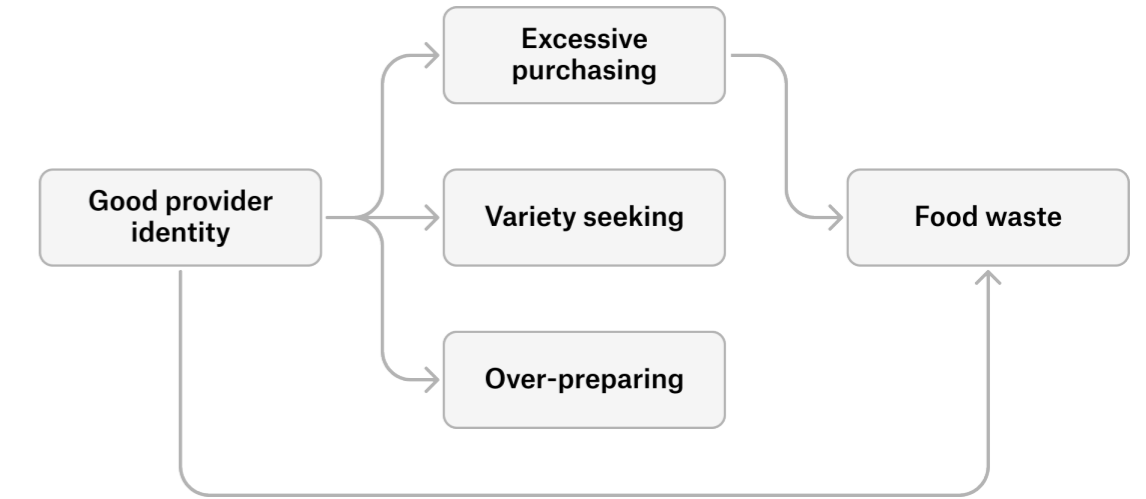

Figure 2 Research findings by Amber Werkman.

1.3 Design brief

Problem statement

Unlike retailers and producers who have access to consumer data to estimate product demands, consumers do not have the tools to make similar informed shopping decisions. To accomplish behaviour change towards minimizing overprovisioning, the motives behind it need to be addressed. People tend to buy more than they need to accommodate for the lack of predictability, rather than making shopping decisions that accommodate the flexibility that they demand.

Research question

How can we design a digital intervention to help consumers reduce overprovisioning when they shop for groceries online?

Design approach

This design project aims to help consumers – especially those who tend to buy too much – to do the shopping based on their needs. Because this requires behaviour change, I took inspiration from the Social Implication Design method (Tromp & Hekkert, 2018), which is a derivative of ViP (Hekkert & van Dijk, 2011) and that helps to design for behaviour change and impact on a societal level through an individual interaction.

Unlike SID, however, I am not describing a future world from context factors, but I do literature research, interviews, and other activities to understand the phenomenon as well as the opportunities better. Similar to SID, I will mediate the societal goal by creating a design vision, that bridges research and design. Here, I describe the specific objectives for the design phase and what kind of interaction I envision. I will then make several iterations to get from this abstract vision to a concrete design, which will be evaluated on the individual as well as the societal level.

Figure 3 shows roughly how the research and design process involves multiple layers. After deconstructing the phenomenon, I will research the behavioural drivers and explore the interactions. I will then use these insights to describe the desired interaction and develop an intervention that will have an impact on society.
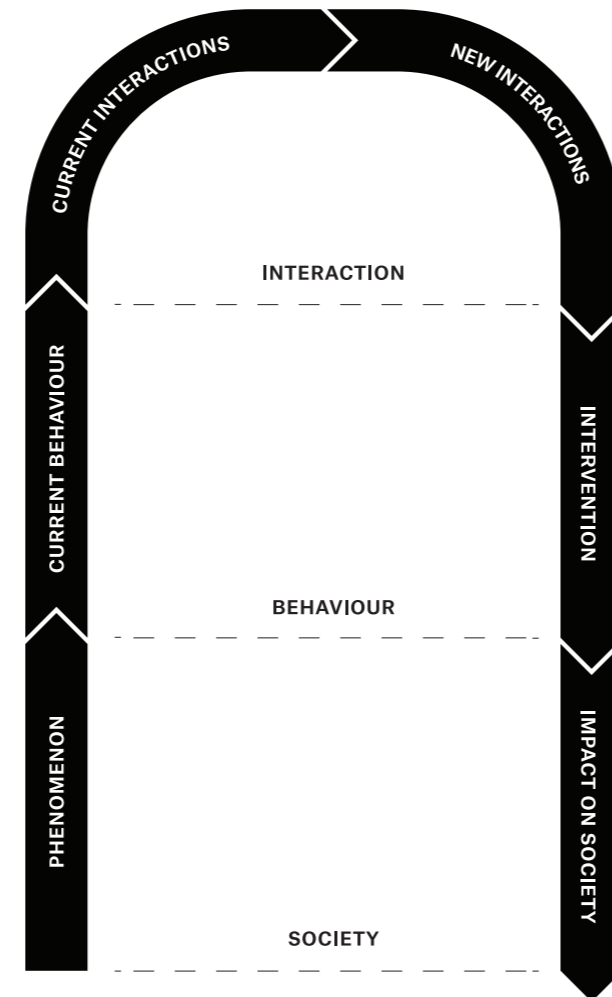

CURRENT INTERACTIONS | NEW INTERACTIONS

INTERACTION

CURRENT BEHAVIOUR | INTERVENTION

BEHAVIOUR

PHENOMENON | IMPACT ON SOCIETY

SOCIETY

Figure 3 Layers of the design approach, inspired by the Social Implication Design method

1.4 Stakeholder analysis

Before diving into the science behind over-provisioning, I want to start with an overview of the actors who may be affected by this design project.

FETE's vision (Reframing Studio & FETE, 2021) identifies four stakeholders as part of this transition: consumers, retailers, producers and society. The latter is important because food waste is a collective responsibility. Although there are more stakeholders who have a responsibility or interest, such as political actors, research institutes and NGOs (Mesiranta et al., 2022), these are less relevant in a design for consumers.

Consumers

Consumers can be divided into grocery shoppers and other household members who cook with or eat the groceries. While grocery shoppers are directly targeted by a design intervention, other household members are indirectly affected. As individuals, consumers base their decisions on feelings and cultural values, which can lead to irrational behaviour such as buying more than they need.

Figure 4 Consumers in the grocery store

Attitude

Consumers have a common aversion to wasting food (Roodhuyzen et al., 2017). It is seen not only seen as a waste of money but also as morally wrong (Van Geffen et al., 2020). However, the strength of this attitude depends on people's awareness of the situation. We tend to underestimate the environmental and social consequences of food waste, as well as the amount of food we waste ourselves (Abeliotis et al. 2014 as cited in Van Geffen et al., 2020), which makes their attitude towards tackling the problem of waste less strong.

Influence

As individuals, consumers do not have power to make impact on a societal level, and this lack of behavioural influence is perceived as such (Van Geffen et al., 2020). At the same time, with more than half of food waste occurring in households (Crippa et al., 2021), there is much to be achieved on a collective level.

Value provided

Consumers can benefit from shopping more carefully in several ways. First, they can save money to better provide for their family in ways other than an abundance of food. Secondly, they can improve their self-image and set a better example for their family by wasting less.

Retailers

The retailer will be the mediator of the interaction to be designed. Somehow it must be willing to help the consumer to buy more accurately. The specific stakeholder in this project is the online supermarket. In the Netherlands, this market is dominated by Albert Heijn, Picnic and Jumbo.

Figure 5 *Grocery delivery driver*

Attitude

Although retailers are successful in minimising food waste in their part of the supply chain, household food waste is not a financial concern for them. Albert Heijn, for example, communicates that it combats food waste by discounting products earlier and donating products with a short remaining shelf life to the food bank (Albert Heijn, 2020). However, there is no mention of household waste. Jumbo says it wants to communicate to help consumers waste less (Jumbo, 2020), leaving it up to consumers to act.

Influence

Retailers play a predominantly conservative role when it comes to changes in the food system. The supermarket's incentive is to generate as much revenue as possible while minimising production costs.

Value provided

By changing the retailer's business model, they would be incentivised to help their customers better plan their meals, which in turn could lead to a closer relationship between consumer and retailer.

Food producers

Producers are responsible for the start of the food cycle. Depending on the type of food, there can be multiple responsible producers: primary producers farmers, processors/factories, packagers, etc.

Figure 6 *Grower*

Attitude

Although producers have the incentive to sell as much of their products as possible, recent research points to the negative consequences of food waste for producers (van Herpen & de Hooge, 2019). This study showed that consumers develop negative brand attitudes when branded products are wasted. Therefore, it is in the interest of producers to carefully consider package sizes to reduce overprovisioning. This aversion to wasted products could also apply to non-branded products, such as watermelons. While it may be difficult to consume whole watermelons, it is possible to consume quarters without any waste. Therefore, watermelon farmers are more likely to sell more if they cut them into quarters.

Influence

Producers more or less supply what retailers, and indirectly consumers, demand. Their influence is limited to product characteristics such as portion size, shelf-life and quantity offered.

Value provided

In FETE's vision, producers have more freedom to produce (A vision of a food system that caters for enough, 2021). Instead of consumers dictating supply, producers will be able to sell based on their harvest.

Society

Society includes the other stakeholders and politics on a collective level. It involves societal goals such as economic growth and reducing greenhouse gas emissions.

Figure 7 *City market*

attitude

Unlike individual consumers, society as a whole is responsible for the consequences of food waste. It costs society money, causes avoidable greenhouse gas emissions and reduces the space available for other purposes such as housing.

influence

Society can have an impact by changing the norms on which individuals act. Similar to trends such as the increasing avoidance of meat (Beardsworth & Keil, 1991), the transition from excess to enough is gradual. In addition to changing norms, societies can enforce regulations to prevent food waste through policy.

value provided

Besides reducing government costs through eco-efficiency, society can benefit from a closer relationship between consumers and producers.

Overprovisioning is a complex behaviour. Buying more than you need is often unintentional, but it is the unwanted consequence of what consumers consider when planning and shopping. Because shopping is a habitual process, overprovisioning quickly becomes a more subconscious habit. In this chapter, I dive into the drivers of this behaviour and the underlying psychology. I also describe influencing factors and opportunities for design. This chapter is the result of a deep dive into the literature on household food waste and environmental behaviour. I also interviewed Erica van Herpen, Professor of Marketing and Consumer Behaviour at Wageningen University, who is leading the FETE project.

2 Behavioural drivers

p.14-18

2.1 Drivers of overprovisioning

Why is it so difficult for consumers to buy just enough? To understand this, we need to consider the difficulties and temptations at the planning and shopping stages of the food waste cycle. In this section, I highlight some of the drivers that are prominently mentioned in literature reviews such as Schanes et al. (2018) and Van Geffen et al. (2020).

Improper planning

Some of the decisions that impact the amount of food that is bought are made before doing the shopping. According to Schanes et al., good preparation before doing the groceries – including looking in the fridge and making a shopping list – helps to buy more accurately (2018). In other words, a lack of proper planning is a common cause of overprovisioning.

Stockpiling

Planning and buying groceries can be a time-consuming activity, and thus stockpiling can reduce the number of trips to the supermarket and moments to think about meal planning. Besides, it is a way of making sure that there is enough food. This behaviour is known to be a driver of overprovisioning (Graham-Rowe et al., 2014).

Impulse purchasing

I know from personal experience that overprovisioning is often the result of buying unusual items or quantities, for example because I want to try something new, or there is a special offer I want to take advantage of. The lack of a good planning routine can lead to more of these impulse purchases (Stancu et al., 2016).
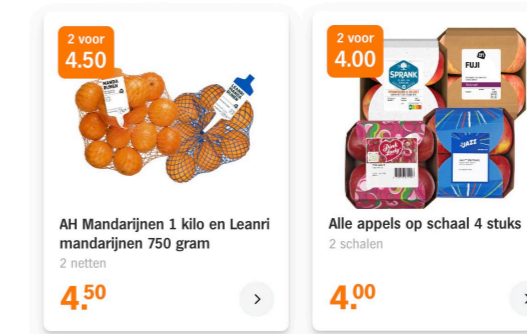

Figure 8 Bulk promotion at Albert Heijn

Identifying as a good provider

The 'good provider identity' refers to the goal of being a good parent or partner by providing both abundant and adequate food (Graham-Rowe et al., 2014). This includes being able to provide enough food for all guests at social occasions. Interestingly, preventing food waste can also be seen as part of the provider identity, as people want to avoid doing a poor job of managing the household (Hebrok & Boks, 2017) and will therefore also try not to buy too much. However, in one of the studies conducted by Amber Werkman, an increase in excessive purchases was found to be associated with a stronger provider identity.

Figure 9 Toddler influencing the shopping

Conclusion

The behaviours that lead to overprovisioning are can be summarised as the skills (planning), effort (stockpiling), goal distractions (impulses) and confidence (providing) that stand in the way of adopting more accurate buying habits. The provider identity is a particularly complex driver, as it involves a conflict between two morals. This also adds complexity to the solution to be designed. It is not just about making it easier for people to reduce overprovisioning, it is also about convincing providers that they do not need as much as they think they do.

2.2 Conflicting underlying goals

Although in section 2.1 (p.15) the causes of overprovisioning are described, the question that remains is why people are so resistant to improving their habits. It seems like wasting is morally acceptable to an extent, and that people lack an intrinsic reason to change their behaviour.

Goal framing theory

The underlying behaviour can be explained with goal framing theory. Lindenberg & Steg (2007) suggest that three types of motivations predict how people evaluate environmental behaviour. While hedonic goals make people sensitive to feelings and gain goals to changes in money or status, normative goals make people sensitive to behaving appropriately. This suggests that communication can influence environmental behaviour through a focus on either hedonic, gain or normative goals, depending on the situation.

Hedonic and gain goals

Hedonic and gain goals are self-centred goals, such as *seeking pleasure*, *avoiding negative thoughts*, *avoiding effort* and *avoiding costs*. When these goals are in focus, people evaluate the importance of environmental behaviour based on how easy it is, or how much money it saves. This is often problematic in pro-environmental behaviours, as the money saved from the behaviour does not outweigh the effort (Steg et al., 2014). In the context of food provisioning, the money saved by buying less may not be worth the effort of planning and the uncertainty of whether it will be enough. A study by Bolderdijk et al. found a similar situation, where a billboard with a message to check tyres (improving the efficiency of cars) was not effective when the message focused on monetary benefits (2012).

Normative goals

A normative goal can be described as a desire to do the appropriate thing (Lindenberg & Steg, 2007). When this type of goal is in focus, pro-environmental behaviour is evaluated against moral norms, rather than on effort or money. In the same study by Bolderdijk et al. (2012) mentioned above, a billboard with a pro-environmental message was effective in getting people to check their tyres. In this example, the self-fulfilment of acting on biospheric values outweighs the effort.

To act on biospheric values, we first need to be aware of the problem and understand what we can do about it. In the context of overprovisioning, the problem is that people underestimate the amount of food they waste (Van Geffen et al., 2020). But when people are asked to track their waste, they will start to waste less now that they are aware, as Erica van Herpen explained to me in our online interview.

Conclusion

Consumers evaluate the need to change their behaviour differently in the self-centred and normative frames. In reality, it is a mix of these goal frames, but the balance of this mix is influenced by contextual factors, such as those described in section 2.1 (p.15). The first three drivers mentioned there relate to hedonic goals and tend to steer the consumer towards the hedonic goal frame, making environmental behaviour less important. But even if people consider reducing waste to be important, this normative goal conflicts with the good provider identity. Based on this analysis, there appear to be two approaches to helping consumers reduce overprovisioning: (1) increasing the ability to plan well, and (2) aligning provider norms with the intention to reduce overprovisioning (See Figure 10).
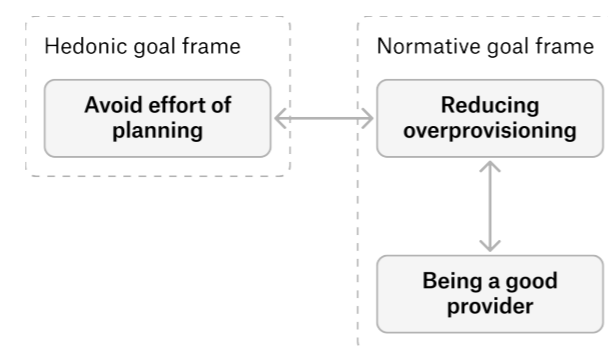

Figure 10 Goals in the normative and hedonic goal frames related to reducing overprovisioning

2.3 Factors

When we talk about normative goals, many factors influence our moral norms. For example, I have noticed that my grandparents and my parents behave in opposite ways when it comes to saving and wasting food. While my grandparents do not waste food at all, my parents have not adopted the same behaviour. When I talked to others about this, I heard the same stories. It indicates that demographics and sociographics can have a big influence on behaviour and that generalisations are difficult. In this section, I describe the differences in behaviour that may be related to these factors. This helps to specify the target group and reveal richer characteristics.

Biospheric values

People with relatively high biospheric values are more sensitive to environmental messages as they seek to align their behaviour with their self-image (Mazar et al., 2008). According to goal framing theory, these people have strong moral norms about environmental behaviour and are therefore less focused on the effort and money required to achieve pro-environmental behaviour. This does not necessarily mean they are going to waste less, but it says something about how willing they are to act.

Socioeconomic status

Socioeconomic status (SES) primarily determines the amount of financial resources available but can have many other effects, including participation in society and health (Adler & Ostrove, 1999). Consumers with lower SES may therefore have other priorities than minimising food waste. However, according to goal framing theory, they may already be minimising their waste to save money. In this gain goal frame, a message about the financial benefits of reducing waste is likely to be more effective than a normative message. People with a high SES, on the other hand, are less sensitive to these monetary benefits because they are trying to achieve hedonic goals with their food purchases.

Household composition

The composition of the household also appears to have a large influence. Single-person households generate the most waste per capita (WRAP, 2008), but families with children generate the most waste per household (Parizeau, 2015). While it is difficult to say which type of household will benefit most from a design intervention, it is more important to describe the different problems they face. For example, households with children find it difficult to predict the amount of food needed for a meal. Single-person households have more difficulty with large packaging sizes.

Age

People of different ages have different meanings and normative values for food. Younger people have more pleasure-seeking, improvisational and social needs when it comes to food (Hebrok & Boks, 2017), while older people with more predictable lifestyles find food waste more problematic (Hanssen & Møller, 2013). People over 65 may be influenced by the past when they experienced times of scarcity, and therefore have moral and financial reasons to waste less.

Conclusion

By combining goal framing theory with these factors, we can think about the type of message and design intervention that would be appropriate to support a particular target group to reduce overprovisioning. As we are designing a digital intervention and with the provider identity in mind, it is logical that the target audience will be families with children. These people provide for their partners and children and have a relatively unpredictable lifestyle. They are also not as concerned about wasting food as older generations. Even if they have high biospheric values, the family will come first, creating a conflict between two moral norms.

2.4 Towards behaviour change

In the interview I had with Erica van Herpen, she explained that behaviour change towards less overprovisioning requires two principal things: (1) having the motivation to set the goal, and (2) having the abilities and opportunities to strive for this goal. In this section, I highlight how we can have a positive effect on goal-setting as well as goal-striving to achieve behaviour change. I also describe how changing the incentives in the food system will lead to less waste.

Goal-setting

Although people generally do not want to waste food (Roodhuyzen et al., 2017), they are often not fully aware of the amount of food waste in their households (Van Geffen et al., 2020). For people to set a goal to buy more appropriately, they first need to understand that they can reduce their waste levels by buying less. For this to happen, the communication towards the consumer should be about the consumer's impact on their own waste, not the tiny impact that they have on the societal problem.

Goal-striving

In addition to understanding the importance of changing habits, people need to be able to take action. The literature review by Van Geffen et al. (2020) identifies several ways in which consumers could more easily reduce the excessive purchases that lead to waste: (1) by making it easier to plan meals accurately, (2) by making greater use of long shelf life products, and (3) by being more creative when preparing meals. In addition to the opportunities, a trigger in the form of a reminder is likely necessary to bring this goal to the forefront.

Changing the incentives

I would like to elaborate a little on the opportunity of meal planning, as this is an important theme in FETE's future vision and was discussed extensively in the interview with Van Herpen. In the current food system, retailers make a profit on all products, whether they are consumed or not. To change this, retailers need to be incentivised to sell enough rather than as much as possible. This can be achieved if supermarkets start selling meals instead of loose ingredients.

The idea that buying meals rather than ingredients helps to reduce waste is supported by a study by Schuster et al. (2022), who collected self-reported information on food waste from traditionally cooked meals versus meals cooked using a Hello Fresh meal box. They found that the meal box helped

to reduce waste by 38%. This study suggests that the principle of selling meals can be effective in minimising household food waste.

Figure 11 visually describes how the selling of meals creates a different incentive than the traditional selling of loose ingredients. This incentive has to do with the value assessment that the customer makes in the store: when a customer buys a complete meal, it is the price of the meal that counts, not the price per ingredient. This means that any excess in the meal is not in the retailer's interest. The retailer would rather cut out the abundance to provide just enough and reduce costs.
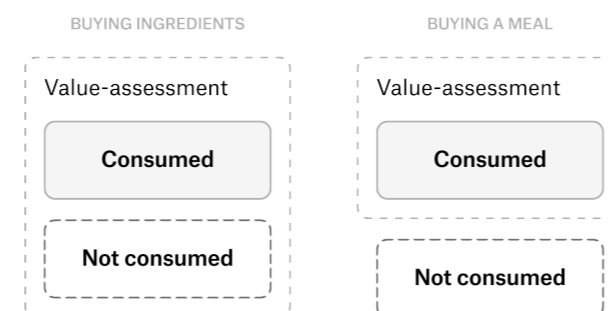

Figure 11 Value-assessment when buying ingredients versus buying a meal

Conclusion

To accomplish behaviour change, consumers need to be supported in their ability to buy more according to what they use. What they need for this, is support in meal planning.

In the previous chapter, the behaviour is analysed using literature, and some general directions for behaviour change were given. In this chapter, I will scope down to a more specific domain that allows me to design something meaningful for a smaller target group in a specific situation rather than something general for everyone in every situation.

3 Domain exploration

p.19-31

Preparations for a family dinner in the online grocery store

The chosen domain specifies the target group to family providers, revealing interactions such as caring for your children that transcend personal hedonic interests. The activity is scoped down to buying the ingredients for a single meal, as there appear to be interesting opportunities here. The context is the online grocery store, which best suits the design of a digital intervention.

In the course of this chapter, I describe three types of activities that I did to explore the domain. These are interviews with the target group, clustering and interpretation of context factors from literature, and journey mapping.

3.1 Explorative interviews

I conducted five interviews with parents who provide for a family. The goal of the interviews was to learn how they experience their provider identity when doing preparations for meals for their household, and how this leads to excessive purchases. Three of them ordered some of their groceries online.

Setup

I started the interviews by asking if they recognised the provider identity and excessive purchasing, and asked them to think of a recent meal when they felt this provider identity and perhaps had to throw away food as a result of buying too much. I then used the clusters in the next chapter as a guide to asking probing questions about their values and experiences.

Interviewing technique

I wanted the interviews to be open, to make people feel more comfortable talking about their experiences. However, I learned that it was difficult for people to talk about things like identity and underlying values. For example, when I asked participants about their identity with cooking, I got confused looks. I realised that my questions were too direct and that they needed to start from more obvious questions and answers to be able to think about emotions and values. So instead of asking them directly about their food values, I started by asking them about the last time they had thrown something away, then how they felt about it, and finally why they felt that way, to find out how they value food. In this method, called laddering, the interviewer uses attributes to elicit underlying values (Miles & Rowe, 2008) (See Figure 12). Adding these layers to the conversation helps participants to be aware of them and to talk about values.
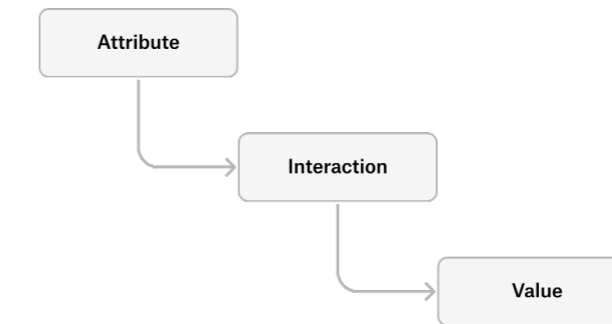

Figure 12 Principle of laddering

Use of observation

In some of the interviews, I observed people composing a meal for a family dinner in an online grocery store, intending to use this as a starting point for a deeper conversation. However, the opposite happened and the conversation became superficial when talking about specific groceries and meals. I therefore decided to remove this observation from the interview and focus on optimising my questions to elicit underlying values.
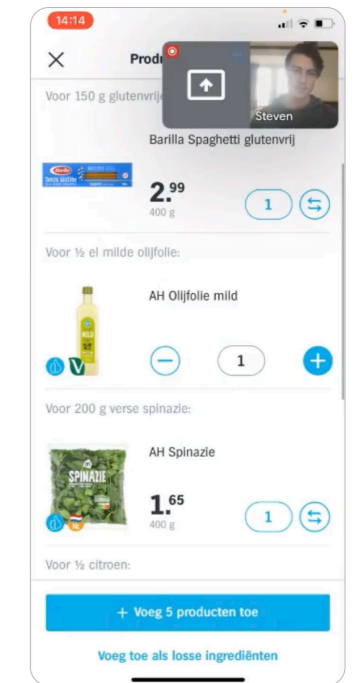

Figure 13 Observing through screen sharing

3.2 Clustering the research

In the first phase of the project, I gathered a lot of insights from the literature on household food waste, pro-environmental behaviour and the good provider identity. As this was a complex web of context factors, I looked for common themes. These clusters represent abstracted interpretations of the literature, intended as intermediate steps towards a design vision by giving meaning to the evidence. The clusters were also used as a starting point for the interviews with family providers, from which some quotes are included here. See Appendix A (p.91) for all the individual contextual factors and their sources.

1. Grocery shopping as an expression of identity

"Because I care about cooking well, I would rather buy an extra ingredient than cut back."

Like cooking, preparing a family meal can be an activity of choosing how to present yourself to your household. For example, a good cook needs quality ingredients to prepare a delicious meal. In addition, people who do the shopping want to identify themselves as good providers for their families. They aim to show affection and devotion by providing healthy, proper and satisfying meals, which often results in an abundance of food. For example, people often want to provide variety in food and meals, which immediately increases the likelihood that some will be wasted.

Because identity is such a strong driver of purchasing decisions, it can actually be used as a tool in the intervention. As people tend to act according to their self-image (Mazar et al., 2008), perhaps we should try to align people's identities more with their intention to reduce overprovisioning. This need not be done through biospheric values, but could for example be enforced by reframing the identity of the good provider as one who buys just enough.

2. Environmental concerns take a back seat

"Sustainability??? I only care about the food to be tasty, affordable and healthy."

When it comes to shopping, social and environmental concerns are often given a low priority. Especially when feeding a family, buying enough food and cooking the right meals requires a lot of planning and thought. In addition, the need to remain flexible for unplanned activities leads people to stockpile food. Rather, it is financial concerns – i.e. concerns about wasting money on wasted food – that play a major role in the intention to reduce overprovisioning.

We need to be aware that environmental messages are not so effective in the context of shopping for a family. It is likely to be more effective to emphasise the personal benefits of buying less or the benefits for the family. For example, an intervention could convey a message that it saves money, or that there is no need to worry about having enough if you have a backup. These messages trigger existing concerns in the context of buying groceries, and thus

3. Confidence as a driver for action

"It is unfortunate that I need to throw it away. I try my best by freezing it and eating it the next day, but a lot goes into the trash bin."

Confidence plays a key role in the goal of buying less. As long as people do not have confidence in their ability to buy enough, they will buy more than necessary to compensate. The paradox is that confidence comes with practice, but the practice requires confidence. People are often comfortable with this status quo because it is what they are used to and what they perceive as the norm.

I believe the role of design is to help consumers gain confidence in their ability to buy enough. This can be achieved by providing the tools or information needed to make better decisions in the supermarket. In addition, the design could provoke playful, creative and adventurous feelings to bypass confidence as a required driver for action.

4. Depreciation of food

"I think we are very much spoiled here. We just buy and eat what we like."

In Western society, there is an abundance of food available at low prices. Unlike older generations who experienced scarcity during and after the Second World War, younger generations have a lower appreciation of food in general. In addition, many foods in the supermarket have been processed in some way, such as ready meals, pre-cut vegetables or filleted meat, which has disconnected consumers from farms. Ultra-processed foods, for example, are known to be thrown away more quickly than whole foods (when they have the same shelf life). Another factor is the timing of disposal. As this happens after the food has gone bad, the pain is not felt in the consumer's wallet.

Considering people's concerns, it is likely that people value fresh, healthy, expensive and unprocessed food more because they are more aware of its origin, how it helps them to feed their family or how much it costs them. An intervention could be aimed at emphasising freshness, health benefits or even cost to make people rethink how much food they need, for example in the way the supermarket Crisp advertises its products (Crisp, n.d.).

5. Avoiding confrontations with our behaviour

"If I am not sure if my milk is still good, I put it back in the fridge and wait two weeks before I throw it away. I could have done it now as I know I am not going to drink it anyway."

People tend to keep products that are on the verge of going bad in the fridge, waiting for them to go rotten so that they can get rid of them with less guilt. People may also feel good about at least having the intention to consume it later, even if this is unlikely in reality. People will avoid thinking too much about waste because they generally have a strong aversion to feeling bad about their behaviour. With this in mind, it is not surprising that people systematically underestimate the amount of food they waste. We also tend to suppress moral norms about waste when we are providing for others.

Confrontation can do more harm than good when it comes to behaviour change. If the designed intervention would point fingers at the behaviour of an individual, the result can be a complete rejection of it. I believe a more supportive approach to make users feel good about improvements in their behaviour is more effective. In the long term, this may also lead to a positive shift in their moral norms concerning food waste.

3.3 Journey mapping

The context of this domain is a mix of digital and physical activities and touchpoints. Online grocery shopping is growing rapidly in the last few years (Baarsma & Groenewegen, 2021), and the service is advancing towards offering a complete shopping experience. Yet, planning, shopping, preparation and dining remain in the physical space and often include social interaction. To analyse this mixed context, I mapped out the entire customer cycle from planning to dinner. Based on this flow of Figure 14, I elaborate on crucial touchpoints with narratives.
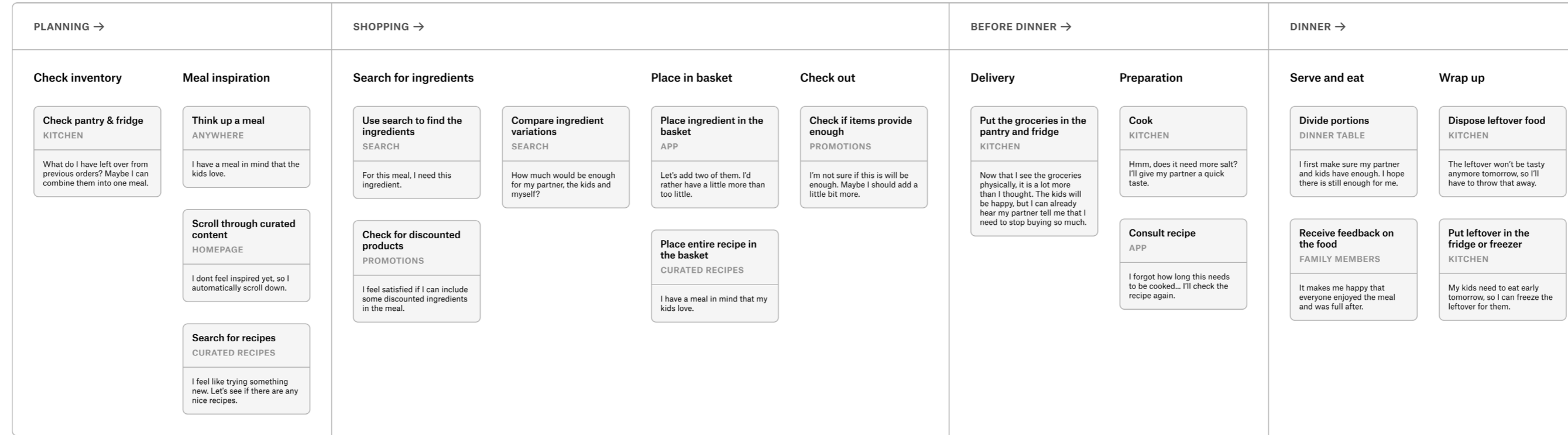

Figure 14 Customer journey flow of ordering groceries online

PLANNING →

Check inventory

| Check pantry & fridge |
| KITCHEN |
| What do I have left over from previous orders? Maybe I can combine them into one meal. |

Meal inspiration

| Think up a meal |
| ANYWHERE |
| I have a meal in mind that the kids love. |

| Scroll through curated content |
| HOMEPAGE |
| I dont feel inspired yet, so I automatically scroll down. |

| Search for recipes |
| CURATED RECIPES |
| I feel like trying something new. Let's see if there are any nice recipes. |

SHOPPING →

Search for ingredients

| Use search to find the ingredients |
| SEARCH |
| For this meal, I need this ingredient. |

| Check for discounted products |
| PROMOTIONS |
| I feel satisfied if I can include some discounted ingredients in the meal. |

| Compare ingredient variations |
| SEARCH |
| How much would be enough for my partner, the kids and myself? |

Place in basket

| Place ingredient in the basket |
| APP |
| Let's add two of them. I'd rather have a little more than too little. |

| Place entire recipe in the basket |
| CURATED RECIPES |
| I have a meal in mind that my kids love. |

Check out

| Check if items provide enough |
| PROMOTIONS |
| I'm not sure if this is will be enough. Maybe I should add a little bit more. |

BEFORE DINNER →

Delivery

| Put the groceries in the pantry and fridge |
| KITCHEN |
| Now that I see the groceries physically, it is a lot more than I thought. The kids will be happy, but I can already hear my partner tell me that I need to stop buying so much. |

Preparation

| Cook |
| KITCHEN |
| Hmm, does it need more salt? I'll give my partner a quick taste. |

| Consult recipe |
| APP |
| I forgot how long this needs to be cooked... I'll check the recipe again. |

DINNER →

Serve and eat

| Divide portions |
| DINNER TABLE |
| I first make sure my partner and kids have enough. I hope there is still enough for me. |

| Receive feedback on the food |
| FAMILY MEMBERS |
| It makes me happy that everyone enjoyed the meal and was full after. |

Wrap up

| Dispose leftover food |
| KITCHEN |
| The leftover won't be tasty anymore tomorrow, so I'll have to throw that away. |

| Put leftover in the fridge or freezer |
| KITCHEN |
| My kids need to eat early tomorrow, so I can freeze the leftover for them. |

Narratives

Using information primarily from interviews, I created narratives to empathise with users' experiences. I also drew implications from these experiences based on literature. Quotes from interviews and app examples from Picnic are added.

1. The convenience of being home

Narrative

It is such a convenience to be able to shop from the comfort of my own home. The kitchen is just a few steps away from my sofa, so I can add ingredients to my basket while I check my stock. Unlike the slightly stressful experience of the physical supermarket, I have time to think and consider alternatives. The online environment also helps me to minimise buying items I don't need.

> 66 *The process of putting things in my shopping basket as a shopping list helps me to be more aware of what I'm buying.*

Implications

Shopping lists help reduce food waste (Jörissen et al., 2015) and when shopping online this is already implemented. Yet, the effectiveness of this basket on overprovisioning depends on the amount of overview that you have as a user.

## 2. Kicking off the shopping

Narrative

Whenever I lack inspiration for a meal or am bored, I like to scroll through the homepage. This is where I stumble across previously purchased items, promotions and other curated content to inspire meal ideas. Usually, I already have an idea of what I want to make and jump straight to the search. But whenever I come back to that screen, it is overwhelming and it distracts me from my primary shopping goals. Sometimes I end up putting products in my basket that I don't need.

> " *I take my time when shopping ingredients online, and I deliberately look for what I need.*

Implications

If a user already has meal plans, this section may interfere with them. According to Schanes et al. (2018), curated content can increase the likelihood of impulse buying and thus overprovisioning. At the same time, this page can be used to help the user plan meals.
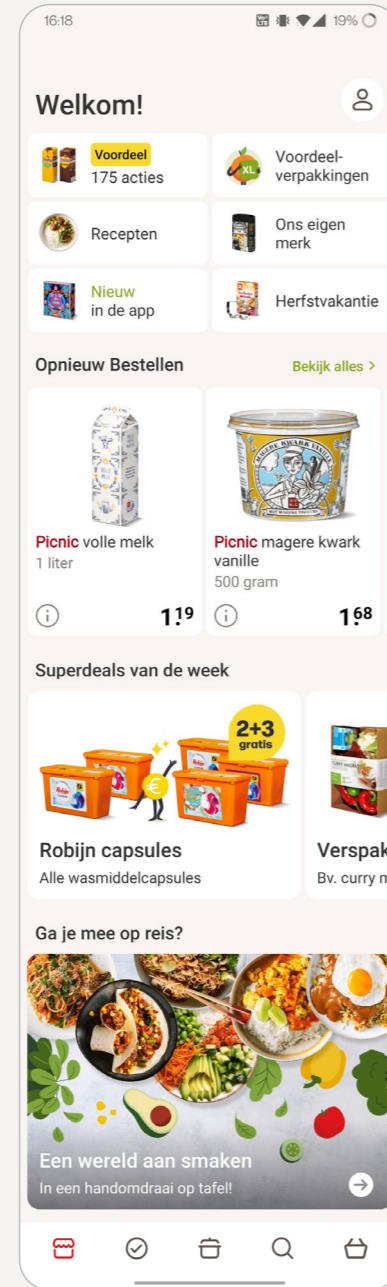
I don't know where to look at

Interesting!

3. Being tempted by promotions

Narrative

The promotions page is one of the first places I check to see if I can save money on dinner. Here, I stumble upon a bulk discount that I can plan my meal around. I usually only need one of these for a family dinner, so I hesitate to buy it. I am tempted to buy two and use one for a meal later in the week, but I am not sure it will be used. Also, I am now spending 50% more money than I want to.

> " *The supermarket offers a second or third product for free, and that triggers me, because maybe I can use it later.*

Implications

Promotions complicate meal planning by tempting the user to deviate from plans and compose a meal for which it is more difficult to estimate the correct quantities. If promotions have already been anticipated by the user, they are less of a problem for meal planning. Promotions can lead to excessive purchases in at least two ways. First, bulk promotions such as 'buy 1 get 1 half price' tempt the user to buy more than necessary (Graham-Rowe et al., 2018; Porpino et al., 2015). Secondly, promotions tempt the user to make impulse purchases, which are a driver of overprovisioning (Schanes et al., 2018).

Do I really need it?
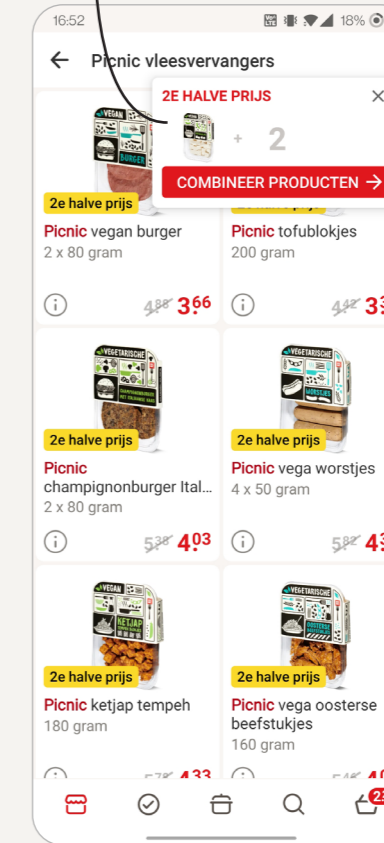
Monetary benefits :)
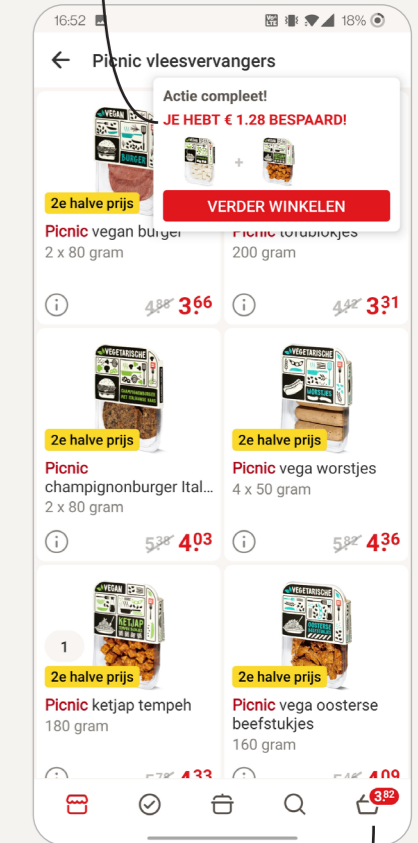
Spending more than intended :(

## 4. Searching and browsing categories to compose a meal from scratch

Story

The online store makes it easy to find the product I need quickly. I can also easily compare options such as fresh and frozen without having to go to different areas. There are no distractions and the process of adding to my basket helps me to keep track of my choices.


66 *The process of placing items in my basket — like a shopping list — helps me be more conscious of what I buy.*

Implications

Compared to the physical grocery store, finding ingredients is easier and more structured in the online store. This helps to buy according to a plan or to make a plan while doing the shopping, which helps users avoid buying excess foods (Schanes et al., 2018).
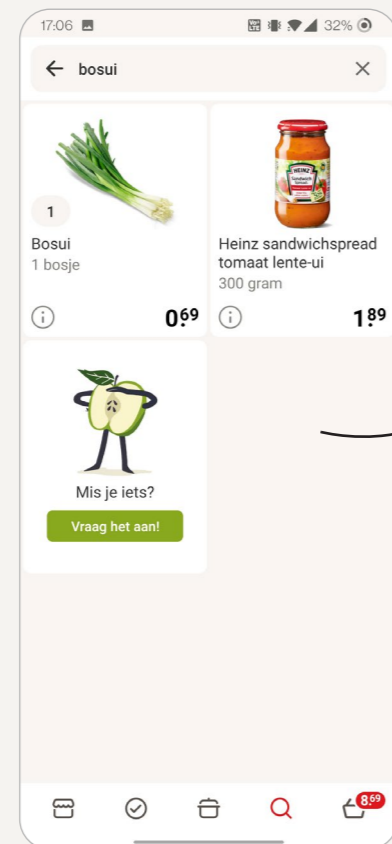
Limited impulses

products from different shelfs
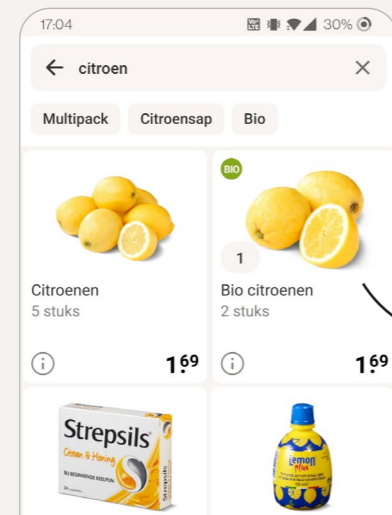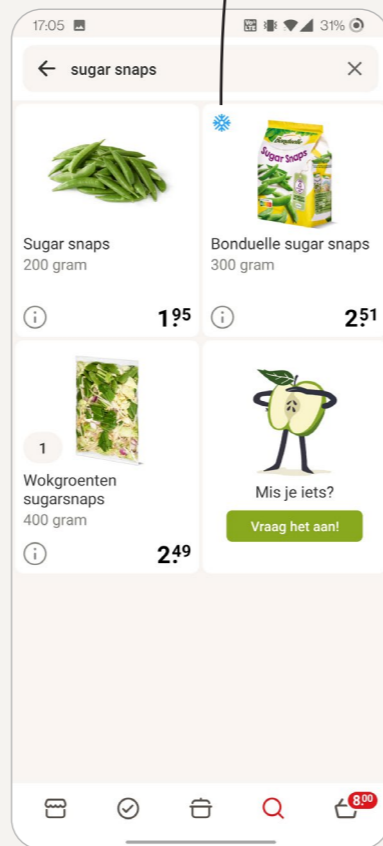
Considering alternative quantities

5. Browsing recipes for inspiration and convenience

Story

I like to try new things from time to time and the recipes in the app are a great source of inspiration. However, it is sometimes difficult to find a recipe that appeals to me. Also, most of the recipes are based on a household of four average eaters, which leaves me with inconvenient quantities. So sometimes I just follow the recipe and add all the ingredients in one tap for convenience. The leftovers can be eaten later, but I often forget that I have them in the fridge.

66 *I like to look at the recipes when I go shopping for dinner because I like to make something different every time.*

66 *I am lazy, so I just put the whole recipe in my shopping basket, even though I know it is too much.*

Implications

Although recipes support consumers in planning their meals, they come with several issues. The user is often incentivised to cook too much just to follow the instructions, and many recipes are not meant to be flexible.

I only need three portions :(

Can I express myself in this meal?

Lack of consideration

Lack of flexibility
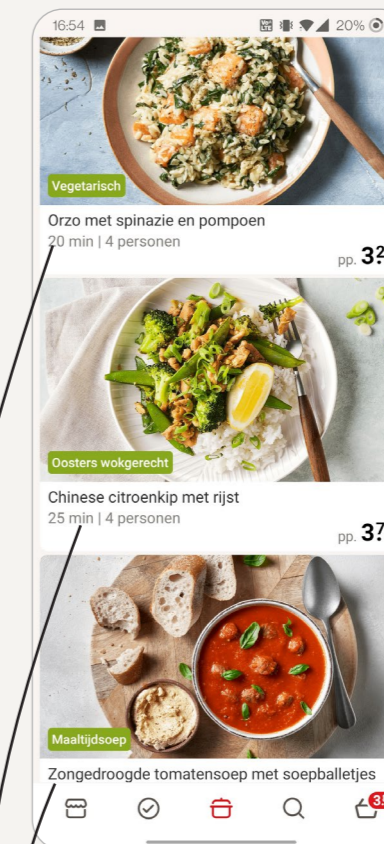
Which one satisfies my provider goals?

5. Concluding the order in the basket

Story

I ask myself if I have enough or too much. It is difficult not to have a clear idea of how much I have because I have to rely on pictures and numbers. Because I only order once every few days, I'd rather have a bit more, just in case. At the same time, I'm almost always surprised at how much it all costs. It makes me think twice about whether I need certain items.

Implications

Adding extra items at the checkout stage due to a sense of uncertainty often leads to overprovisioning (Schanes et al., 2018). The shopping basket would therefore be a good place to provide reassurance.

Lack of intuitiveness

Considering total amount of money spent

Minimum order value :(
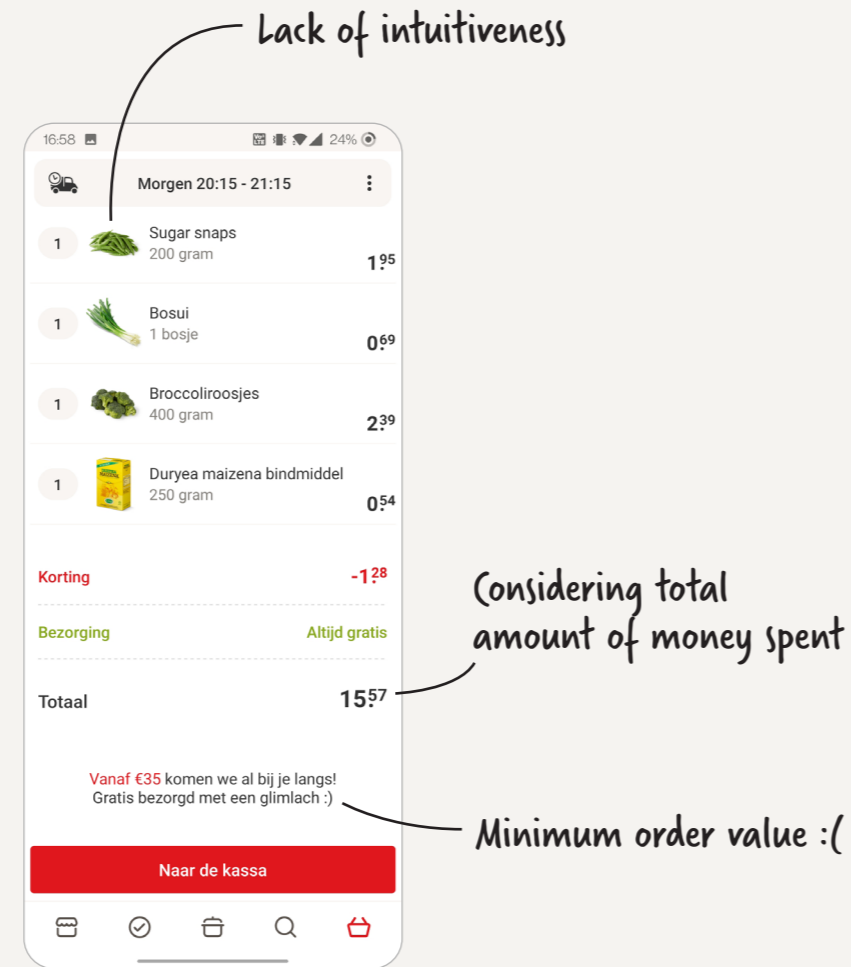
Conclusion

Touchpoints in the online grocery store can be seen as opportunities to reduce over-provisioning. Currently, the home page, promotions and recipes tend to distract the user from proper planning, leading to impulse purchases. By redesigning these touchpoints, impulsivity can be reduced by, for example, directing the user to meal applications for promotions. Recipes can also be redesigned to help users in their specific situations, rather than just providing a bunch of generic meals. Furthermore, the digital basket can potentially play two roles in reducing overprovisioning: providing an overview to improve planning, and reassuring that the meal is good enough.

The journey flow shows that the place of intervention is important, as it determines which considerations and uncertainties are prominent. On the home page and in the recipes section, the user may still be looking for inspiration, whereas in the search section, the user is more likely to have a concrete meal plan. Just before checking out, the user may be reluctant to make changes to the basket. It makes sense to target multiple touchpoints to engage the user over a longer timespan, and to communicate appropriately based on where the consumer is in the shopping journey. Altogether, this analysis highlights the opportunity to facilitate meal planning with a variety of touchpoints, for example by calculating calories, or having a meal dashboard in the basket.
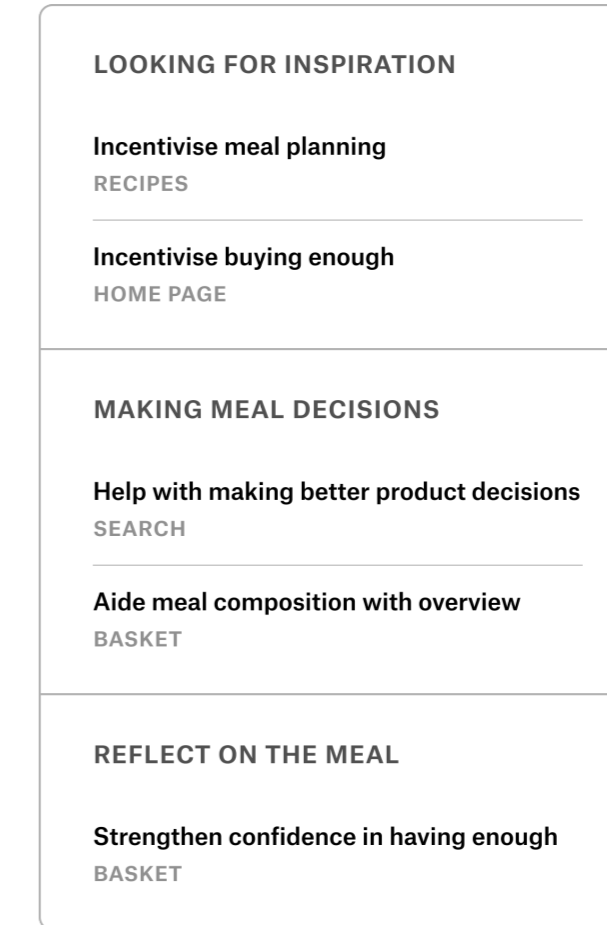
LOOKING FOR INSPIRATION

Incentivise meal planning
RECIPES

Incentivise buying enough
HOME PAGE

MAKING MEAL DECISIONS

Help with making better product decisions
SEARCH

Aide meal composition with overview
BASKET

REFLECT ON THE MEAL

Strengthen confidence in having enough
BASKET

Figure 15 Opportunities for touchpoints within the shopping phases.

In the course of the project, I realised that the good provider identity is unlike any other driver of household food waste. Because it cannot simply be ignored or tamed, it is crucial to allow consumers to act upon their good provider values while trying to buy less excessively. Although at first I assumed that this phenomenon mainly applies to parents, I realised that it also influences my own shopping behaviour. Having lived in a student home for a quite some time, I felt the urge to learn to cook so that I could be proud of the meals I provided, and show that I care about my roommates. I always made sure to have extra portions, and I was almost ashamed when there was a bit too little. I still feel the urge to buy and make good food and drinks when I have friends visiting. All these behaviours come from my desire to provide well for others. In this chapter, I try to explore what lies behind the provider identity by organising an inspiration session and clustering my insights into themes.

4 Exploring the provider identity

p.32-36

4.1 Inspiration session
4.2 Themes

4.1 Inspiration session

I set up a meeting with some fellow designers to talk in-depth about the provider identity and how to design for it. In this session, we talked about our own experiences of cooking for roommates and friends, for example, but we also talked about childhood experiences. The session aimed to use these memories to explore possible interaction visions and even to do a bit of ideating together.

Setup

The session lasted about 75 minutes and there were five minutes of individual association for each of these three steps. After each steps we discussed and responded to each other. In the first step, I asked my peers to recall memories of catering for others and buying or cooking too much as a result and to describe these on the paper. Second, I asked them to think about how these experiences led to food waste and what interaction they would need to feel comfortable with buying less. Third, we used the interaction visions to formulate ideas and opportunities together.

Results

For my fellow students, behaviour related to providing is a way of showing appreciation to others, and they felt that providing was part of a more general willingness to go the extra mile or spend a little more money when looking after others. Although they did not have children, eating with others evoked deep-seated concerns about pleasing them with good and exciting food: 'I like to ask what they would like to eat'.

Reflecting on current interactions, we talked about 'fears' and 'doubts', but also about desires to be creative and to be rewarded by the eaters: "I had a roommate who made certain noises when he liked the food. Although it was annoying, I liked the confirmation that I was serving good food". When I asked them about their needs to feel confident in buying less, they talked about feelings of security and making it an achievement not to waste.

Although the meeting was too short to fully dive into ideation, some interesting directions were mentioned, such as having snacks or desserts as a backup to ensure you have enough, helping people to be more creative with cooking, and tracking calories and macros to measure the amount of food needed.

Reflection

The inspiration session helped to confirm elements of the design vision that I already had in mind, and enriched it with examples and different perspectives. I learned that providing is not only about personal fears and insecurities, but also simply about giving back to the people you care about. I have also come to realise that culture plays a big part in how this identity is expressed in groceries.
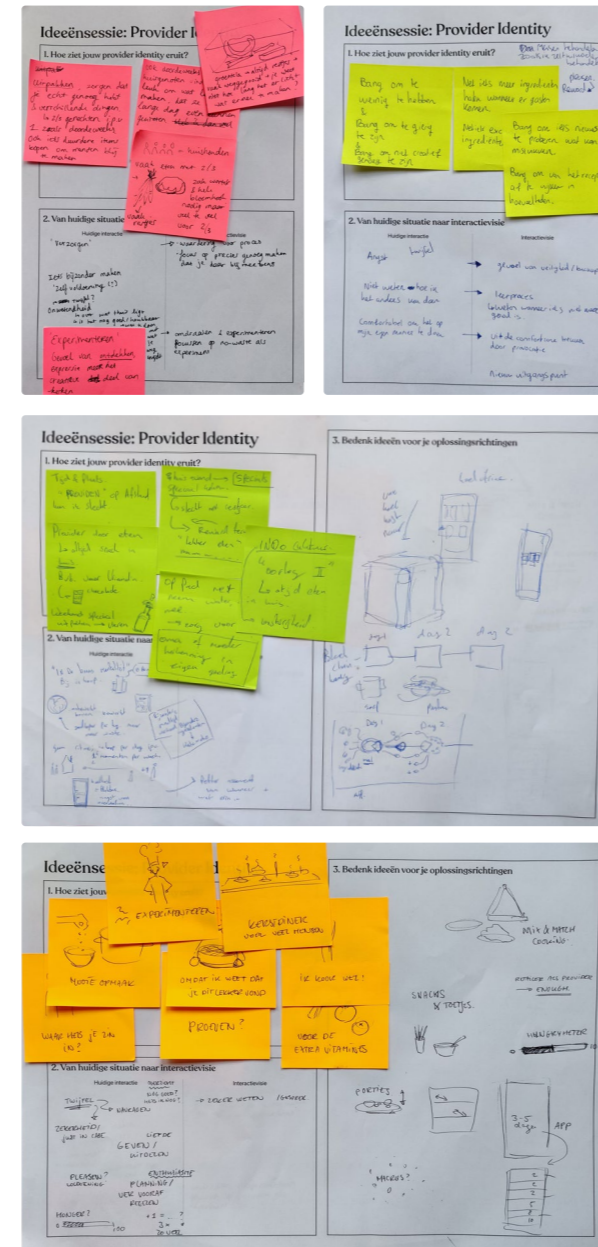
Figure 16 Materials and results

4.2 Themes

I combined the insights from the interviews with parents, the inspiration session, and my own experiences into these themes meant to inspire my design vision. The themes represent principle elements of what the identity can represent.

Showing appreciation and love

Food can be seen as a non-verbal means to tell others that you appreciate or love them. Providers aim to please their eaters with the things they enjoy, or make sure they experience delight after they have had a long day. Showing love through food can be done in many different ways, such as cooking a lot, making sure there are always snacks at home, or buying something special for a friend that feels ill.

Showing love does not always require a positive reaction. Sometimes, it means making decisions for others that they disapprove of, for example when preparing lots of vegetables for a child. Here, satisfaction comes from self-approval.

> *When a good friend of mine is ill, I sometimes bring special food because I want to take care of them.*

Expressing yourself and your values

Some people like to cook and show off, while others do not consider themselves a kitchen princess or see cooking just as a necessity. In both cases, choices in meals and ingredients reflect your values.

If you enjoy cooking, and you have guests staying for dinner, you may use this moment to show this enjoyment by buying some extra fresh herbs or making up the plates in a particular way. Although this expression can also be present when cooking for yourself, the presence of other people adds a layer of exhibitionism. It may provoke you to experiment and try something new and invest effort into making it a success.

Parents may want to express towards their kids the importance of healthy food by prioritising vegetables, or express biospheric values by cooking vegetarian or vegan.

> *I'm not a kitchen princess and I usually don't use recipes. For me, it's more important that the meal is healthy, vegan and tastes good.*

Acting on cultural and social norms

People recognise provider behaviour from their parents or grandparents. These childhood memories strongly influence what they consider 'normal' when providing for their own children. When it comes to eating, many parents find it important that their kids try as much as possible. Another example is that in many homes it is a sign of hospitality to always have some food at home for the kids, or in case there are guests.

Cultural norms also directly influence our concerns with wasting. People that have lived in other parts of the world or generations ago and witnessed scarcity show more appreciation towards food, and therefore disapprove of wasting it.

" My grandparents are Indonesian and whenever I visited them there always was food.

" My boyfriend is born in Colombia and does not consider wasting anything.

Educational responsibilities

As a parent, you have the responsibility to pass values and norms to your children so they can find their way in society. Being careful with food is one of those values that many parents want to learn their kids.

Children look at the behaviour of their parents to judge what is normal and what is not, and therefore parents need to set a good example. If children see one of their parents doing something that they are not allowed to, they may find it unfair and more difficult to acknowledge that it is important.

" We teach our children to make conscious choices about what you cook and what you eat.

" I don't find it necessary to add salt on fries, but the kids want it because they see their dad doing it.

Desire to be acknowledged

If you put effort into cooking, you want to be rewarded with recognition. This recognition is not always verbal, but can also be experienced through seeing happy faces or hearing eating sounds. In the end, experiencing true acknowledgement is more satisfying than (insincere) compliments.

During cooking or shopping for ingredients, you may be afraid that you do not have enough, that you are not being creative enough, or that the food will not taste good. To deal with uncertainties, you may for example let your eaters have a taste before serving or cook another leftover portion just to be sure to have enough.

" I felt satisfied when my roommate was making noises to indicate that the food I cooked was tasty.

" I often let the people I cook for have a taste before serving it to them.

The design vision bridges research and design by giving direction to what I want to achieve and describing the type of interaction that is required. Although the design vision is written as a fixed chapter, it has undergone several iterations based on further research and ideation.

5 Design vision

p.37-40

5.1 Design statement

I am aware that this project will not provide the one solution to overprovisioning and that I need to make choices about the kind of impact I want to make, and where I want this impact to be. It was clear to me that aligning the incentives of being a good provider with buying less can have a big impact on food waste in family households. Based on my research, I believe that a lack of confidence stands in the way of problem awareness. I therefore want to design an interaction that helps consumers build confidence in being good providers, so they can act upon their normative goal to reduce waste. The design statement captures this vision and gives me direction in the design phase, in which I generate ideas and concepts.

The confidence is twofold. The first is confidence in being a good provider in itself, which can be enhanced by incorporating the process of providing for a family into the design and should make consumers more receptive to the message of not buying too much. The second type of confidence relates to the skills, abilities and opportunities required to believe in the impact a consumer can have on food waste, as described in section 2.4 (p.18) based on the literature review by Van Geffen et al. (2020).

Design statement

I want family providers to reduce overprovisioning, by feeling confident in being a good provider while buying less, when they are shopping for ingredients for a family dinner.

The purpose of the design statement is to formulate the desired effect on society as well as the envisioned interaction to accomplish this. Furthermore, the statement describes the targeted user and the moment of the interaction.

5.2 Interaction vision

In this context, I envision confidence as friction of comfort and discomfort. Changing habits requires you to step out of your comfort zone, but at the same time, you need to feel safe enough to take action. I also believe that behaviour change is a long-term process with gradual but noticeable steps.

Interaction qualities

The envisioned interaction should therefore include qualities I describe as a *safety net* and *discovering new things*. In addition, there should be a learning process that embraces mistakes, which I describe as *learning by doing*. These three qualities together describe an interaction that establishes confidence by providing a safety net to explore from in a gradual learning process.

Safety net

The feeling that something else backs you up if you make a mistake. It takes away some fears that you have and allows you to do things you would not dare to do otherwise.

Keywords: safe, secure, encouraging

Discovering new things

The exciting feeling of trying something out of your comfort zone and broadening your worldview. While doing this, you feel proud of what you appear to be capable of.

Keywords: exciting, proud

Learning by doing

The satisfying feeling of learning something by trial and error rather than reading it from a book. The process is creative and embraces mistakes. Not only the result, but the way towards it makes you feel proud.

Keywords: creative, autonomous, proud

Metaphor & product qualities ➡

The interaction should feel like doing a rock climbing parkour with friends, where the hook safeguards you from danger. The bumpy rock provides new unexpected challenges around each corner, and you have to feel and try with your hands and feet how to move forward.

The hook attachment protects you from falling. The solid material gives you confidence and encourages you to move forward.

Reliable

The product should be reliable to build a trusted relationship with the user over time and to provide the feeling of safety that is required for confidence. It can do this by providing trustworthy information and being consistent over a longer period of time.

Keywords: trustworthy, evidence-based, consistent

The bumpy rock offers unexpected challenges around every corner. Your confidence grows as you overcome obstacles.

Product quality
Spontaneous

A spontaneous character is required to let the user try something new, which is a vital part of this vision of confidence. Spontaneity can be expressed by appearing unannounced and interrupting the user naturally and pleasantly.

Keywords: unannounced, natural, pleasantly disruptive

You learn to move around using your hands and feet. As you progress, you will learn to trust your abilities.

Product quality
Intuitive

The product should be intuitive to allow users to learn through practice and build confidence in their ability to provide for the family with with less products over time. An intuitive product is responsive, smart and adapting.

Keywords: responsive, smart, adapting

The challenge of my design phase was taking these abstract interaction and product qualities, and developing them into concrete ideas. To aim to overcome this gap that I experienced, my approach was to think about principles detached from the mobile experience to achieve reliability, spontaneity and intuitiveness. In the first attempt at ideation, I thought of elementary associations and ideas based on the product qualities. A summarising sketch of this can be found in Appendix B (p.93). I then moved towards exploring concepts, as described in Appendix C (p.94). In this chapter, I will focus on the concepts and prototypes that I have made, and the principles from research that come back in the designs.

6 Design iterations

p.41-60

6.1 Principles

Before diving into the concepts, I would like to summarise five principles that have emerged from chapters 2, 3 and 4. This section explains where these principles come from.

1. Facilitate & incentivise meal planning

In section 2.4 (p.18) I explained that looking at meals rather than ingredients helps to encourage consumers to buy only what they need, as it is clearer what is wasted. It can therefore help to facilitate the composition of a meal beyond simply providing recipes.

2. Facilitate creative meal composition and use of leftovers

In section 2.4 (p.18), I noted that one of the pathways to buying enough is creativity in cooking and shopping for a meal. Design can support this by enriching the experience with a variety of inspirations.

3. Elicit our aversion to wasting personal resources.

This principle comes from clusters 2 and 4 in section 3.2 (p.22), which explain that personal concerns are stronger than environmental concerns and that the strength of feelings of waste is often dictated by price. The design could emphasise how it can be a waste of money to buy more than you need.

4. Provide space to express identity

In the first cluster of both section 3.2 (p.22) and section 4.2 (p.35), I stated that personal expression is an important need when cooking and shopping for the family. Therefore, I want to make sure that the design does not interfere with this need and that it perhaps even enhances the expression of identity.

5. Encourage buying less to be a good provider

In cluster 5 of section 3.2 (p.22), I suggested that feelings of guilt can have a negative impact on behaviour. In addition, in the first cluster of this section and in section 2.2 (p.16), I explained that it can be part of the good provider identity to reduce excessive purchases. With this in mind, I think the design should avoid communicating the negative effects of wastage and instead focus on the positive learning aspect of being a better provider when less food and money are wasted. This principle is also related to the educational responsibilities of a good provider as explained in section 4.2 (p.35).

6.2 Concepts

With interaction and product qualities in mind, I developed three concepts to further explore the principles of section 6.1 (p.42). It should be noted, however, that in reality this was a co-evolutionary process, i.e. the ideation helped to establish these principles and vice versa.

These concepts explore different ways of helping people to buy less in the context of providing for a family. The concepts focus on different principles and vary in the type of consumer they might attract. At this stage, the exact look and feel and interactive behaviour is less important than the concept idea. The concepts are later evaluated for potential desirability, feasibility and viability, as well as the elements of the interaction vision.
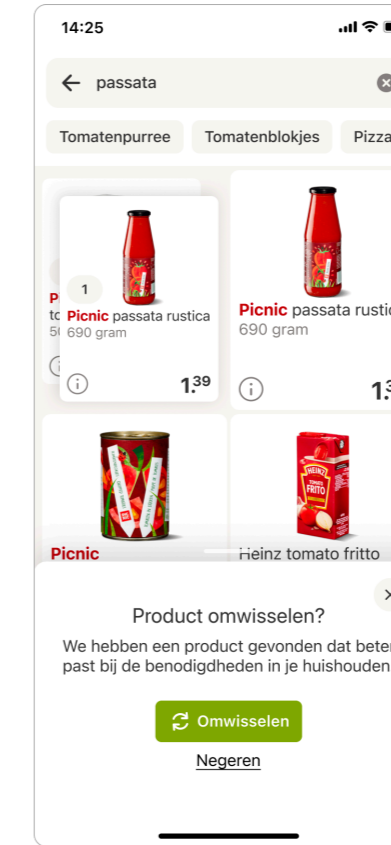
1. DISCOVERY THROUGH SWAPPING
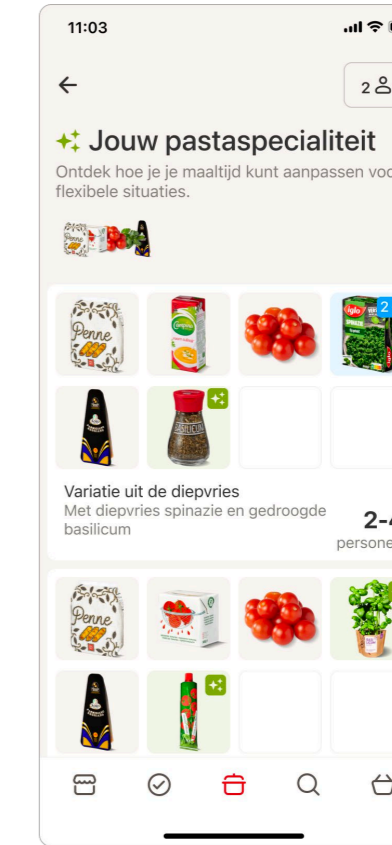
2. EXPLORATIVE MEAL PLANNING

3. CONSCIOUS GOALS

1. Discovery through swapping

Focus on principles 3 and 5.

Suggesting food swaps to consumers is not new, but has not been used to prevent overprovisioning, or food waste in general. The context of providing for a family is challenging, because preventing food waste has a lower priority when shopping for groceries. Therefore, the goal of this concept is to gradually become a better provisioner, by helping them with suggestions in an accessible and non-disturbing way.

Swaps create reconsideration moments to support shopping more appropriately. They help establish confidence in buying less, by proposing one small change at a time, and allowing the consumer to reflect on it. Through the feedback that the user gives after having prepared the meal, the swaps get more accurate and personalised over time.

The intervention is reliable through building trust over time by encouraging the user to try small changes to gain 'proof by experience'. The intervention behaves spontaneously and intuitively by appearing unannounced and responding to excessive purchases of the user. It is able to do this by recognising patterns over time, such as buying too much passata.

Target consumer

This concept is made for the more stubborn consumer that needs an intervention to break unconscious habits. This consumer is sceptical about the reliability of the service,

SWAPPING PROMOTIONS

SUGGESTED SWAP
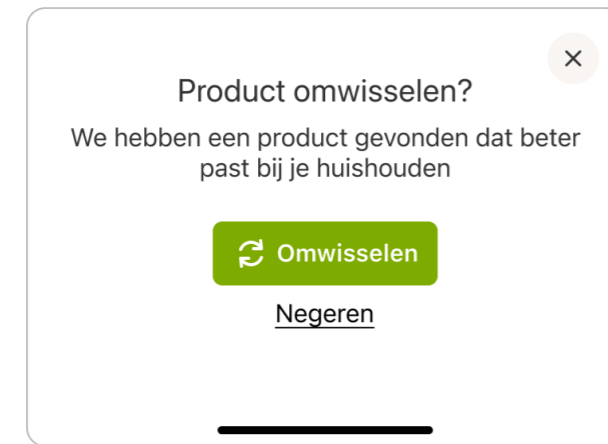
SWAP MESSAGE

IMPROVE EXPERIENCE OVER TIME

Concept flow ↴
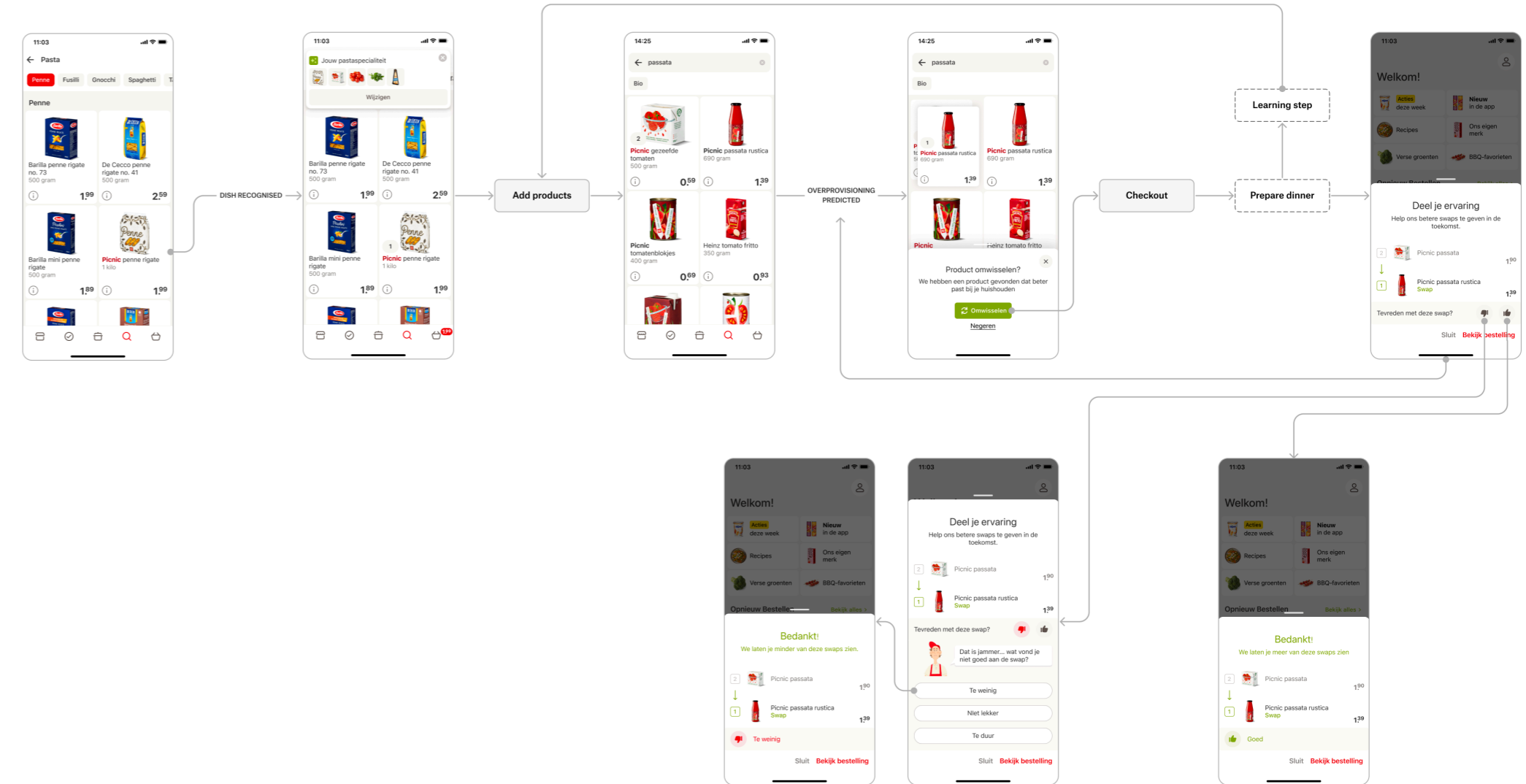
2. Explorative meal planning

Focus on principles 1 & 2.

Recipes are a great way to encourage meal planning, but as explained in section 3.3 (p.24), they often come short in securing provider goals ánd minimising overprovisioning. While the current recipes are not that flexible toward various situations and goals, this concept aims to provide that through 'hybrid' meals. These are initiated by adding ingredients as a user, and enhanced by the app to support specific situations and goals, such as the uncertainty of family members staying for dinner.

The vision behind this concept is that meals are not static but should be flexible and experimental. For example, a pasta dish might as well be complemented with an extra vegetable if desired, or frozen variants if flexibility is required. The service functions as a personalised generator of meal varieties, that allow you to explore the endless possibilities that make provisioning more accurate and more enjoyable.

The intervention expresses reliability by making use of numbers as proof, such as the amount of calories, the weight of vegetables after cutting, or the amount of flexible portions. The meal variations are unexpected, therefore spontaneous. Furthermore, the concept aims to intuitively blend into the thought process of composing a meal, by allowing individual exploration firs, and then jumping in to complete the meal with a variety of alternatives.

Target consumer

This concept suits consumers that enjoy meal exploration and see this as a part of providing a meal to others. This consumer is quickly bored and sensitive to diverting from the original plan.

Variatie uit de diepvries
Met diepvries spinazie en gedroogde basilicum
2-4 personen

MEAL VARIATION FOR MORE FLEXIBILITY

Japanse wok
Met **Japanse wokgroenten** en **prei**
2-3 personen
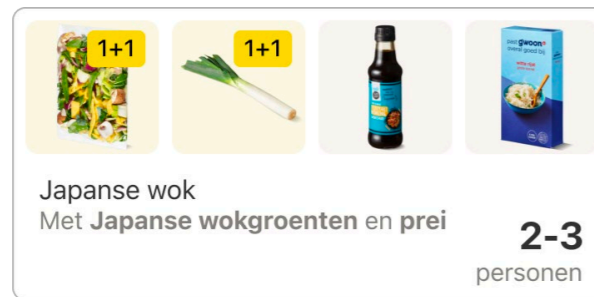
MEAL VARIATION FOR BULK PROMOTIONS

Je hebt meer dan nodig voor 2 personen

Flexibele variaties ›

WARNING PROMPT FOR OVERPROVISIONING

Concept flow ↘
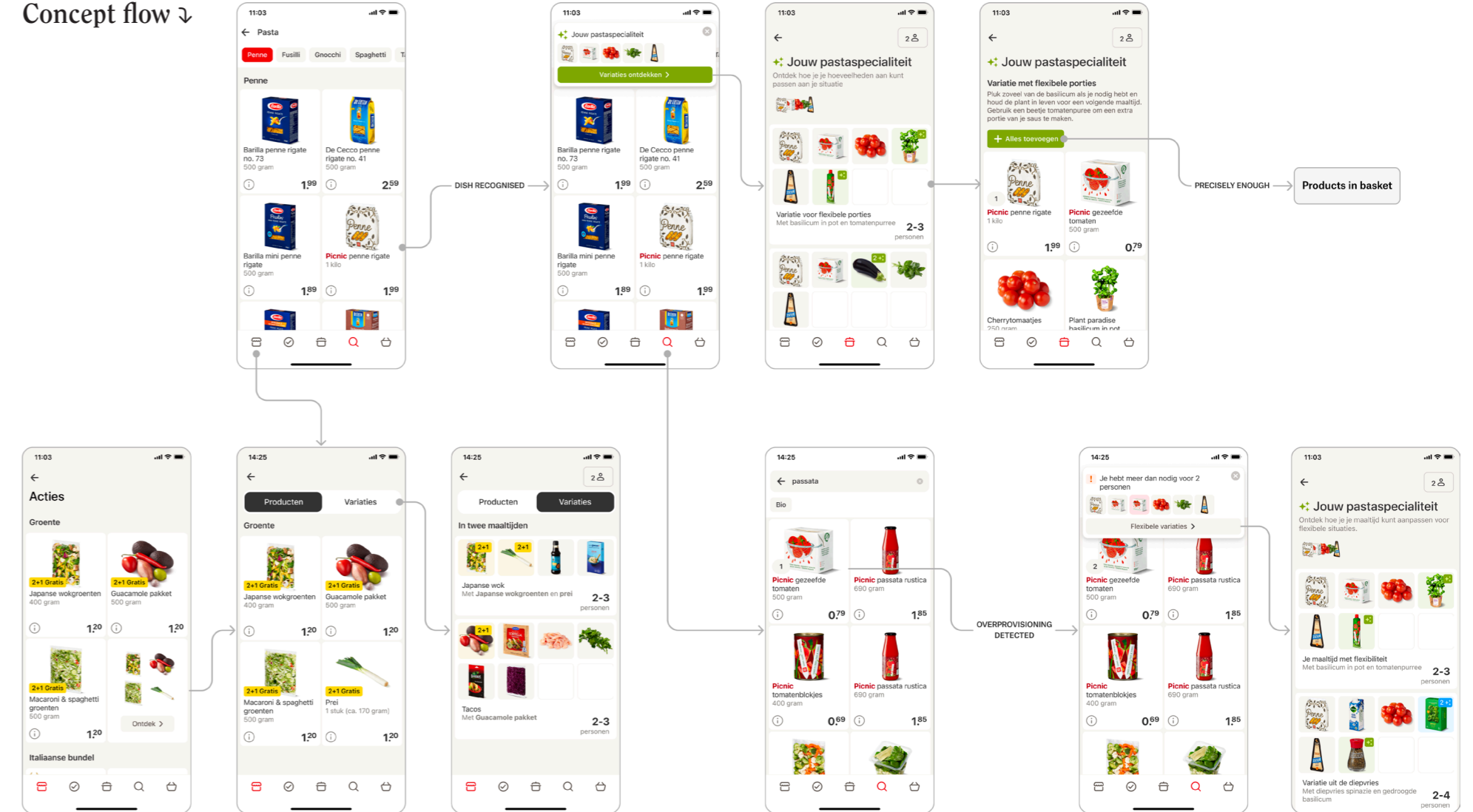
3. Conscious goals

The goal of this concept is to establish a partnership in providing for the family between the user and the service, by rearranging the app to provider goals that the user chooses. As opposed to the other two concepts, smart algorithms play less of a role. Instead, it encourages users to consider their provider goals explicitly, which helps to convince them that the intervention is aligned to these goals. In the shopping journey that follows, products that secure provider goals are prioritised and highlighted. Furthermore, the nutritional values of a meal are displayed in context of the message that the user has enough in the basket.

The concept is reliable by listening to the chosen goals and showing the results in numbers. The interaction appears spontaneously along the search for ingredients, and is intuitive by responding to the goals that the user has selected.

Target consumer

This concept suits food-conscious consumers that demand confirmation and overview. This consumer is sensitive to clear information and does not enjoy surprises.
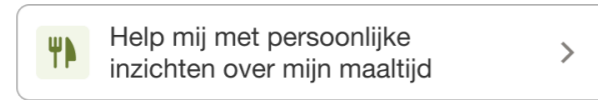
INTRODUCTION BANNER

PROVIDER GOALS FOR THE MEAL

ASSIST WITH PRODUCT CHOICES

CONFIRMATION OF BEING A GOOD PROVIDER

PROVIDER GOALS IN RECIPES
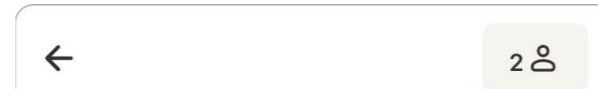
Concept flow ↳
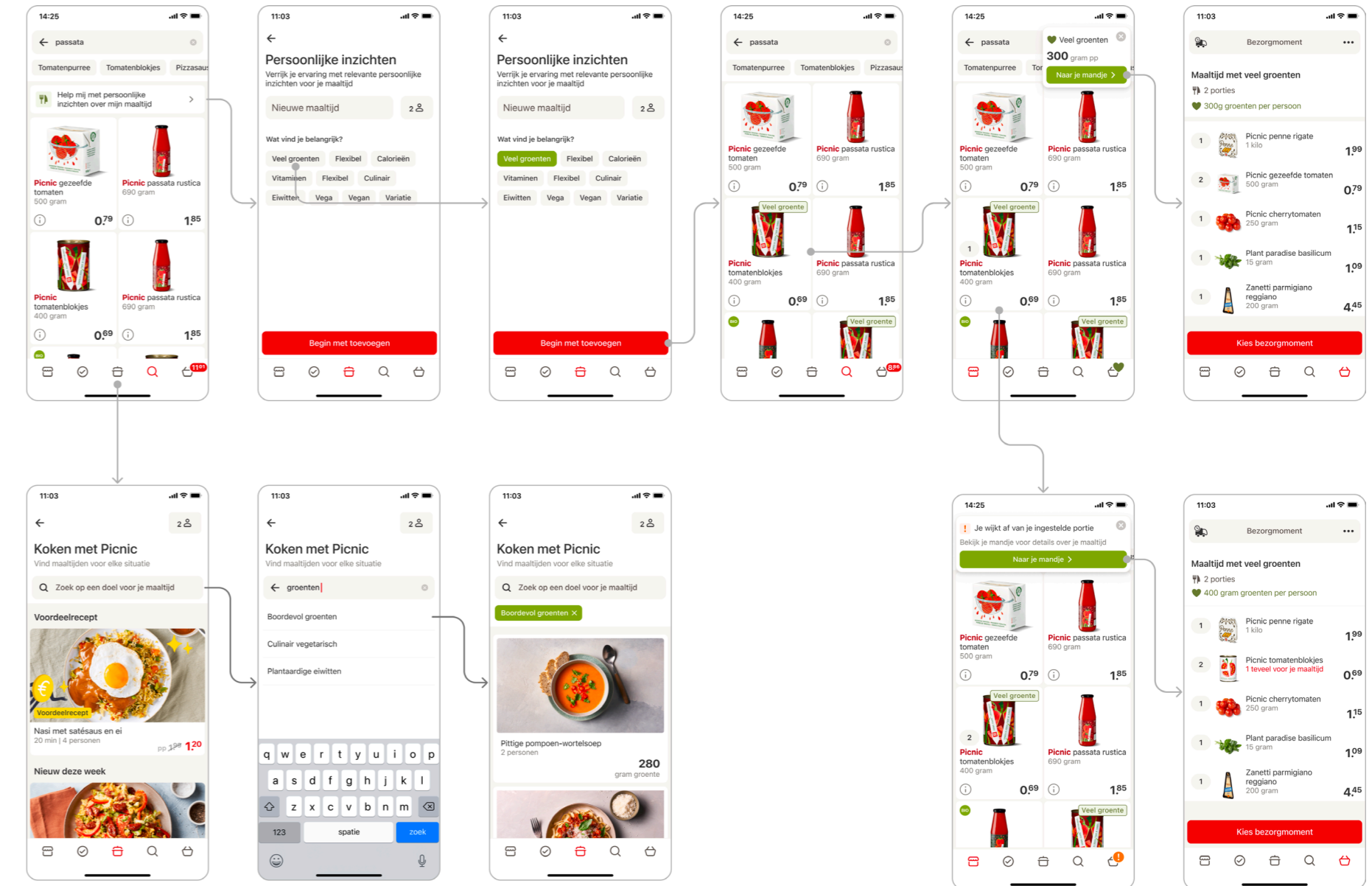
6.3 Evaluation

In this section, I describe how the concepts compare in terms of building confidence to buy less and in terms of desirability, feasibility and viability. I was assisted in this evaluation by colleagues and the client.

Prototype

I created a prototype in Figma with the three concepts (see Appendix D (p.95)). In each of the concepts, the task was to compose a simple pasta dish in the Picnic app for themselves and a partner or household member. Participants were instructed to add two specific products one after the other.
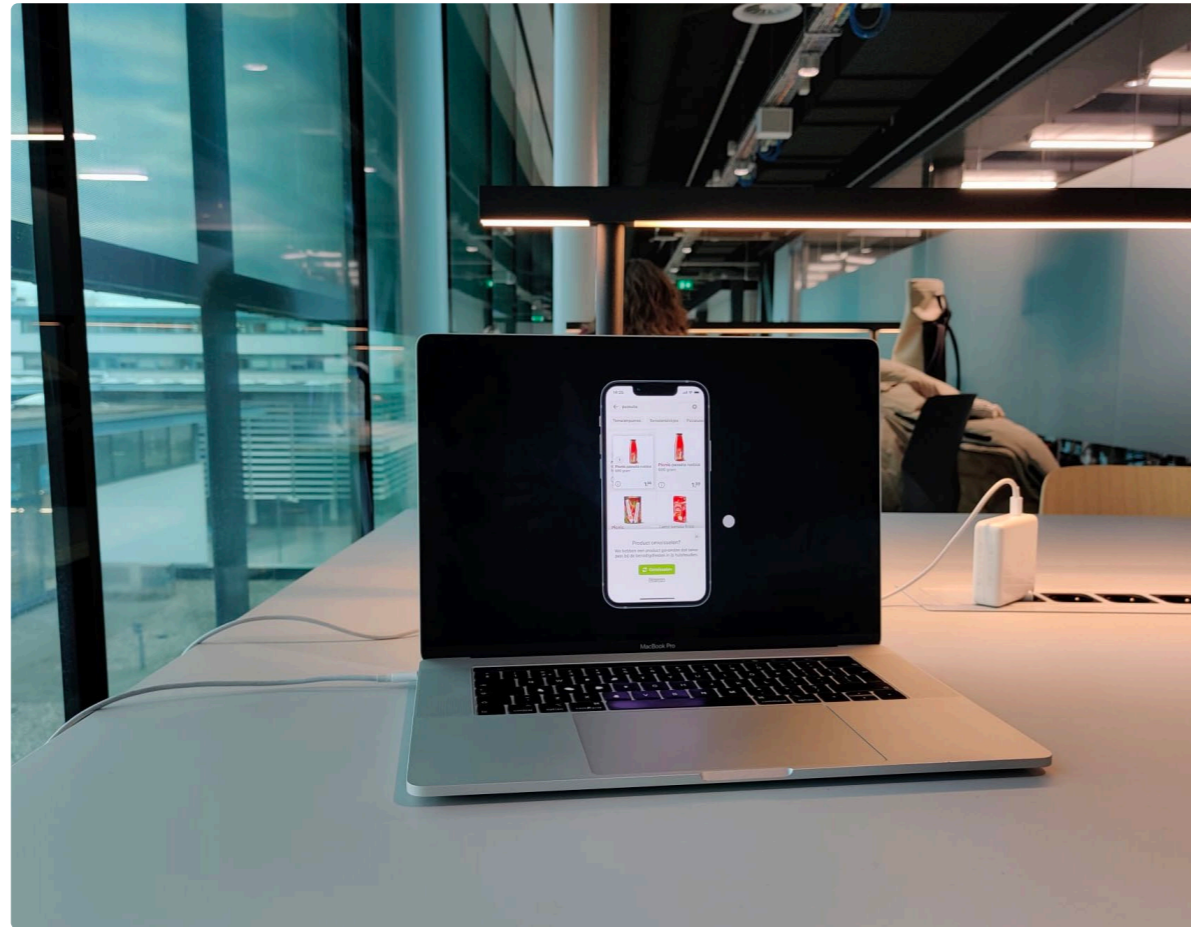
Figure 17 Prototype of the evaluation

Peer critique

I asked three fellow designers to test the prototypes and tell me which concepts were in line with the product qualities (reliability, spontaneity and intuitiveness). I also asked them which concept makes them feel most/least confident in being a good provider, and which concept they think has the most potential.

Concept 1

MOST DESIRED ● ○ ○   **INTUITIVE** ● ● ○

RELIABLE ● ○ ○   **CONFIDENCE** ● ○ ○

SPONTANEOUS ● ○ ○   **POTENTIAL** ● ○ ○
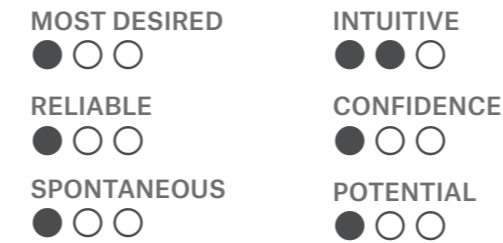
The concept involved swapping two regular Passatas for a 'rustic' Passata. The participants did not understand what this version was and therefore did not fully trust the swap.

❝ *This swap provides me with too little information to be able to judge if it benefits me.*

The swap is seen as concrete in terms of buying less. Yet the objective of the swap is not properly communicated.

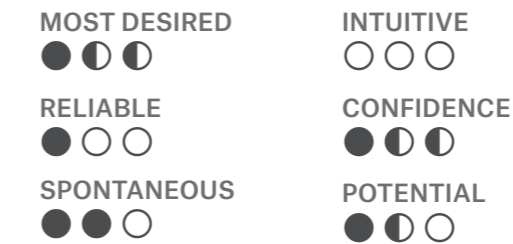❝ I *can clearly see how this concept could help me with reducing food waste.*

❝ *I lack information on why this particular swap is being presented to me. It does not convince me that it is a better option.*

In addition, the appearance of the swap was perceived as forced and uncomfortable. One of the participants mentioned that he wanted to be more in charge.

❝ *The appearance felt spontaneous, but in an unpleasant way. It caught me off guard.*

❝ *The swap feels forced and not spontaneous at all.*

Concept 2

MOST DESIRED ● ○ ◐   **INTUITIVE** ○ ○ ○

RELIABLE ● ○ ○   **CONFIDENCE** ● ◐ ◐

SPONTANEOUS ● ● ○   **POTENTIAL** ● ◐ ○

The main criticism of this concept was that the alternatives were too defined, leaving no room for personal exploration. Although this may be appropriate for the Meals tab, it is not desirable when composing your own meal.

❝ *I would prefer it to be a little more suggestive rather than deciding so much for me. I want to be in the lead of my own meals.*
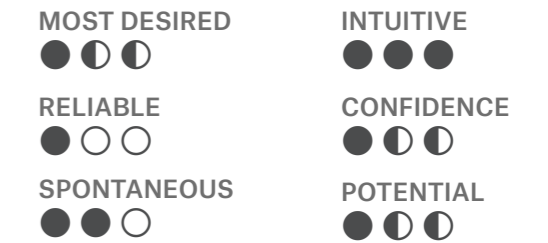
❝ *It is too obtrusive for me. If I am minding my own business with my groceries, I do not want to see all these meal variations.*

Peers were also sceptical about the app knowing exactly which meal the user was preparing and the accuracy of the variations presented. They are more likely to accept an intervention that is honest and suggestive rather than smart and all-knowing.

❝ *I'm skeptical about the quality of the meal because I don't think the app will be able to know what I like in a meal.*

Concept 3

MOST DESIRED ● ◐ ◐   **INTUITIVE** ● ● ●

RELIABLE ● ○ ○   **CONFIDENCE** ● ● ◐

SPONTANEOUS ● ● ○   **POTENTIAL** ● ● ◐

This concept was the least controversial among the peers. However, it was also the most unclear how it would help them to buy less.

❝ *I don't understand how buying more vegetables makes me buy less.*

❝ *"The message is not so catchy that I consider buying less because of it.*

Peers were divided on how useful meal information was for them. This highlights that people make their provider goals concrete for themselves in different ways.

❝ *Insights into my meal is something I'd like to have anyway.*

❝ *I buy vegetables rather instinctively, so the '250 grams' does not tell me much.*

Client feedback

The researchers need to be able to perform a measurable quantitive test with the design, in which there is only one variable (product packaging size). These concepts, however, make use of product alternatives and even meal alternatives to combat overprovisioning. While these are valid tactics, there are lots of other factors that play a role in deciding to comply to accept product alternatives as a customer, such as differences in brand, taste or product price. Comparing these concepts, the interaction of the first concept clearly was most suitable for measuring effectiveness, as the other two concepts had an indirect approach to reducing overprovisioning. It is important, however, to acknowledge that quantitative research will focus on a specific use case, whereas the concept needs to be designed for the context, which includes more than one use case.

Ranking of concepts

I ranked the concepts on interaction qualities (Figure 18) and a critical evaluation on their desirability, feasibility and viability (Figure 19), to get an overview of how the concepts compare to each other.

SAFETY NET	DISCOVERING NEW THINGS	LEARNING BY DOING
1ST Concept 3 — Simple and transparant information helps users feel secure in providing well. Yet, numbers such as amount of vegetables are not always easy to judge and sometimes not reliable.	**1ST Concept 2** — The user discovers lots of new variations in a small amount of time. These variations transcend the product level and provide insights on the meal level.	**1ST Concept 1** — The user is slowly adapting to better provisioning behaviour, and learns through practice how smaller quantities or long-shelflife alternatives can still meet the requirements the user has in mind as family provider.
2ND Concept 2 — The concept provides meal alternatives for flexible usecases. Yet, the presentation of multiple meal combinations requires complex calculations. Similar to the weather forecasting, complex estimations are difficult to rely on.	**2ND Concept 2** — The user discovers which products or quantities can help to reduce overprovisioning. The insights are tiny and some may be experienced as obvious rather than true discovery.	**2ND Concept 2** — The user gets acquainted with new tactics of provisioning habits for their own meals, but on a more subconscious level. Therefore, it does not clearly help in setting the intention to learn to waste less.
3RD Concept 1 — It remains unclear how these swaps help the user to provide well for the family, as these goals are absent in the current design.	**3RD Concept 3** — In some cases, the information that it provides may be a discovery for the user. Yet, the information is primarily for confirmation of existing insights, rather than discovering new insights.	**3RD Concept 3** — The user learns how certain products are more suitable for the requirements that they set for a meal. However, the user does not directly learn how to use these insights to reduce overprovisioning.

Figure 18 Ranking of concepts on interaction qualities

DESIRABILITY	FEASIBILITY	VIABILITY
1ST Concept 3 — The displayed information on product and meal level correspond to the user's goals. The user is in control over what is displayed in the service.	**1ST Concept 3** — The interaction is straightforward and responds on user input rather than a prediction model. It builds on simple information and calculations that are feasible for an online supermarket.	**1ST Concept 2** — Aside from helping customers, the hybrid meal planning interaction makes online supermarkets stand out from the competition by providing a more accurate tool to buy recipes, that at the same time are personalised.
2ND Concept 2 — The alternative meal combinations provide dinner inspiration for providing for a family, providing a benefit to the user besides wasting less. Yet, the design is heavy and undesirable in situations in which the user is not interested in meal alternatives.	**2ND Concept 1** — The principle of the interaction can work in a variety of usecases and can easily adapt to lots of products using a relatively simple algorithm. Yet, it will be difficult to predict the needed quantities accurately from previously ordered groceries.	**2ND Concept 3** — Online supermarkets are always interested in improving customer satisfaction by improving their service. This concept helps in a more complete provision of information, thereby improving the in-app customer experience.
3RD Concept 1 — The swap does not introduce to the user why it is there, and therefore it is hard to judge as a user why this would be beneficial at all.	**3RD Concept 2** — The complexity of the required prediction model makes it unfeasable for the online supermarket. In addition, a lot of operational work is required to write all the situation-specific content.	**3RD Concept 1** — Existing supermarkets may not be interested in interventions that are only targeted at selling less to the customer.

Figure 19 Ranking of concepts on critical evaluation metrics

Conclusion

The rankings show that each concept has its strengths and weaknesses from which learning can and should be made. The interaction of concept 1 has a concrete effect and a clear learning process, but lacks a safety net. Concept 2 allows users to discover the power of long-life substitutes, but the effect on overprovisioning is unclear. Concept 3 provides more autonomy and allows users to act explicitly upon their provider goals, but it does not help convince consumers enough to buy less.

Overall, the evaluation has enriched me with the following takeaways:

- Set the expectations of the intervention from the start, so that users understand why they are interacting with it.
- Put effort into the copywriting, so users feel that they are approached appropriately and pleasantly.
- Put service first, so that users feel the design is made for them.
- Avoid complex data mechanisms that leave users confused about what is happening. Instead, put the user in the driver's seat.
- Be transparent about why certain information is displayed.
- Avoid showing numbers unless it is clear how they are calculated or how they can help the user.

6.4 Single design concept

This single design concept brings together all the insights from the literature, interviews, ideation and concept evaluation into a design that should help family providers gain confidence in their creativity and skills over time to cater for the family, while they step-by-step reduce the buying of excessive purchases.

In line with the design vision, the designed interaction covers three crucial phases. First, it reassures the user that family members are being taken care of. It then encourages the user to try an alternative product variation that might be more appropriate for the dinner. Finally, the user should become aware of how to provide with less excessive purchases by reflecting on the substitute in the context of the dinner. By repeating this cycle over and over, family providers should gain the confidence needed for sustainable behaviour change.
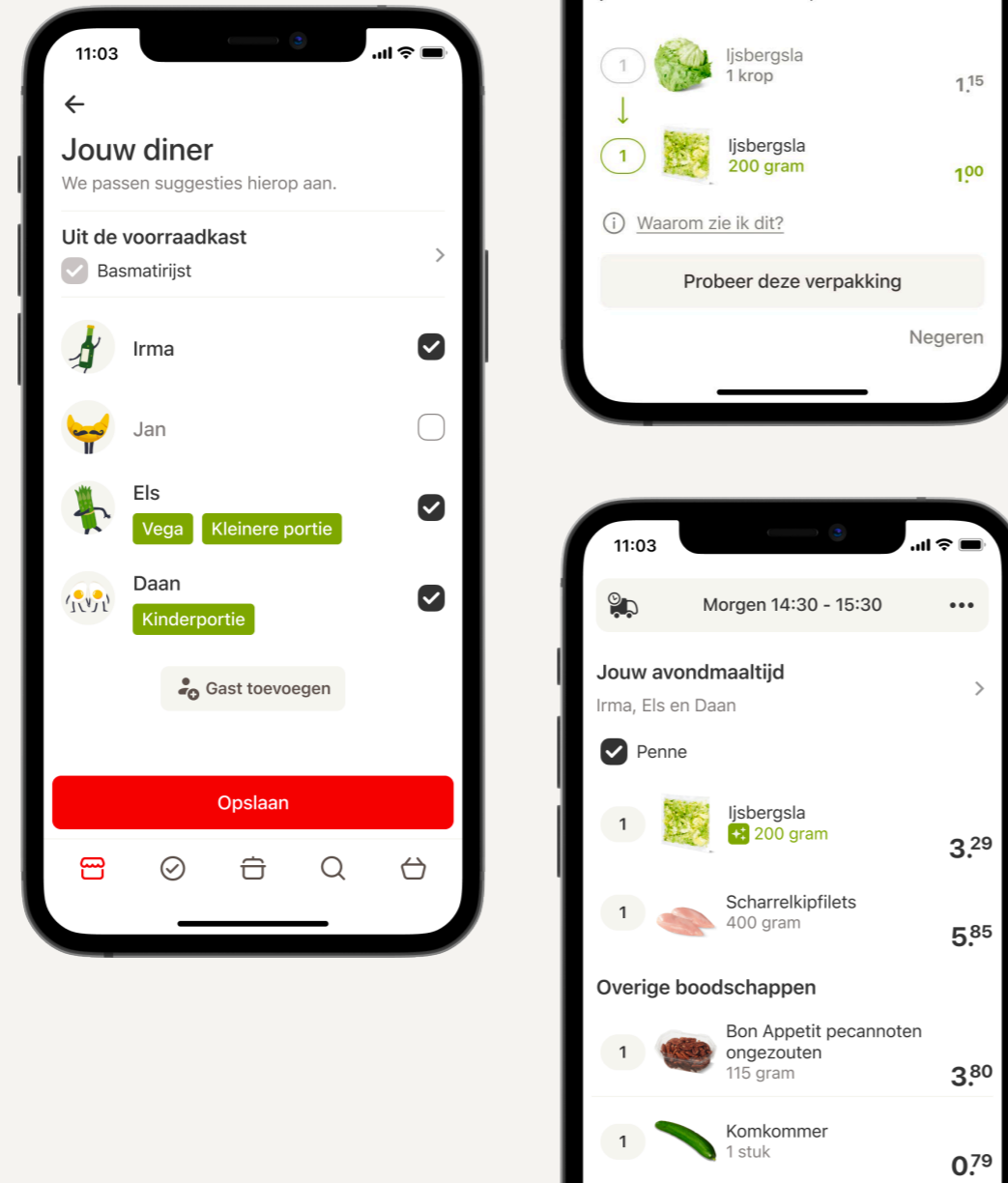
Concept diagram

This diagram describes the buying cycle of a suggested substitute by means of the designed features. It shows how the actions of the user relate to the three elements of the interaction vision. See Appendix C (p.94) for an extensive flow diagram of the design.
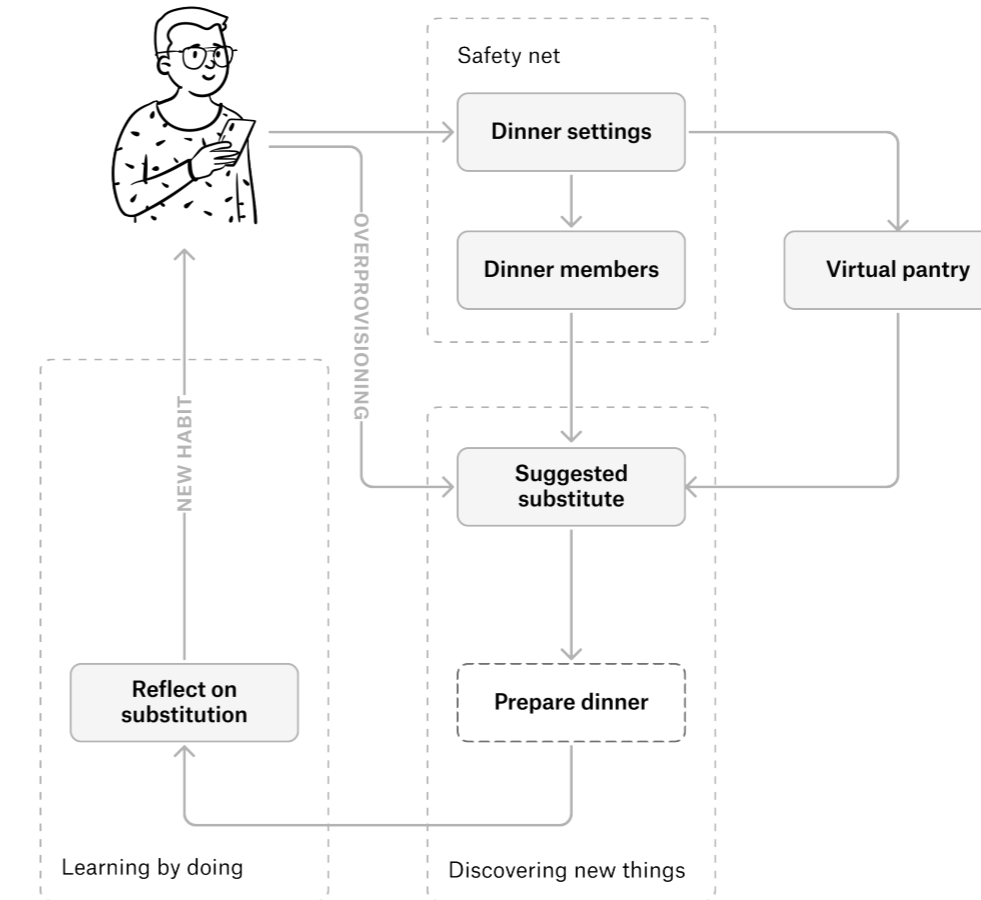
Figure 20 Concept diagram

Concept deconstruction →

The concept consists of five elements that interact with and influence each other. Some of these elements are derived from the three concepts in section 6.2 (p.42), while others are new and result from an iteration of the principles in section 6.1 (p.42). See Appendix D (p.95)for an overview of all the screens designed.

Your dinner

The 'Your dinner' screen is the place where the family provider initialises the composition of a new meal for a specific dinner. To cater for the flexibility that family dinners demand, eating members can be ticked on and off. The household list and preferences can be managed in a separate screen.

In addition to the fact that the dinner settings are needed to later suggest accurate product substitutes, it serves the consumer by conveying that the members and their preferences are being taken into account. The intended interaction is to create trust that the service will only make suggestions that meet the needs of the family members. This is communicated in the design by saying 'we adjust our suggestions accordingly'.

SET PREFERENCES
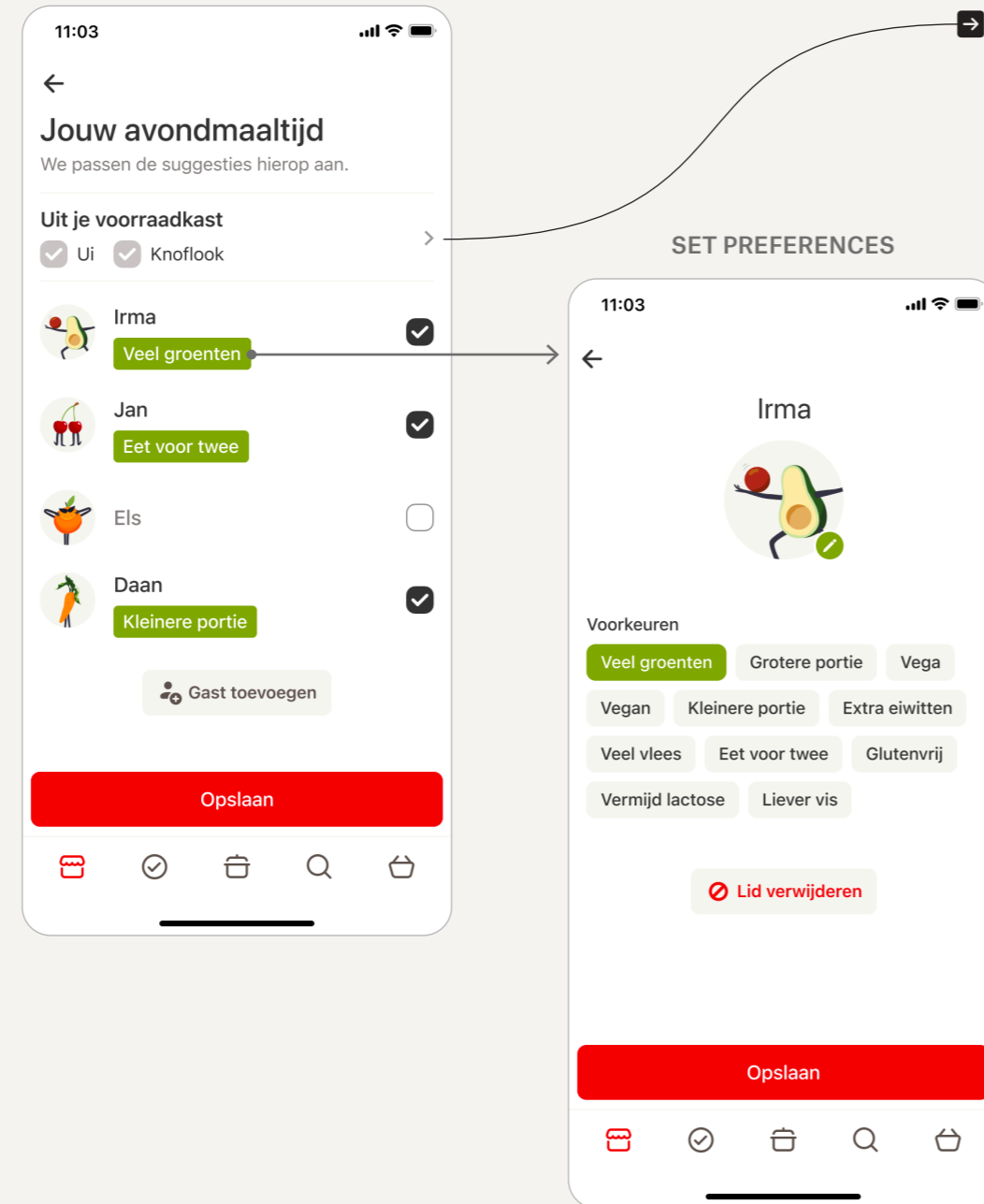
Virtual pantry

The virtual pantry is nothing more than data from previous orders about products that might be left over. By encouraging the use of those in the new meal, it becomes easier to minimise waste. In addition, when these products are added to the meal, they are factored into the calculation of appropriate quantities to suggest relevant substitutions.

It also serves as a reminder to users of what they have left over. They may be ordering from another location or simply not be thinking about checking the fridge. By selecting which products are left over after each order, the habit of checking the fridge is created. In addition, the user is reminded to make more use of leftovers, which encourages a second habit that reduces over-provisioning.

The virtual pantry is designed to be minimal. It does not require active manual management in the app. Instead, it uses existing moments to check if there are any ingredients left over from previous orders. Therefore, there is no setting to manually add ingredients.

START MEAL FROM A LEFTOVER
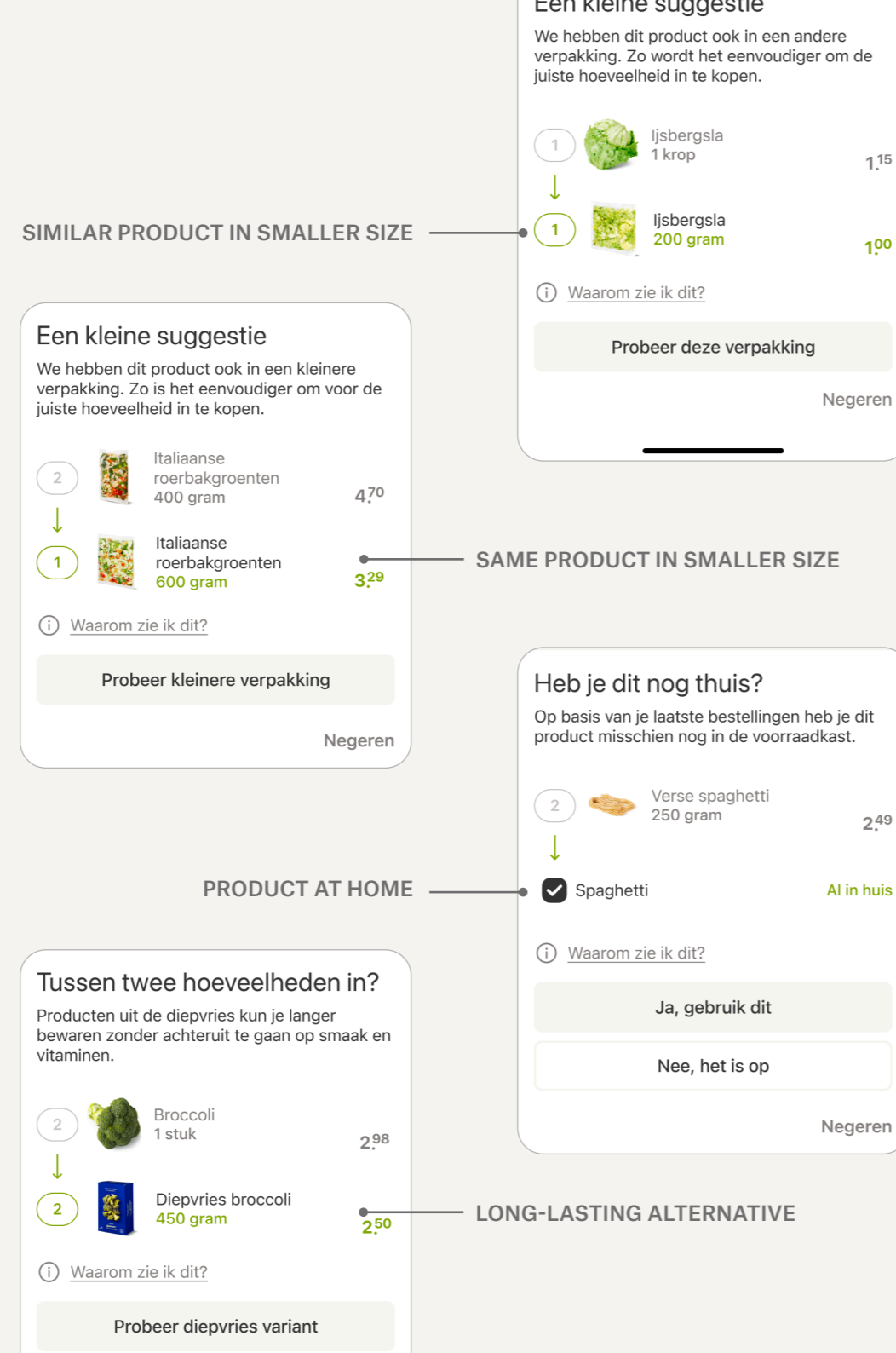
SELECT LEFTOVERS FROM ORDER
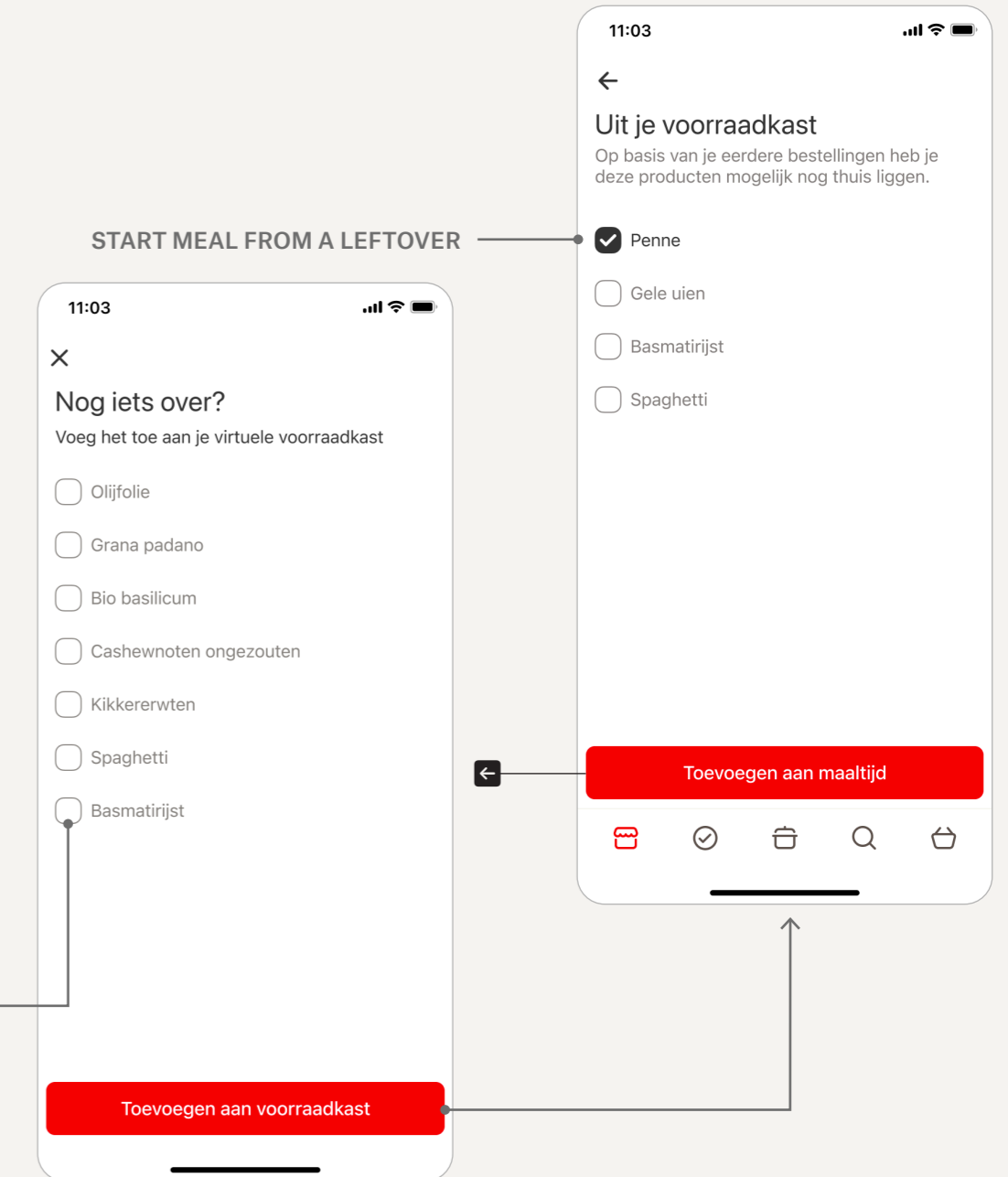
Spontaneous suggestions

Once you have saved the settings in 'Your dinner', you will receive a prompt when you add a product that is too much for your meal. These prompts are designed to encourage you to try something different, which could be a smaller packaging size, a smaller product quantity, a long-lasting alternative, a smaller similar product, or the use of a leftover instead of a fresh ingredient.

The intended interaction is highly related to the interaction quality of discovering new things. When the user is confronted with a comparison between two products, the price difference may convince the user to choose the smaller size. It should feel like a tiny 'try-out' experience that does not seriously affect provider goals. Once the user has agreed to a substitution, a new label is placed on the product to remind the user that this is just a small experiment.

The copy is therefore written suggestively, supporting the user in making good choices without judging them for putting too much in the basket. The title "a small suggestion" has a double meaning: it emphasises the modest nature of the suggestion, but also hints at buying less.

SIMILAR PRODUCT IN SMALLER SIZE

Een kleine suggestie
We hebben dit product ook in een andere verpakking. Zo wordt het eenvoudiger om de juiste hoeveelheid in te kopen.

1   Ijsbergsla 1 krop   1.15
↓
1   Ijsbergsla 200 gram   1.00

ⓘ Waarom zie ik dit?

Probeer deze verpakking

Negeren

Een kleine suggestie
We hebben dit product ook in een kleinere verpakking. Zo is het eenvoudiger om voor de juiste hoeveelheid in te kopen.

2   Italiaanse roerbakgroenten 400 gram   4.70
↓
1   Italiaanse roerbakgroenten 600 gram   3.29

ⓘ Waarom zie ik dit?

Probeer kleinere verpakking

Negeren

SAME PRODUCT IN SMALLER SIZE

Heb je dit nog thuis?
Op basis van je laatste bestellingen heb je dit product misschien nog in de voorraadkast.

2   Verse spaghetti 250 gram   2.49
↓
☑ Spaghetti   Al in huis

ⓘ Waarom zie ik dit?

Ja, gebruik dit

Nee, het is op

Negeren

PRODUCT AT HOME

Tussen twee hoeveelheden in?
Producten uit de diepvries kun je langer bewaren zonder achteruit te gaan op smaak en vitaminen.

2   Broccoli 1 stuk   2.98
↓
2   Diepvries broccoli 450 gram   2.50

ⓘ Waarom zie ik dit?

Probeer diepvries variant

LONG-LASTING ALTERNATIVE

Reflecting on the experience

After the dinner, the user reflects on how well the substituted product provided enough for the family. This can be seen as a concluding interaction in the learning cycle, as the reflection with the family takes place during the actual dinner. If the experience was positive, this reminds the user to use this substitute again in a future meal in this dinner situation.

If the experience was disappointing, the feedback communicates that a process is taking place. The interaction is designed as a reciprocal learning experience where the user works together with the app to align being a good provider with minimising waste.

Deel je ervaring
Hiermee help je ons in de toekomst betere suggesties te geven.

1   Ijsbergsla 1 krop   1.15
↓
1   IJsbergsla 200 gram   1.00

Was dit genoeg?   👎 👍

Sluit

Wat fijn!
We laten je deze en soortgelijke hoeveelheden vaker zien. Zo weet jij makkelijk welk product je het beste kan kiezen.

1   Ijsbergsla 1 krop   1.15
↓
1   IJsbergsla 200 gram   1.00

👍 Goed

Sluit

Bedankt voor het doorgeven!
We laten je minder soortgelijke suggesties zien. Zo wordt de service beter op je afgestemd.

1   Ijsbergsla 1 krop   1.15
↓
1   IJsbergsla 200 gram   1.00

👎 Te weinig

Sluit

Highlighted relevant items

Because we can do more to help users feel confident about the meals they provide, certain products and recipes are highlighted because they meet the family's preferences or are useful for reducing overprovisioning, such as frozen and previously substituted products. As you try more and more of these substitutes, you will notice that the number of highlighted products starts to grow. This helps to remind you of the changes you have already made to reduce waste.

FROZEN VARIANT

SWAPPED EARLIER

OTHER RELEVANT
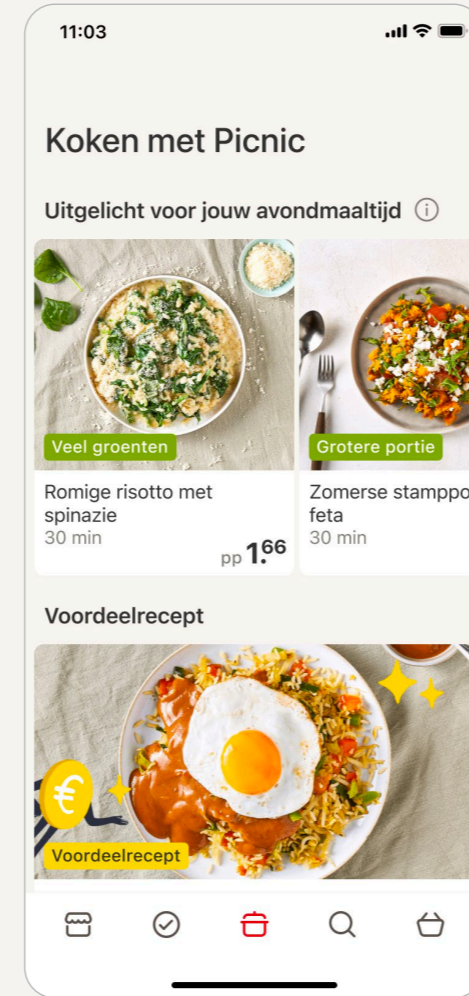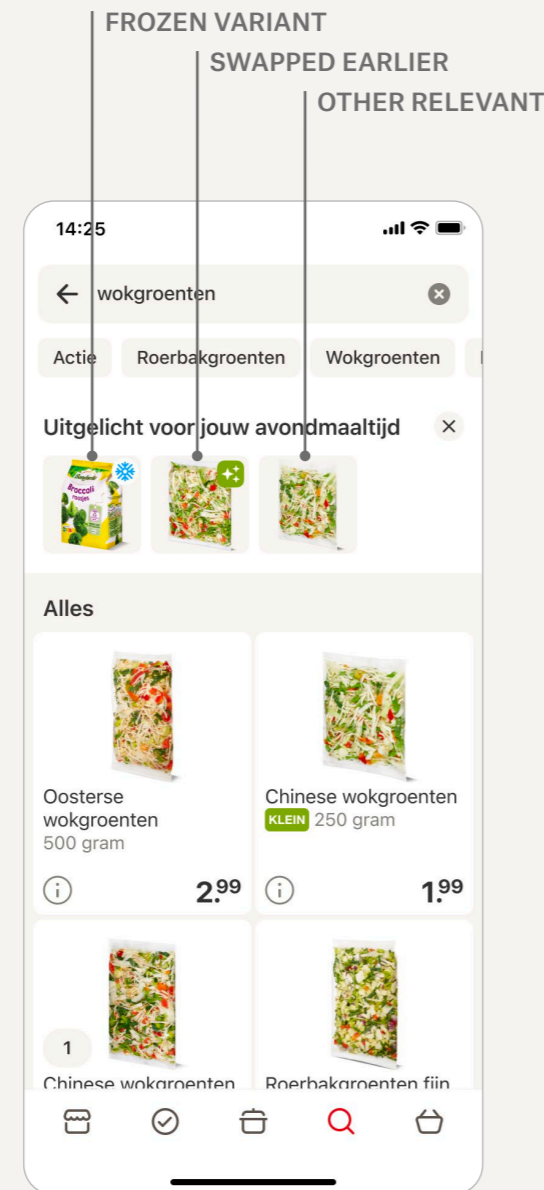
RELEVANT RECIPES

7 Concept testing

p.61-71

7.1 Evaluation metrics

The concept is assessed first and foremost on its effectiveness in achieving the goal that was formulated in the design statement:

Design statement

I want family providers to reduce overprovisioning, by feeling confident in being a good provider while buying less, during the shopping for ingredients for a family dinner.

We can break this down into measuring a reduction in overprovisioning and experiencing confidence in being a good provider while buying less. While the first aspect can be evaluated by looking at the number of suggested substitutes that are adopted, the second one is subjective. I therefore ask participants to respond to a list of statements before and after interacting with the prototype to see the effect of the design on confidence. These also help to assess the interaction qualities of the design and can serve as conversation starters to gather qualitative data.

Statements questionnaire

Before / after interacting with the prototype...

	1 Fully disagree	2 Disagree	3 Slightly disagree	4 Slightly agree	5 Agree	6 Fully agree
I feel competent to buy exactly enough for a family dinner.	○	○	○	○	○	○
I feel confident in being a good provider for my family.	○	○	○	○	○	○
I feel like I am still learning how to reduce excessive shopping.	○	○	○	○	○	○
I find it easy to make the right choices regarding product quantities and sizes.	○	○	○	○	○	○
I am inclined to choose fresh products over frozen or long shelf life.	○	○	○	○	○	○
When I buy too much, it is because of factors I cannot influence (such as packaging sizes).	○	○	○	○	○	○
I think about the consequences of overprovisioning when shopping for ingredients.	○	○	○	○	○	○
I am afraid of not having enough when buying less.	○	○	○	○	○	○
I am afraid to come short as a provider when buying less.	○	○	○	○	○	○
I find it easy to set the right example for my children regarding food and waste.	○	○	○	○	○	○

7.2 Test setup

The test covers the first use of the service when buying ingredients for a family meal. The goal of the setup was to mimic both the context and the personal situation as closely as possible. Therefore, I chose to implement real data in the prototype rather than generic items.

Five of the six tests were conducted online using Google Meet because of the physical distance and limited time available, and because the prototype was digital anyway. The added benefit was that it was easy to record the meeting, so I could review the test and listen to what they said about the concept.
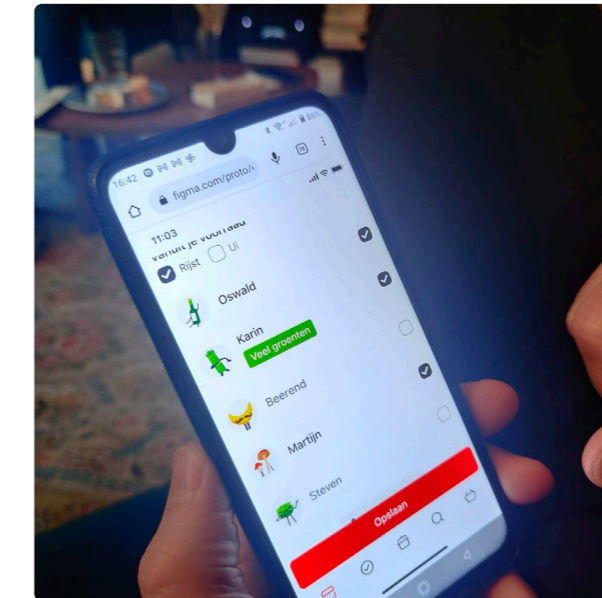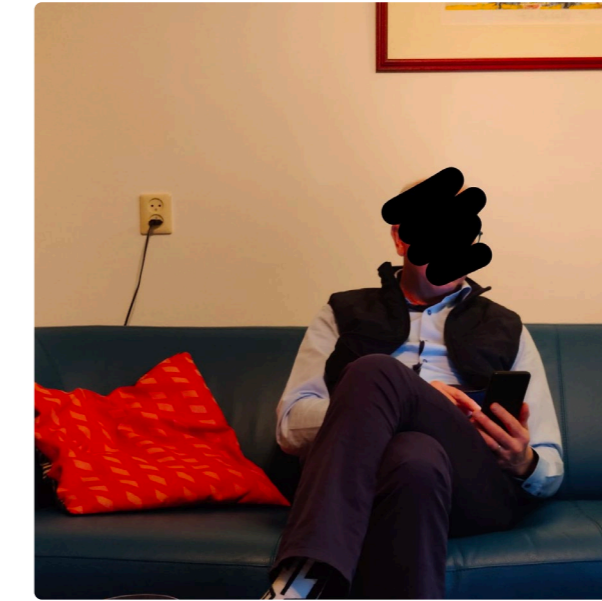

Figure 21 Prototype in the hands of a participant

Participants and attributes →

Six people took part in the test. They were selected because of their living situation, preferably with children, but at least with a partner. Before the session, they were asked to choose a meal containing one or two products that resulted in a meal that was too much for their household. The product substitute was chosen by me and was based on real products and prices at Picnic at the time of the test. In addition to the products, the prototype was personalised for each participant by replacing the names and preferences of the family members with their own.
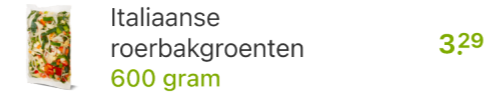
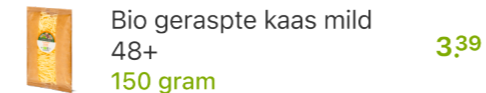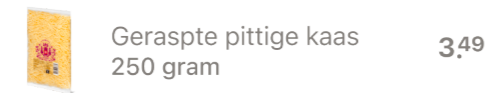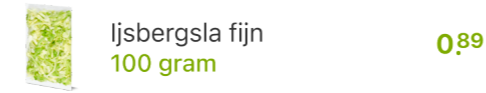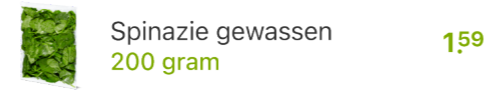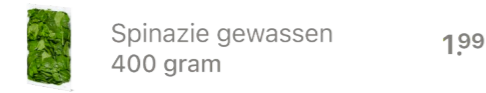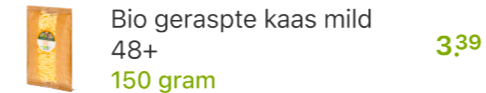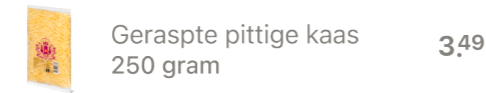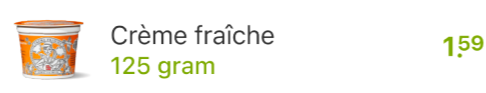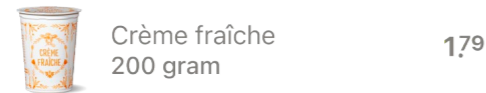|	Chosen product(s) ↴			Substitute(s) ↴	
Participant 1 Man (64) together with partner, 3 children out of the house	Italiaanse roerbakgroenten 2x 400 gram	4.70	→	Italiaanse roerbakgroenten 600 gram	3.29
Participant 2 Woman (23) together with partner and 1 toddler (2)	Ijsbergsla 1 krop	1.15	→	Ijsbergsla 200 gram	1.00
Participant 3 Man (26) together with partner	Ijsbergsla 200 gram	1.00	→	Ijsbergsla fijn 100 gram	0.89
	Geraspte pittige kaas 250 gram	3.49	→	Bio geraspte kaas mild 48+ 150 gram	3.39
Participant 4 Man (25) together with partner	Spinazie gewassen 400 gram	1.99	→	Spinazie gewassen 200 gram	1.59
Participant 5 Man (28) together with partner	Crème fraîche 200 gram	1.79	→	Crème fraîche 125 gram	1.59
	Geraspte pittige kaas 250 gram	3.49	→	Bio geraspte kaas mild 48+ 150 gram	3.39
Participant 6 Woman (40) together with partner and two children (7,12)	Oosterse wokgroenten 400 gram	1.59	→	Tofublokjes 200 gram	2.21
	Oosterse wokgroenten 2x 400 gram	5.98	→	Bonduelle gegrilde groenten (diepvries) 2x 400 gram	5.62
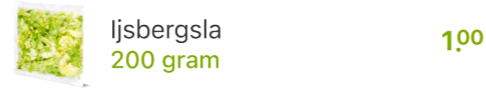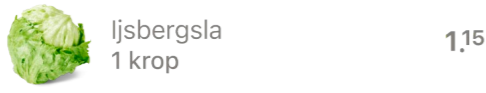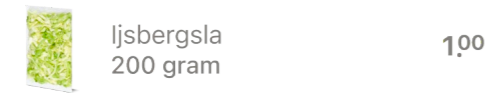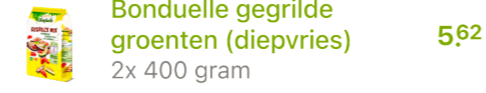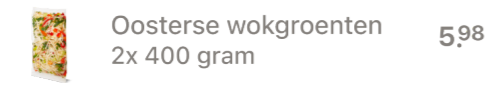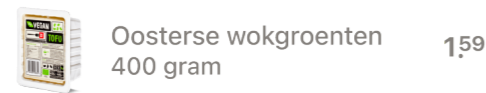
Procedure

1. Pre-test questions

Before sharing the prototype, I asked the participants to respond to the statements from section 7.1 (p.62) via a Typeform questionnaire, and to think out loud. The audio and screen were included in the recording.

2. Prototype hands-on

Next, I asked the participants to open the online prototype. I introduced them to the context of the app (i.e. Picnic as an online supermarket platform) and the scenario, which was to use the Picnic app to add the meal they had in mind to their order. The situation was that most of the ingredients had already been added, except for the product or products they had chosen for the test. During the test, I introduced some of the features to give them time to think about it.

3. Post-test questions

After the participants had their hands on the prototype, I asked them to complete the statements questionnaire again. Apart from its value for quantitative analysis, this seemed to be a good conversation starter for what they had experienced. I then asked them how they perceived the different elements of the concept, as explained in section 6.4 (p.54).

RECORDING
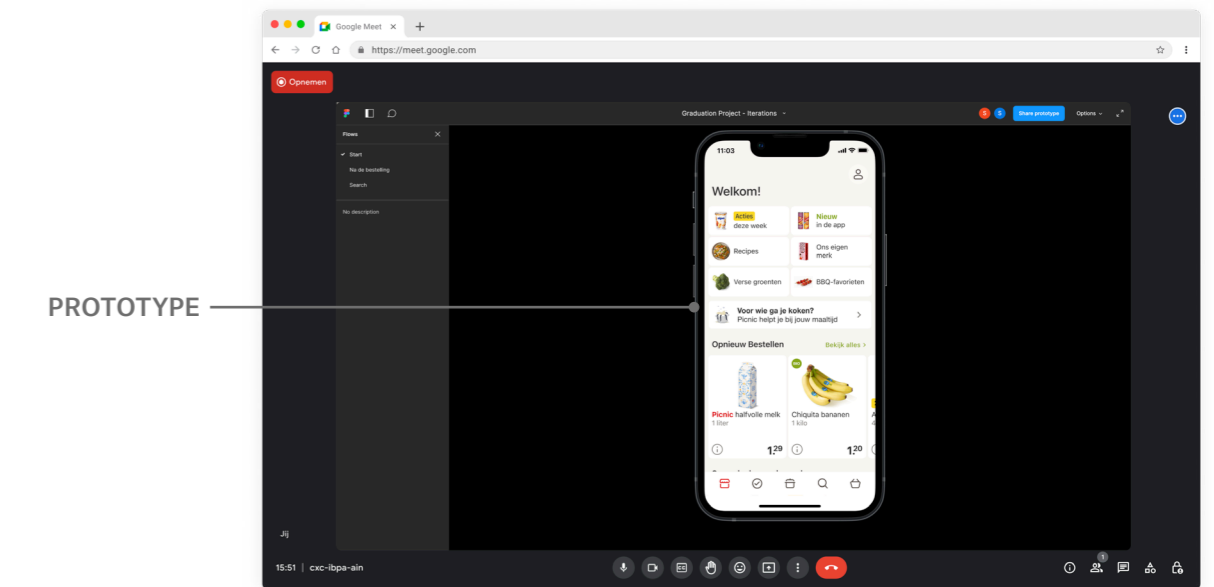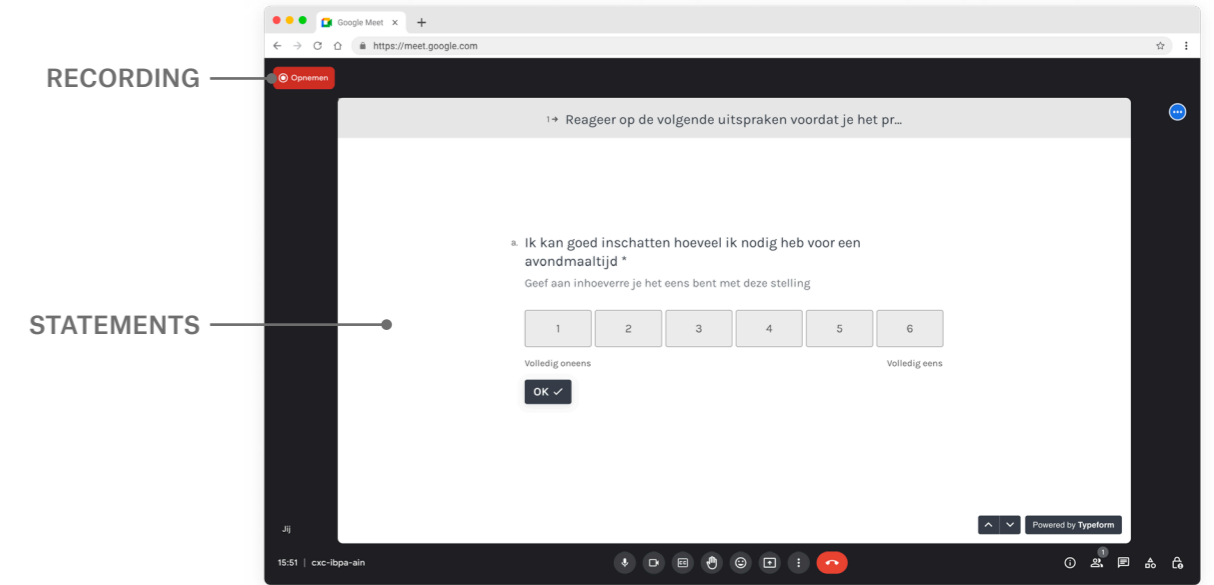
STATEMENTS

PROTOTYPE

Figure 22 Mockups of the screen recording

Prototype

I prepared the interactive prototype in Figma, which is the tool that I have been using for the design as well.

The prototype included the following activities:

1. Going through meal settings
2. Search for the chosen product
3. Placing the product in the basket
4. Selecting the suggested alternative
5. Checking out from the basket
6. Giving feedback on the substituted product
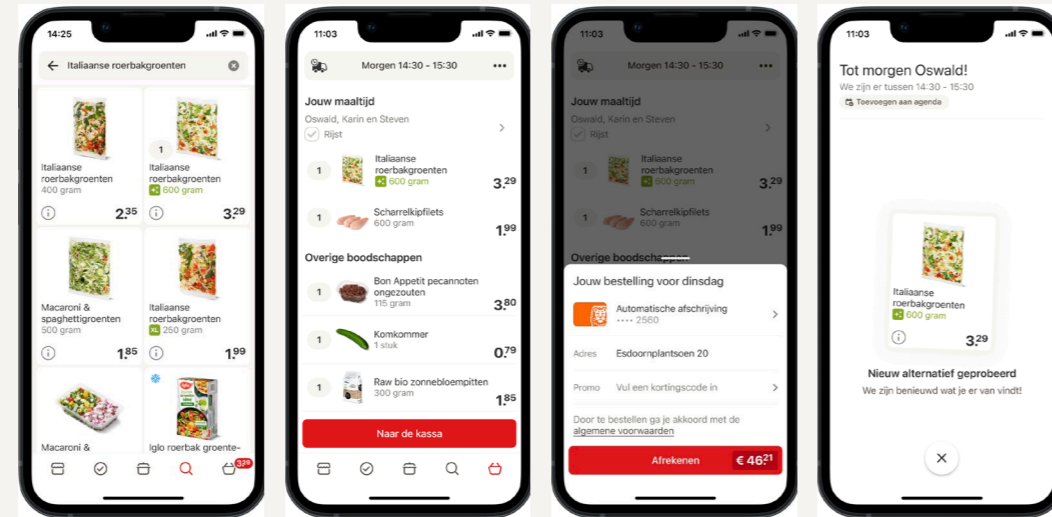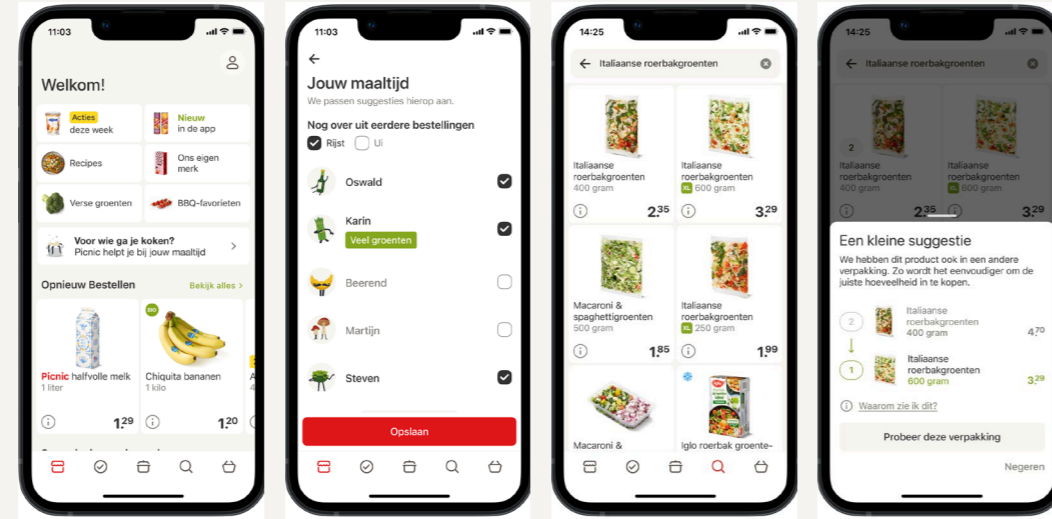
Click or scan to view

7.3 Results

After obtaining and analysing the recordings, the results of the concept test are broken down into the three interaction qualities, and the effectiveness in achieving the goal as formulated in the design statement. The responses to the statements that are referenced in this section can be found in Appendix E (p.96).

Safety net

An important prerequisite for feeling confident in being a good provider is to feel safe. The concept aims to achieve this by showing that the suggested substitutes take into account the family members and their preferences.

Overall, participants were fond of seeing their family members in the meal settings. When I asked what these settings do, they all responded along the lines of helping them shop for a meal for the number of eaters, as this was communicated on the banner. It was not clear, however, how they were helped. Later, when the substitute was suggested, most of them started to understand that the family members are taken into account. According to the responses on statement 8, three of the participants felt less afraid to buy less, whereas two of them did not change their minds. This indicates that the interaction can help consumers feel safer to buy less.

One of the participants was initially unsure about the safety of the substitute due to a lactose allergy in her child. Once she understood that the service had taken her vegan preference into account when presenting the alternative, she felt reassured. This example shows the importance of communicating the safety net well alongside implementing it technically.

> 66 *Now that I understand the suggestion is vegan, I know that I can take it without any problem for my child.*

Furthermore, the reflection prompt seemed to contribute to a sense of safety through reliability, as the participants understood that it helped suggestions become more personalised and accurate over time.

Discovering new things

Users should be encouraged to try alternatives to adopt more sustainable shopping behaviour. The concept aims to do this by suggesting a product variation that still meets the needs for the dinner.

Some participants discovered a new product variation. This was the case with the 600g Italian mixed vegetables and the frozen grilled vegetables. Although the other substitutes were familiar, participants discovered that these were the more economical choice when they realised that they could not finish the larger value pack anyway.

> 66 *While grated cheese can easily be used later, we tend to throw crème fraîche away if there is any left over. So in this case I would now go for the smaller size, even though the price difference is small.*

It was also interesting to note that participants, even those who rejected the suggested substitutes, appreciated the brief moment of reflection to think twice about the need to buy the larger value pack for their dinner. In many cases, something as simple as displaying the different prices side by side was enough to convince them to buy the smaller and slightly cheaper option.

> 66 *It helps me better assess what I need, mainly by making me think about it.*

> 66 *Usually I just quickly hop through the supermarket, but this makes me reconsider the item. And besides minimising waste it saves some money and limits the space in the fridge that it takes up.*

Learning by doing

There should take place a learning process over time with incremental improvements. In the concept, I wanted to implement this learning process by reflecting on the suggested substitutes after preparing and consuming the dinner.

In the absence of a long-term test setup, participants had to project their learning process. The responses to statement 3 show a slight increase in the perceived ability to learn to buy less. Participants gave different reasons for their learning. For some it was a growing awareness, for others it was the repetition of trying substitutions.

66 *The app helps me to learn how to buy less. I am more aware now of what happens to products that are too large for my meal.*

66 *We've just seen that I added the smaller variation, so step by step I think I'd learn how to buy less.*

A more significant result is found in the responses to statement 1, which show a clear improvement in the perceived competence to cater for enough. Participants felt better able to make the right choices, because they are now comparing the costs for this meal and not just the price per volume.

66 *I think the app helps me to make good choices while shopping for groceries.*

66 *These popups let me compare products such as frozen variations that may not be next to each other in the isle or here in the search results.*

It is difficult to draw results on the reflection prompt as a driver for learning. One participant mentioned that the interaction of giving feedback helps to break some habits. It was clearer to participants how this reflection made the service more reliable over time, giving them a sense of trust in this service.

66 *By giving feedback, I feel encouraged to break my initial habit of going for the larger size.*

Confidence

The responses to statement 2 did not show any increase or decline in the perception of being a good provider. These were high before and after the test.

The effect of the design on *confidence in being a good provider while buying less* can be assessed by looking at the responses to statements 8 and 9. Both show a decrease, which means that there was less fear of not having enough and coming short as a provider when they were buying less in the test. For one of the participants, it was the autonomy to make his own choices that ensured he remained confident in caring for his partner.

66 *I'm still in charge of what I buy, so it doesn't make me feel less confident in being a good provider.*

There was also an increase in responses to statement 10, which means that making better choices contributes to setting the right example for children, which is listed as one of the themes of being a good provider in section 4.2 (p.35).

66 *Because I am more conscious of food waste when using this app, I think it helps me set the right example to my child.*

Reducing overprovisioning

Ultimately, the goal of the design is to reduce overprovisioning in the short-term, but more importantly in the long term. The short term effect is measured by the number of substitutes accepted in the test. Of the 8 suggested items, 4 were accepted and 4 were rejected, as displayed in Figure 23.

Although all participants said they would be willing to switch to a smaller alternative if the price or substitute was right, some kept the larger size because the price difference was too small and they were confident they would finish the product later anyway. Acceptance was also highly dependent on the product. If they had a short shelf life or there was a significant price difference, they were more often swapped for the alternative. For products that were only slightly more expensive, participants preferred to keep the original. This confirms the strength of financial concerns in decision-making.

66 *I get twice the amount for only 10 cents extra, so I would still go for the larger size. I am quite certain my girlfriend will use the leftover in a salad.*

66 *Whether I take the alternative depends on the price difference. Now it was just 40 cents more for double the size.*

ACCEPTED SUBSTITUTES

○	Italiaanse roerbakgroenten 2x 400 gram	4,70	✓	Italiaanse roerbakgroenten 600 gram	3,29
○	Ijsbergsla 1 krop	1,15	✓	Ijsbergsla 200 gram	1,00
○	Crème fraîche 200 gram	1,79	✓	Crème fraîche 125 gram	1,59
○	Oosterse wokgroenten 2x 400 gram	5,98	✓	Bonduelle gegrilde groenten (diepvries) 2x 400 gram	5,62

RETAINED ORIGINAL ITEMS

✓	Ijsbergsla 200 gram	1,00	○	Ijsbergsla fijn 100 gram	0,89
✓	Geraspte pittige kaas 250 gram	3,49	○	Bio geraspte kaas mild 48+ 150 gram	3,39
✓	Spinazie gewassen 400 gram	1,99	○	Spinazie gewassen 200 gram	1,59
✓	Oosterse wokgroenten 400 gram	1,59	○	Tofublokjes 200 gram	2,21

Figure 23 Overview of the substitutes that were adopted and rejected

In addition to substituting large quantities of food, the virtual pantry can help reduce overprovisioning by using leftovers. It was useful as a reminder to consider their use.

66 My husband doesn't write down what we have in the pantry when he does the groceries. So this virtual pantry would remind him of what we have at home.

66 I usually already have a meal in mind and it is more of a coincidence if I can fit leftover products into it. Now I consciously think of a meal that I can use the leftovers for.

Furthermore, the responses to statement 1 show that participants felt significantly more competent to buy exactly enough for their family dinner after using the prototype. The mentioned reason was mainly that it enabled them to make better choices, by taking a brief moment to compare two products.

66 This service helps me to make good choices when I'm shopping for groceries. I think it would be a nice addition to any supermarket.

Additional needs & ideas

I asked the participants what could make this service better suited to them. Some unfulfilled needs had already been identified during the conversation.

Dynamic recipes

One of the participants mentioned that he would like to have recipes that were more in line with his meal goals.

66 I like using recipes but they are very inconsistent. They can be made for small eaters or big eaters, or meant as a starter. I would like to have recipes that were more dynamic.

Clarity about the purpose of the service

This participant also mentioned that he missed a little introduction as to why this service exists. This would have helped him to make more informed choices.

66 It would definitely be helpful to know why this service exists. That the goal is to reduce food waste.

Diet exclusions

One quote from a participant stresses the importance of diet restrictions for certain consumers. This would help them in feeling safe to try substitutes.

66 Because my child is allergic to lactose, and they sometimes put stuff like whey in products, I usually go for standard products or check the back of the product.

Control over suggestions

In this concept, users would have to ignore the service as a whole if they do not wish to be helped with suggestions. One participant indirectly suggested the idea of still being able to help users who do not want to receive suggestions, for example by helping with leftovers or recipes.

66 It is a service, so if people do not want to be helped with it that should be fine.

7.4 Discussion

Test limitations

A number of limitations to this test should be considered when interpreting the results.

Knowledge bias

The participants already knew that the chosen meal was too much for their situation. This knowledge may have influenced their decisions positively or negatively. Therefore, the amount of adopted substitutes does not say much about the effectiveness of the design.

Available time

Due to the lack of time to perform a long-term study to assess behaviour change in any way, I had to rely on subjective projections into the future, making it difficult to make conclusions about behaviour change.

Participants

The people who participated may have influenced the results in one way or another. They were selected from my network and therefore do not represent the diversity of online grocery shoppers and family providers. For example, four of the participants were in their twenties and three had children. A larger group of participants would likely have provided more diverse insights.

Discussion

Overall, the results show that the intervention encourages consumers to buy less while they are confident that they are a good provider. It seems that all three interaction qualities mediate this outcome. The safety net, for example, is experienced because the suggested substitute is directly related to the meal settings. The reflection after the dinner seems to contribute to the reliability of the service. Furthermore, users seem to discover how easy it can be to reduce excessive purchases, because they have a moment to reconsider their original choice. And in terms of a learning experience, users seem to enjoy seeing a gradual improvement in their product choices over time.

The test also identified a number of improvements that could be addressed in a final design iteration. Firstly, it should be clearer how the meal settings cause the suggested substitutes to appear, so users can connect it to their family needs. Secondly, the integration of recipes would empower users to more easily put a good meal on the table without buying too much. A second benefit is that well-tailored recipes can serve as an example of how to provide without waste, contributing to the learning process. In addition, the service could offer a more complete and flexible user experience in general, so users are better supported in their main goals when shopping for meals.

Conclusion

Through testing, I learned that the impact of the concept is much more about creating the right environment for behaviour change to occur, than it is about forcing it. The focus of the designed service should therefore be to support family providers to make better choices when buying groceries, as consumers will always make their own considerations based on price, taste and preference. The final design should perhaps focus less on individual substitutions and more on ensuring that consumers can put together good waste-free meals.

8 Final design proposal

8.1 Summary

The final design is a service that helps family providers to put meals on the table that are appropriate quantities of food without compromising their desire to provide well. This service offers a shopping experience that is in line with the goals that consumers have when putting together meals for their households. It should be seen as an extra layer dedicated to planning meals, that complements the existing shopping experience which is more or less limited to the purchase of individual ingredients.

The interaction is designed to help consumers build confidence in their ability to reduce food waste through a design that is aimed to be experienced as safe, a discovery, and a hands-on learning process. It achieves this by being reliable, spontaneous and intuitive.

Although the design is tailored to Picnic, it would look and behave similarly in the platforms of other supermarkets such as Albert Heijn and Jumbo. It can also be used by consumers who use online grocery apps as a shopping list before they physically visit a supermarket.

8.2 User stories

User stories describe design features from the users' perspective, so that it becomes clear how they provide value to them (Rehkopf, n.d.). Because these features can be accessed from multiple contexts, most stories are broken up into sub-sentences (indicated by '...').

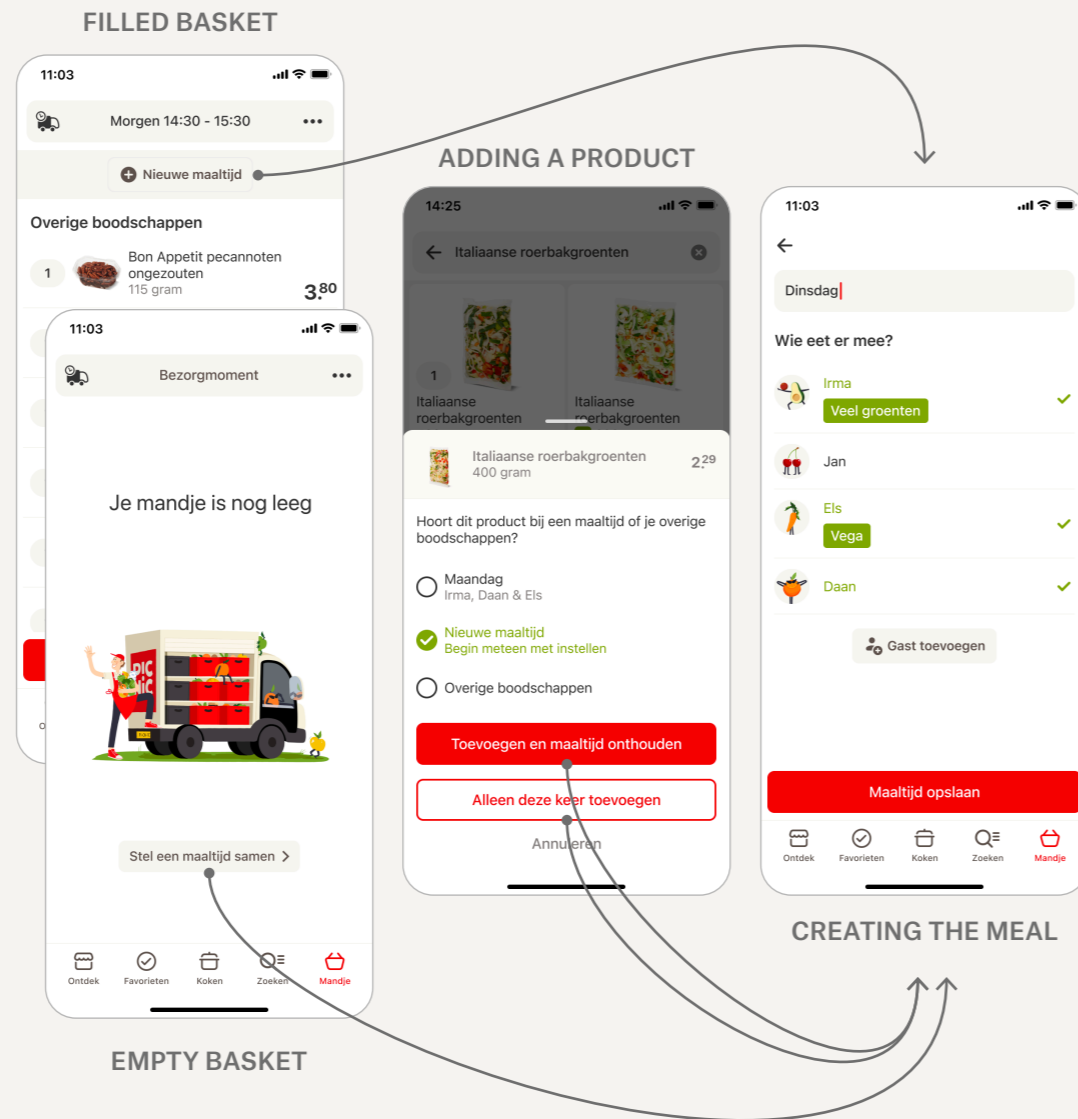## 1. As a family provider, I want to create a new meal...

Users can create meals to give them a better overview of how much they are serving their family for a particular dinner. The set-up begins with naming the meal and selecting the household members who will be attending.

...from the shopping basket

Users can create new meals from the basket, as this is the central place to have an overview of all their meals.

...when adding a product

In the bottom sheet that appears to assign the item to a meal, the user can select the option 'new meal', which subsequently opens its setup.

FILLED BASKET

ADDING A PRODUCT

EMPTY BASKET

CREATING THE MEAL

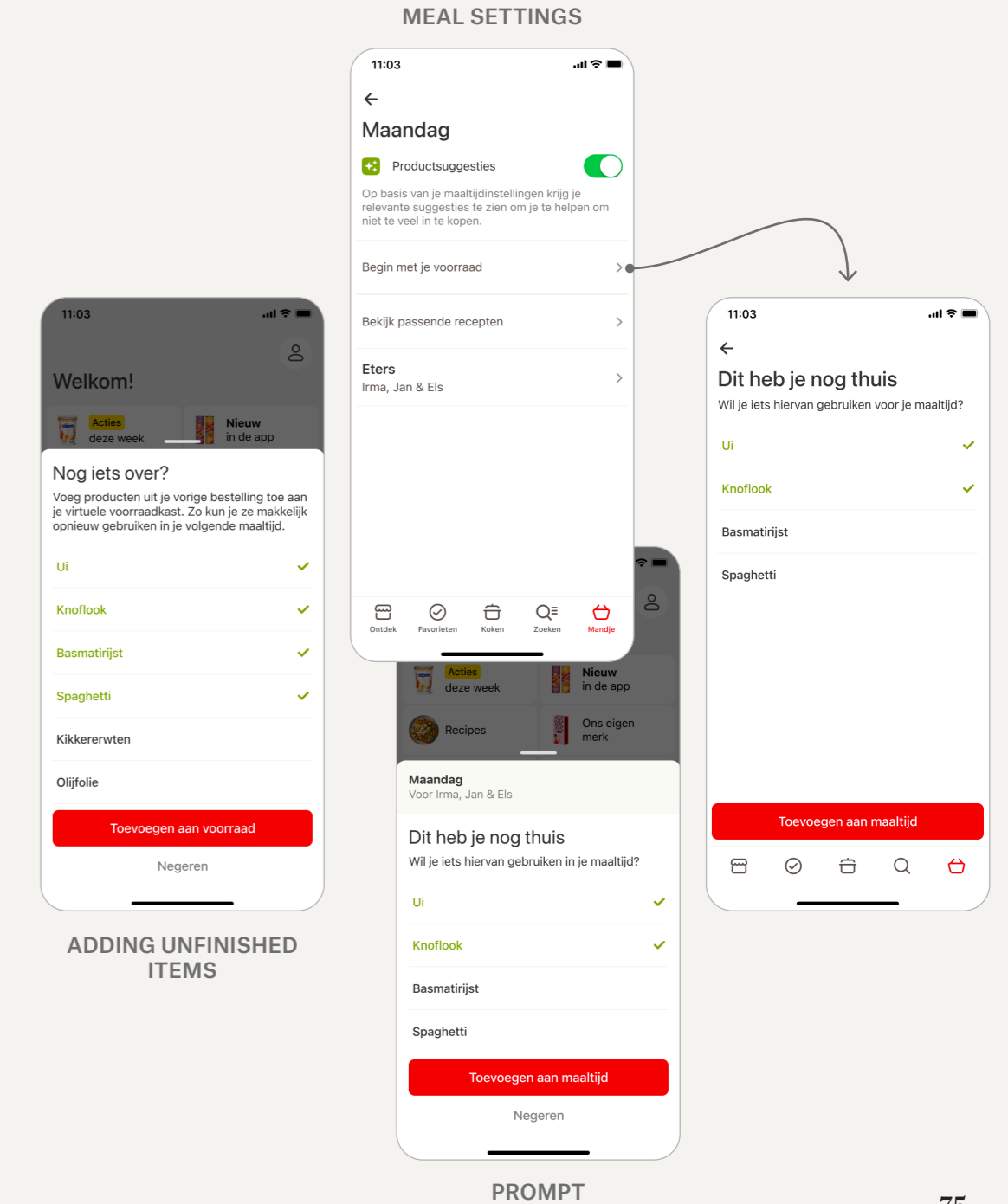## 2. As a family provider, I want to be reminded to use leftovers in the meal...

The user is encouraged to use leftover products in a meal that was set up. For this to work, a prompt will appear a few days after delivery that asks the user to add unfinished items to a list of leftovers that can be used in meals.

...from the meal settings

The meal settings include a section that encourages the user to add leftovers to the meal.

...with a prompt

If the user has not yet looked at the list of leftovers from the meal settings, a prompt will appear as soon as the first item is added to the meal.

MEAL SETTINGS

ADDING UNFINISHED ITEMS

PROMPT

3. As a family provider, I want to be inspired by recipes that are relevant to my dinner...

Users can plan their meals around recipes by intelligently making use of the meal settings. This means that you see recipes that are relevant for the amount of food you need, the preferences of the members who are joining, the products you already have in your basket and any leftovers that you have selected.

...from the meal settings

The meal settings have a section that takes you directly to the recipes with the meal as a filter already applied.

...by filtering manually

Another way to filter relevant recipes is to tap the filter with the name of the dinner on the recipes page.

RECIPES PAGE (UNFILTERED)

RECIPES PAGE (FILTERED)

RECIPE

MEAL SETTINGS
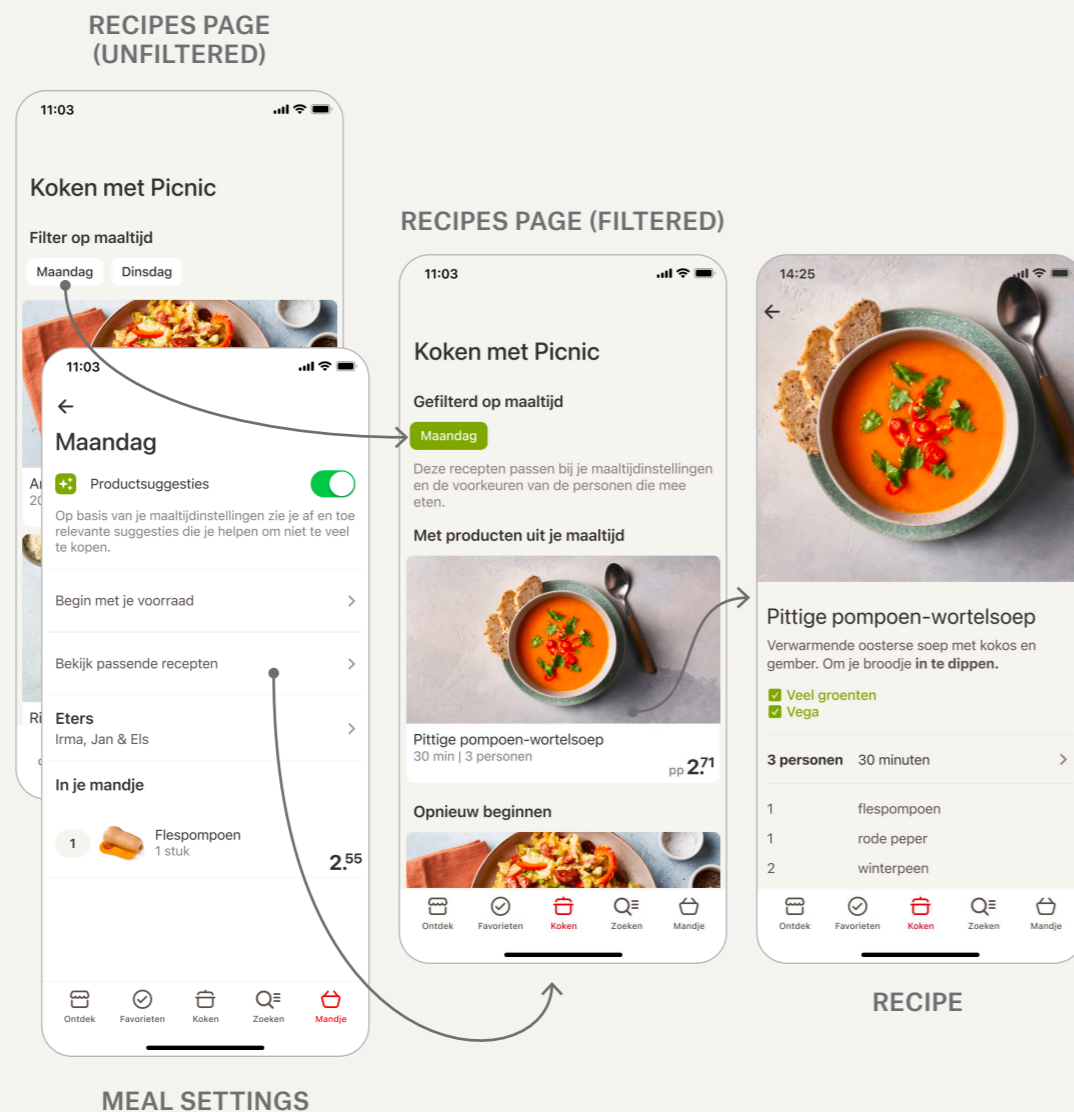
4. As a family provider, I want to assign products and recipes to my meals...

Users can assign products to one of their meals. Not only is this required to receive relevant suggestions, but it also aids meal planning by providing overview and insight.

...when adding a product to my basket

A prompt will appear asking where you want to assign the product to. This can be either an existing meal, a new meal (see story 1), or no meal.

...when adding a recipe to my basket

Similarly, recipes can be added to a meal by tapping an 'Add all' button on the recipe.

...by going into a meal mode

Because it would be cumbersome to do this for each item separately, you can choose to remember the selected meal for items you add later. This changes the basket tab on the bottom right into a 'meal mode' indicator, showing the name of the selected meal. Tapping this indicator opens a menu from which you can select a different meal or deactivate this mode.

MEAL MODE INDICATOR

ADD PRODUCT

ADD RECIPE

MEAL MODE MENU

ITEMS IN MEAL
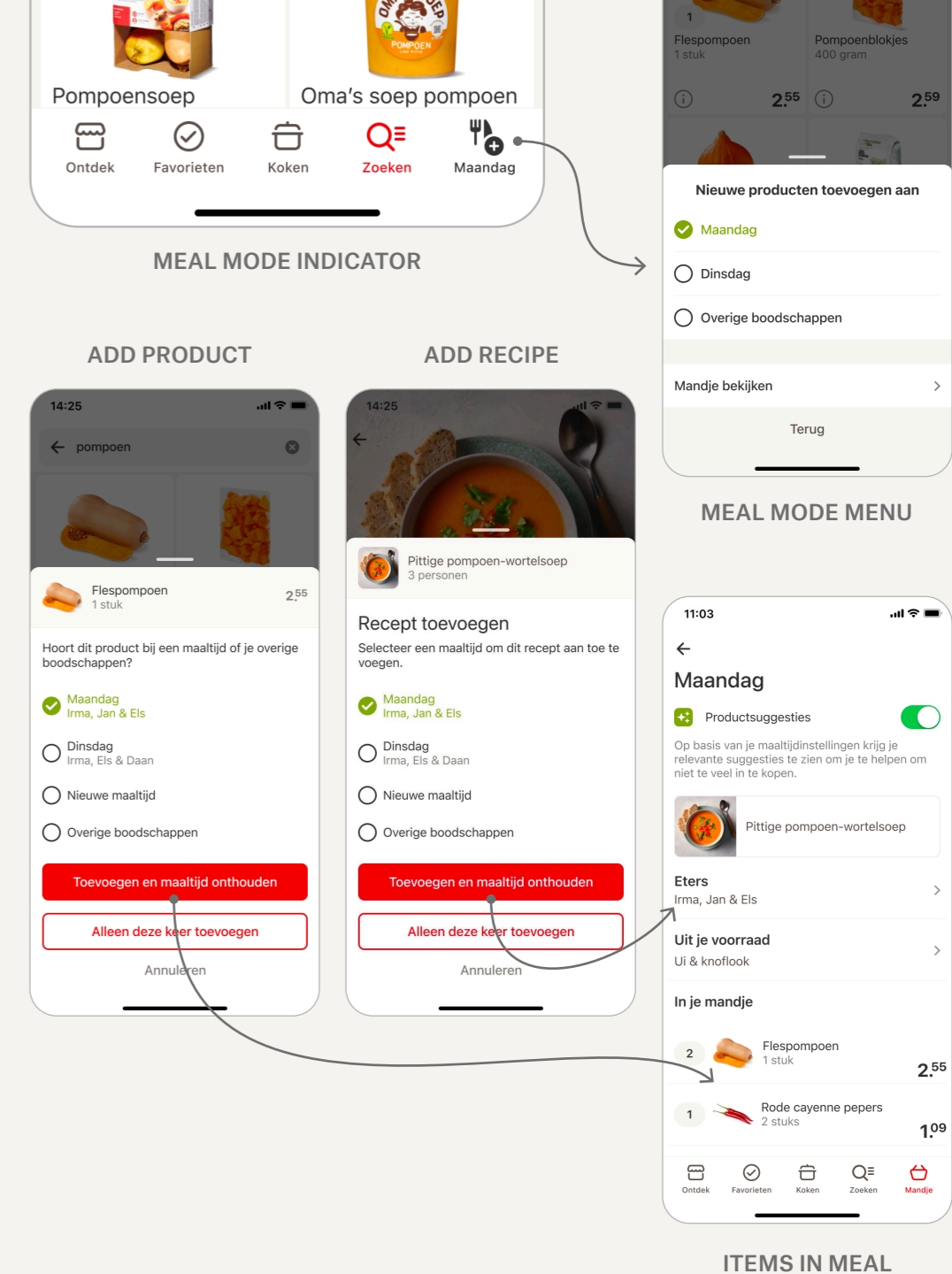
5. As a family provider, I want to know when I am likely to buy too much and see a more suitable alternative...

If product suggestions are enabled in the meal setting (which is enabled by default) users will occasionally be shown substitutes when overprovisioning is likely. Substitutes are provided in terms of product quantity, packaging size and shelf life respectively.

...when adding a product to my basket

In the meal mode, a bottom sheet appears when the item is likely too much for the dinner and a more suitable alternative is available. This allows the user to compare the quantity and price of the selected item with a substitute.

...when visiting the basket

In other cases, overprovisioning is not the result of a single ingredient, but the sum of several items. In this situation, the user is presented with the option to optimise the meal. This involves suggesting one or more substitutes at the same time.

SUBSTITUTED PRODUCT

OPTIMISED MEAL

UNDO

ADD PRODUCT

VISIT BASKET
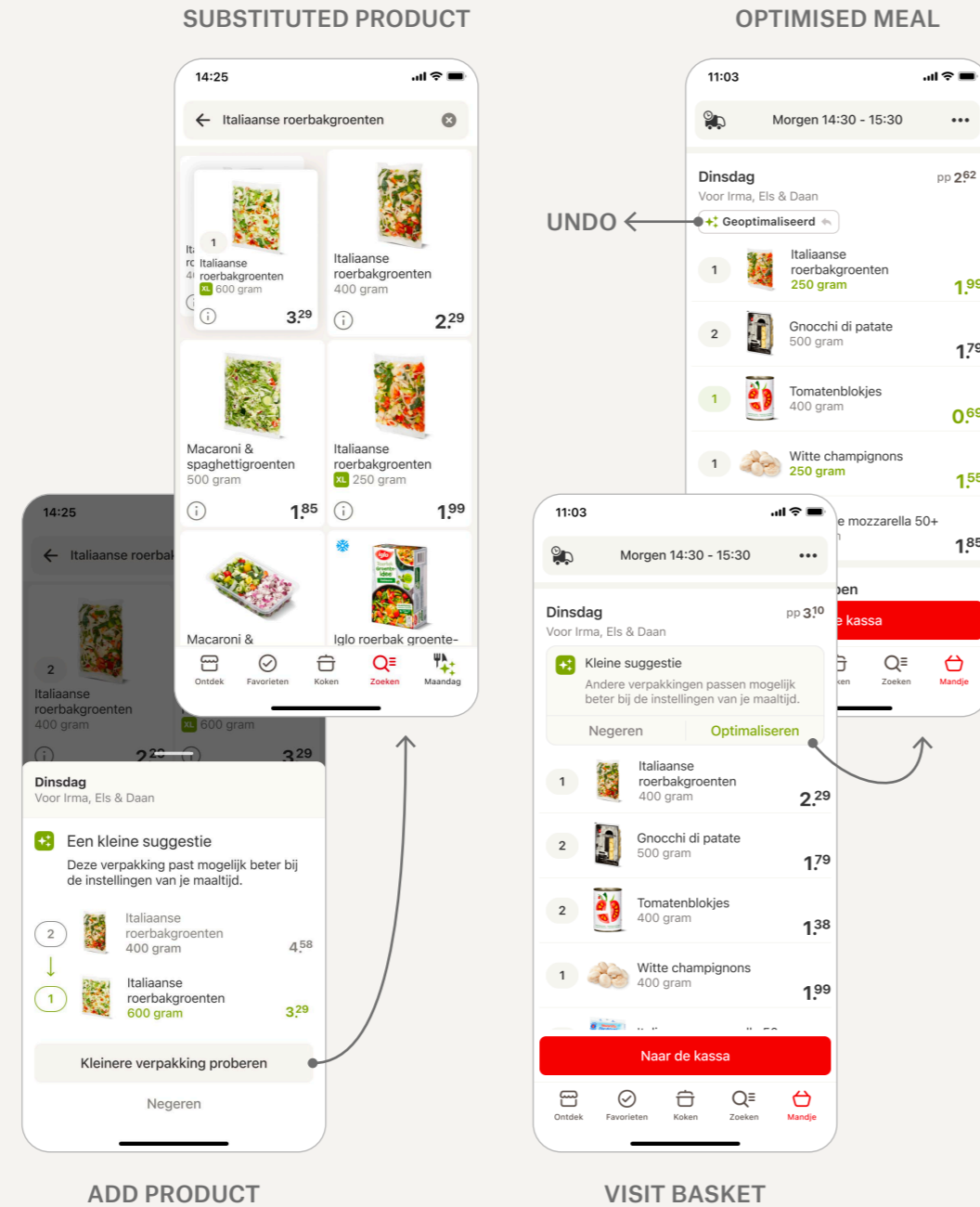
6. As a family provider, I want to take into account the individual needs of my family members

Member profiles can be managed from the 'your home' settings. Here, the user can add new members, delete members, and most importantly set up their needs and diet restrictions.

The member pages contain four sections. At the top, the name and avatar can be changed. Below that, the portion size can be adjusted from standard to (extra) small for children and small eaters, or to (extra) large for big eaters. The following two sections contain diet preferences, such as vegetarian or dairy-free, and allergies.

YOUR HOME

NEEDS (ADULT)

NEEDS (CHILD)
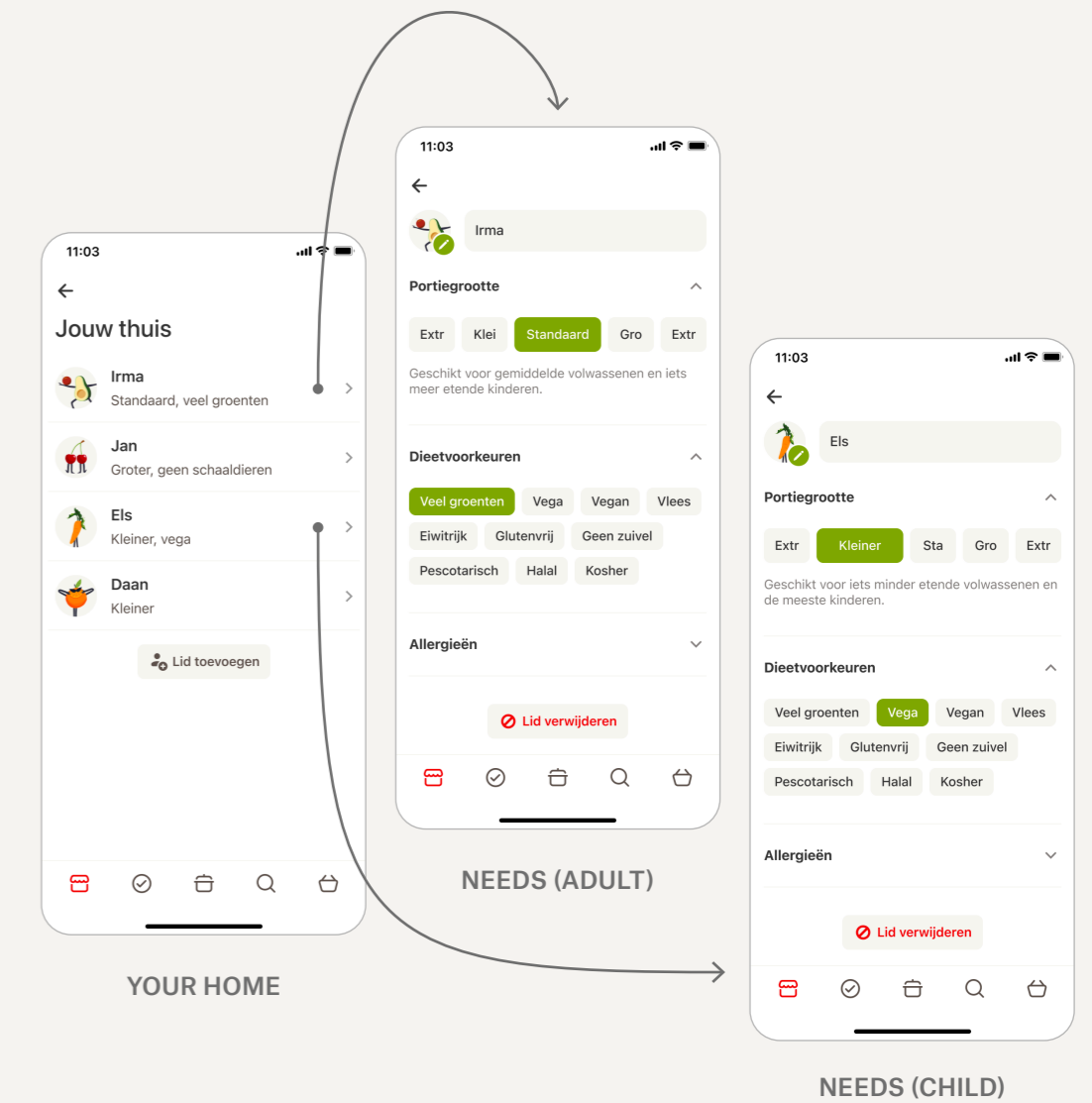
7. As a family provider, I want to learn over time how I can minimise excessive shopping

A few days after delivery, a prompt will appear allowing the user to reflect on the amount of the meal and the suitability of the substitute. While the main purpose of the prompt is to encourage learning how to buy more appropriately, it also improves the service by becoming more personally relevant over time.

Feedback can be given on any meal that was part of the order. This will make the portion sizes for the family more nuanced. Feedback on meals marked with the substitute icon will in addition adjust the algorithm that proposes substitutes. Feedback on the substitute itself will make these more relevant in the future, for example by showing fewer frozen products.

FEEDBACK ON MEAL & SUBSTITUTE

REFLECTION PROMPT
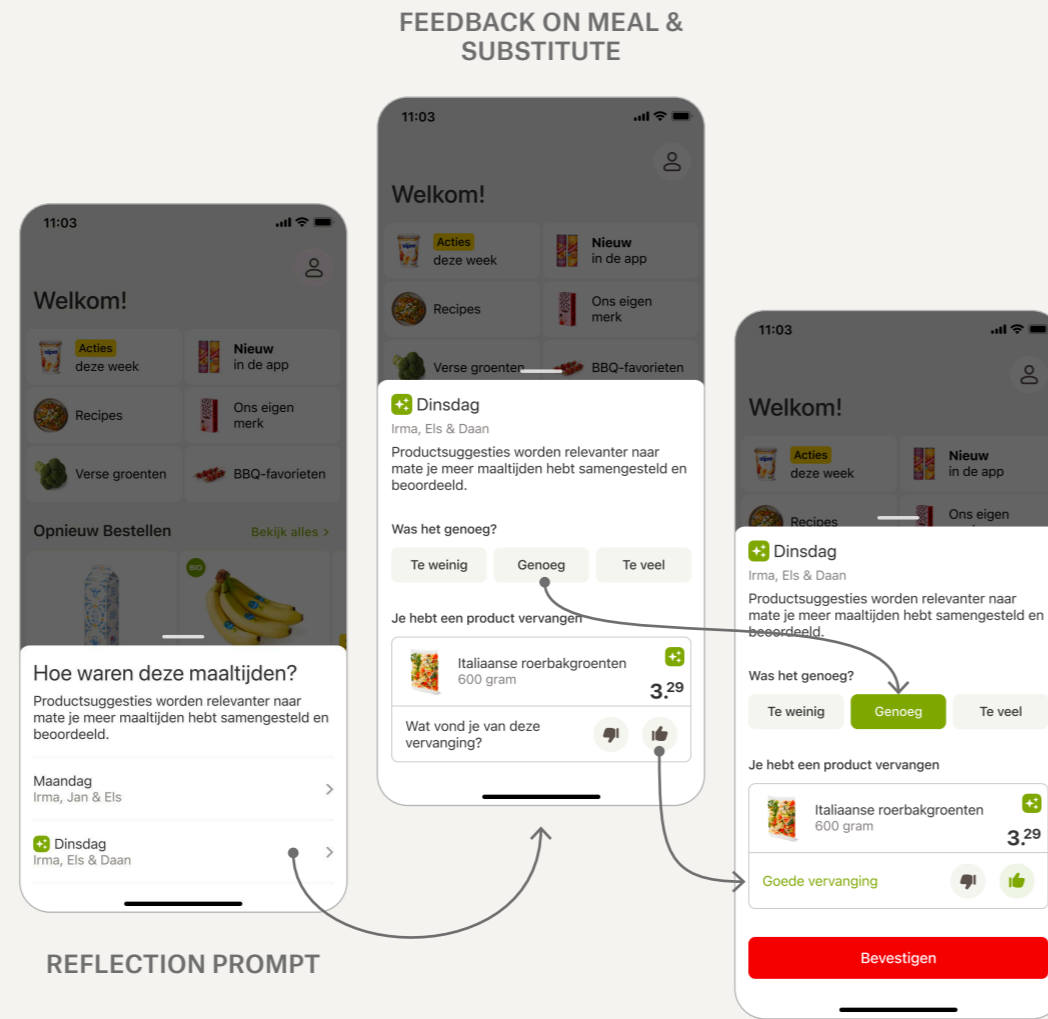
8.3 Implementation

The concept is designed for online supermarket apps, which are already packed with content and differ from each other. Nevertheless, this design can be integrated into any online supermarket, as it is based on common elements such as a shopping basket and a page dedicated to recipes (as described in section 3.3 (p.24)).

For Picnic

Although the design is tailored to the Picnic app, it is still at a conceptual stage. The implementation of such a concept would normally be done in phases, so that the value of each element can be tested. It is conceivable that Picnic could start by showing relevant recipes based on dinner preferences. Only when the building blocks are implemented does it make sense to start suggesting substitutes to the user.

For other supermarkets

Implementing it in other supermarkets means a few adjustments need to be made. Obviously, the look and feel should match the platform by using its standard elements, formats and brand colours. A quick design sketch of what product substitutes could look like if it was applied to Albert Heijn is shown in Figure 23. Furthermore, the interactions may differ from platform to platform. For example, Albert Heijn already has a feature to match recipe ingredients to the quantity of eaters, and this would benefit from the more specified meal settings in this design.

Role of the supermarket

An unanswered question might be why an online supermarket would implement a service that helps consumers buy less. Although it is not the scope of this project to deliver benefits to the supermarket, it is an important stakeholder. Online supermarkets are generally interested in improving their service to customers. As the online store lacks a physical touchpoint, service makes the interaction more human. Good service can therefore attract and retain customers. The services currently offered are designed to help individual consumers, e.g. by providing a collection of recipes or helping with lifestyle choices. Yet there is no service dedicated to being a good provider. By implementing this concept, online supermarkets would be offering a service that addresses one of the biggest concerns people have when doing groceries. Supermarkets should take on this role of providing this service without giving the impression that it is for its own gain.
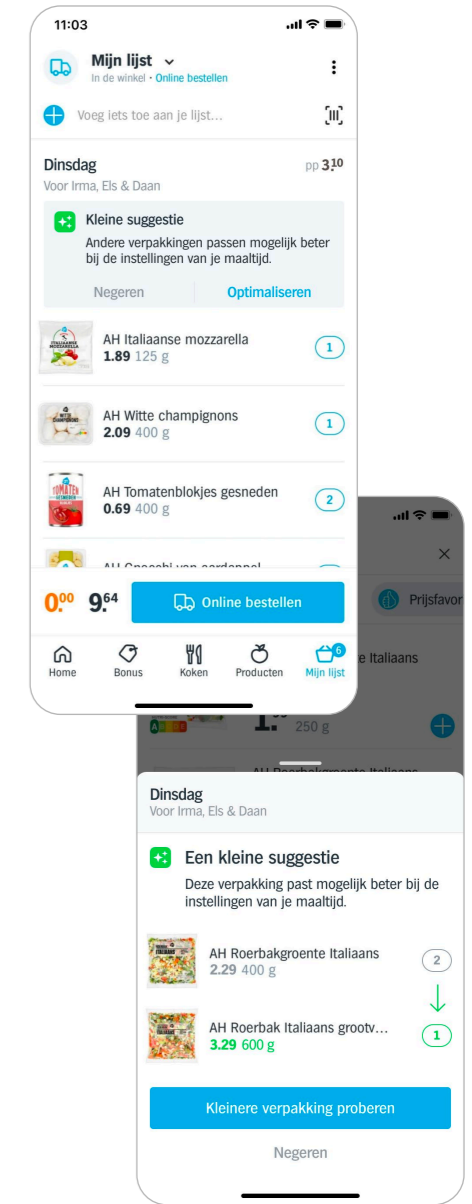
Figure 23 Product suggestions (user story 5) if they were applied to the Albert Heijn platform

9 Conclusion

9.1 Evaluation

At the start of the project, I formulated the following research question:

Research question

How can we design a digital intervention to help consumers reduce overprovisioning when they shop for groceries online?

In the research and design process that followed I tried to answer this question. First, I collected and analysed literature on behaviour change and household food waste. With this knowledge, I envisioned that in order to help consumers reduce overprovisioning, they need to feel confident that they are a good provider while at the same time buying less. I then designed the intervention, which turned out to be promising in the concept testing. I do not claim to have designed the only or the best intervention in combatting overprovisioning, but given the research question that was not the purpose of the project either. Nevertheless, I considered many alternatives and variations before arriving at this design. In the following paragraphs, I reflect on the impact of this design on behaviour change and evaluate its desirability, feasibility and viability.

Behaviour change

As described in section 1.3 (p.10), behaviour change mediates the societal impact that the interaction can have. This means that changing behaviour from overprovisioning to buying enough could significantly reduce household food waste. As described in section 2.2 (p.16), consumers will change their behaviour if their goal to reduce waste is aligned with their other hedonic, gain and normative goals.

Hedonic goals

The design aims to make it as easy as possible for consumers to reduce overprovisioning, by supporting them in planning their meals with appropriate amounts of food. Because of this, their hedonic goals to avoid effort and time are not as much in conflict with their goal to waste less.

Gain goals

In the current shopping journey, consumers are not confronted with the consequences of overprovisioning on their wallets. The substitutions, however, make consumers aware of what they can save, which strengthens their goal to save money on groceries.

Normative goals

Consumers feel a strong moral obligation to provide well for their families, and this makes reducing waste a lower priority. The design aligns these norms by supporting meal planning for family dinners, which helps consumers both in being a good provider and buying appropriately. Second, the design aims to take away insecurities that stand in the way of reducing waste.

Desirability, feasibility & viability

Equally as important as designing an intervention that has the intended effect, was to design something that is desirable for online grocery shoppers, feasible in the given context, and viable for online supermarkets.

Desirability

Consumers must be willing to use this service because participation is voluntary and the intervention is only effective if the user is invested in it. The design therefore addresses desirability in several ways. Firstly, it avoids negative confrontations about behaviour and instead provides opportunities for consumers to reduce waste. Second, the design helps consumers feel good about their ability to provide well and reduce waste at the same time. Third, it gives users control over how they use the service. For some this is finding suitable recipes and for others it is receiving product suggestions. Participants in the concept test were enthusiastic and said that they would like to have such a service in their shopping routine.

Feasibility

To evaluate the feasibility of the design, we need to look at the supermarket that implements it and the user context. Starting with the supermarket, I have described in section 8.3 (p.81) how this concept should be applied to Picnic as well as to other supermarkets. The challenge, however, lies more in the algorithm that needs to be developed to suggest substitutes and improve its accuracy over time. Provided that supermarkets already use such algorithms, this seems feasible. Looking at the context of use, the design fits well into a usual shopping journey, as it carefully waits for the right moments to appear.

Viability

The remaining question is whether the design adds value in the rapidly changing environment that online grocery shopping is. As (online) supermarkets more and more take on the role of helping consumers make healthier and more sustainable choices, a service aimed at reducing food waste cannot be missed. As explained in section 8.3 (p.81), services like these are what differentiate supermarkets from their competitors.
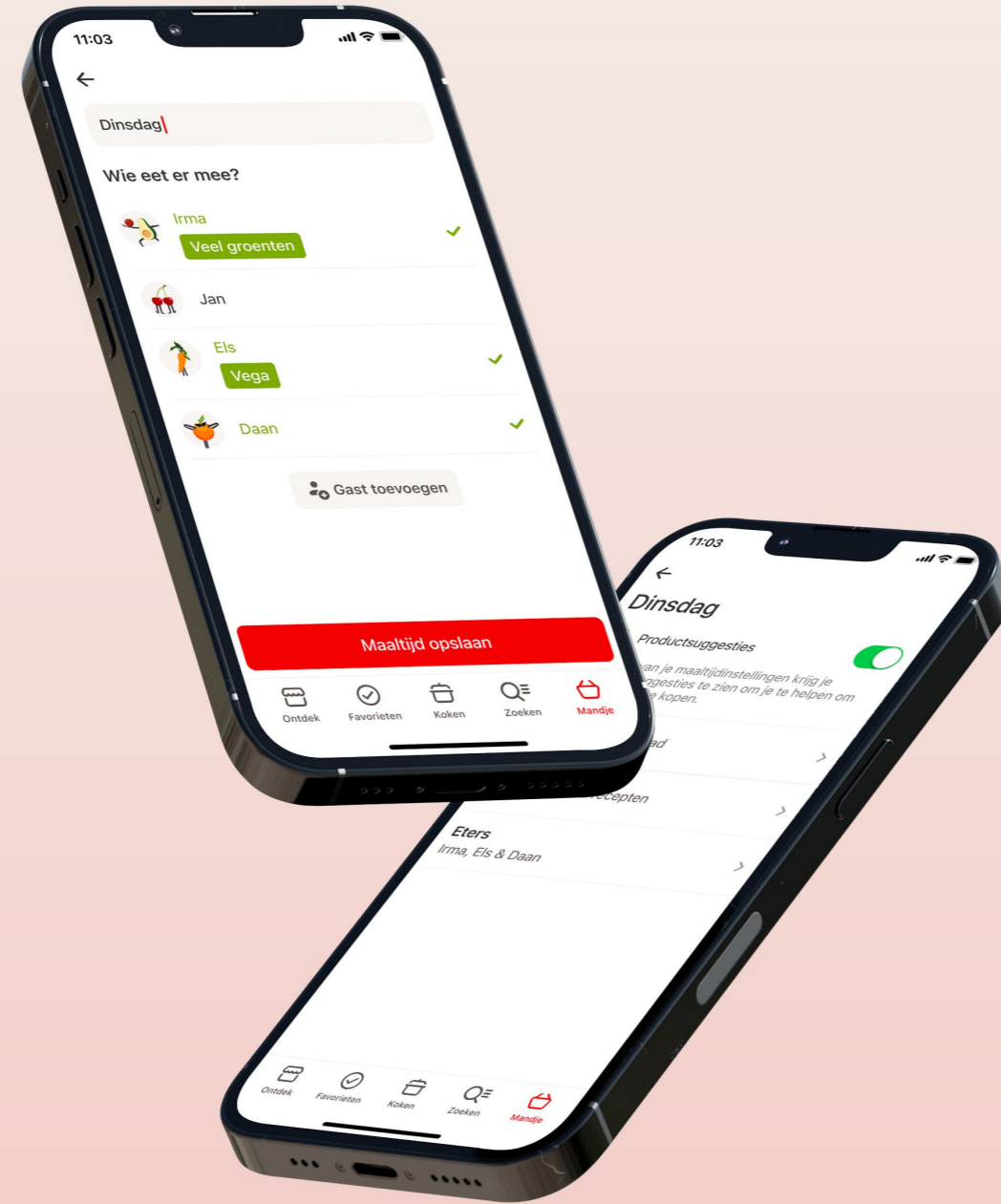
9.2 Project relevance

You might ask yourself how this project is relevant to you. I think that for every person that now and then buys groceries, this project might open eyes to how you can reduce waste. You do not need the designed service to make use of the same principles. For example, you could start with a recipe book for specific situations, by writing down the people who are eating and finding ingredients for meals that work great in those situations. If you are a designer or researcher, this project might be relevant for different reasons.

Relevance for designers

For a project that has a lot of research behind it, it can be difficult to be creative. At some point, you have to let go of what you know and explore the unknown. What helped me move from the literature to a design vision was to define a domain and cluster the literature as if it were context factors. As the findings in the literature are often too superficial to work with, this clustering helped me to create a more meaningful view of the domain. I believe this approach would help other designers, especially within Design for Interaction, to make sense of literature.

Relevance to science

As part of the Food & Eating Design Lab, this project explored a solution in the context of online grocery shopping to reduce household food waste. While current design research is about systemic change (Food & Eating Design Lab, n.d.), this project is a deep dive into the design of an intervention for family providers when shopping for groceries. The findings here are also directly relevant to Amber Werkman's research, as they provide opportunities to quantitatively test multiple interventions. A study based on some of the design is planned for the near future. In the wider field of research on household food waste, this project has explored opportunities for behaviour change. It may be worth investigating whether such an intervention can change behaviour in the long term, and what supermarkets can do to help consumers waste less.

9.3 Personal reflection

Over the past few years, I have explored numerous research and design methods, but this project has been about finding my own way of expressing myself as a designer. It has not been an easy journey, but building on the experience I had, including more specialised experience as a digital product designer, I was able to find a way forward. In doing so, I have learnt how to use my strengths and how to deal with my weaknesses. For example, I know (and have noticed during this project) that I tend to remain open to all possible directions, which makes it difficult to keep pace. In this project, I was forced to take a stand and design from persuasion. I realised that to convince others, I first need to believe in it myself. This meant that I had to make design decisions based on what I was convinced of, not what would appeal to others.

This project also helped me better understand what type of designer I am and how I want to continue after graduating. In the relatively young landscape of digital design, I found it difficult to position myself and to understand how this master's will exactly help me in my professional career. However, I have realised that all the knowledge I have gathered in the past years is more valuable than hard skills. For me, being a good designer is not as much about sketching the fanciest products, but about strategic thinking to define interactions and services.

I am proud of what I accomplished in this project, especially the way I built on the research to develop a vision, and seeing this back in the design. I am also proud of the quality of the design in itself, which was only possible by spending an awful amount of time and effort simplifying complex interactions. Looking back on the process, there are a lot of things that I would have done differently. I wasted time by simply doing things even though I was lost. This resulted in quite some chapters being discarded because they were not in the scope of the thesis. I would advise anyone starting their project to stick to a simple plan based on a design method, so you know what you are aiming for. The method you use, whether it is ViP, SID, or something else, matters less than you might think, but it will give you structure in your process.

Overall, doing this graduation project has been challenging, sometimes tough, but also exciting and meaningful. At the very least it has impacted my own grocery shopping behaviour, as these substitutes are now living in my head.

I would like to close this thesis by thanking my supervisors, Rick and Hannah, who supported and encouraged me to be more open to creativity and intuition when I got stuck in the literature. And to Jenny and Amber from the University of Groningen who helped me get started with this project and who made this project meaningful by using a part of the design in their research. Thanks as well to Erica van Herpen for sharing a lot of knowledge on food waste and the FETE project, and Victor Smits from Hello Fresh for taking the time to talk. And thanks to everyone who took part in interviews and tests. And finally, thank you for reading this thesis.

Steven

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A. Context factors

1. Grocery shopping as an expression of identity

Cooking is more than routine housework, it is also a significant part of self presentation and identity formation (Bugge, 2003)

Parents describe the importance of purchasing a variety of foods perceived to be healthy and nourishing, even if it means food going to waste (Graham-Rowe et al., 2014)

Providing an abundance of food is not reserved exclusively for children but sometimes extends to feeding other family members such as partners (Graham-Rowe et al., 2014)

The domestic context makes it more difficult to make use of leftovers (Evans et al., 2011)

The provisioning of 'proper meals' is a means of practicing care and devotion towards significant others (Murcott, 1983; Charles & Kerr, 1988; Jackson, 2009 as cited in Evans et al., 2011)

2. Too many concerns to be concerned

Reducing household food waste is given a low priority by people (Graham-Rowe et al., 2014)

Throwing away food is an accepted social norm (Graham-Rowe et al., 2014)

Stockpiling is a means to free up time for other responsibilities or unplanned activities (Graham-Rowe et al., 2014)

When it comes to food waste, people are more motivated by saving money than protecting the environment (Hebrok & Boks, 2017)

"Environmental concerns rank behind other factors when it comes to reducing food-waste" (Schanes et al., 2018)

"Concern about food waste is a significant predictor of food waste reduction" (Principato et al., 2015 as cited in Schanes et al., 2018)

"Wasting food is considered as a waste of the time put into the provision and preparation of food" (Schanes et al., 2018)

"Financial concerns associated with the money that is lost when throwing away food are commonly mentioned as the main motivation for minimizing food waste" (Schanes et al., 2018)

Acting upon biospheric values makes people feel better about themselves, and supports hedonic goals (Steg et al., 2014)

"Food waste prevention is not easily prioritised over these other goals, as it is characterised by limited direct personal benefits, except for actingupon moral values" (Van Geffen et al., 2020)

"Interventions should enable people to handle food in such a way that they can prevent food waste while also acting upon their other valued goals, without the need to spend more resources." (Van Geffen et al., 2020)

Hedonic goals make pro-environmental behaviour appear less important (Lindenberg & Steg, 2007).

Generally, awareness of economic consequences (i.e. the costs of their foodwaste) is often more important and more prevalent than awareness of socialor environmental consequences (Van Geffen et al., 2020)

Appendix

3. Confidence as a driver for action

"People who feel more confident about their ability to plan accurately are more likely to perform behaviours that prevent food waste and waste less" (Van Geffen et al. 2017 as cited in Van Geffen et al., 2020).

"Consumers who trust in their ability to reduce their waste and consider reducing food waste under their control, are more likely to reduce food waste directly or at least have a higher intention to do so" (Schanes et al., 2018)

People strive to align their actions with their self-concept (Mazar et al., 2008)

Confidence in food management dissipates some of the fears of getting ill or giving oneself food poisoning (Graham-Rowe et al., 2014)

4. Depreciation of food

Disposing food happens after the five stages of planning, shopping, cooking, storing and managing leftovers (schanes et al., 2018), resulting in a disconnect between buying and wasting.

People postpone disposing products to the moment that they are spoilt (Hebrok & Boks, 2017)

Some people think about food as a renewable resource that has a minimal environmental impact when disposed (Graham-Rowe et al., 2014)

In western societies, many people are not sparing with food anymore due to the abundance of food for low prices, compared to generations that experienced scarcity (Hebrok & Boks, 2017; Aschemann-Witzel et al., 2015; Quested et al., 2013)

People are often led by their desires rather than the stock (Bakeret al., 2009)

Food waste is not felt in the wallet of the consumer (Van Herpen, Online interview)

5. Avoiding confrontations with our behaviour

People often let products on the edge of turning bad turn bad before disposing it (Evans, 2012)

People underestimate the amount of food they waste (Abeliotis et al. 2014, as cited in Van Geffen et al., 2020)

People have a need to be able to feel good about their behaviour (Mazar et al., 2008).

"Leftovers are often put in the fridge after the meal to postpone any uncomfortable feelings that may result from wasting it immediately" (Hebrok & Boks, 2017)
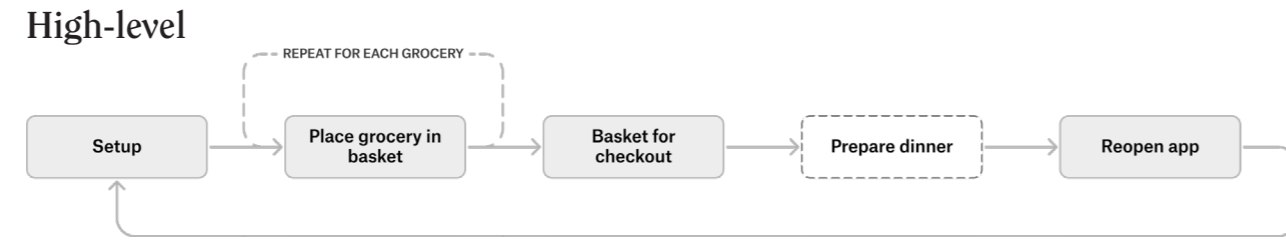
The provider identity supresses the positive effect of moral norms on the intention to reduce waste (Wang et al., 2021)
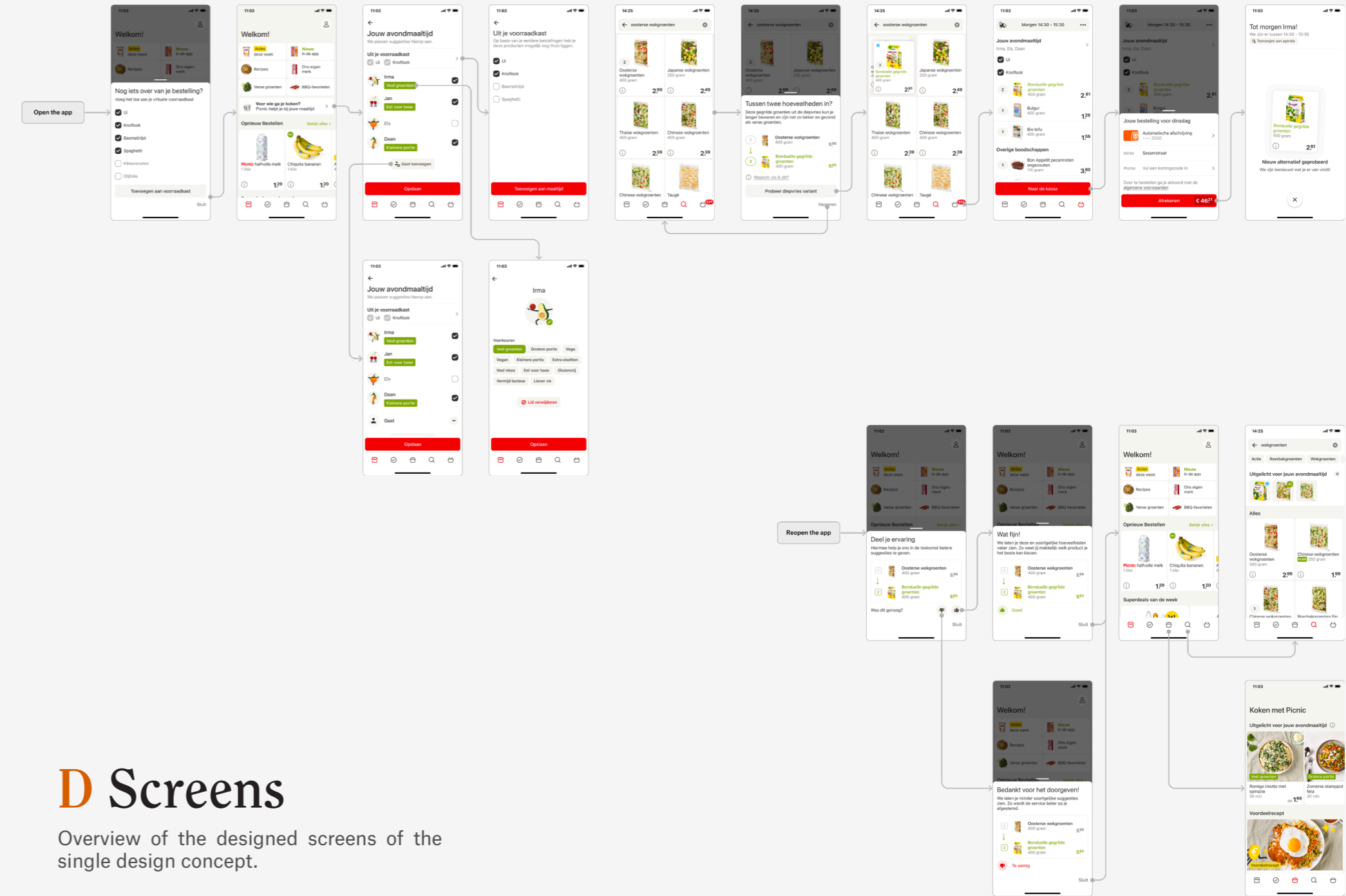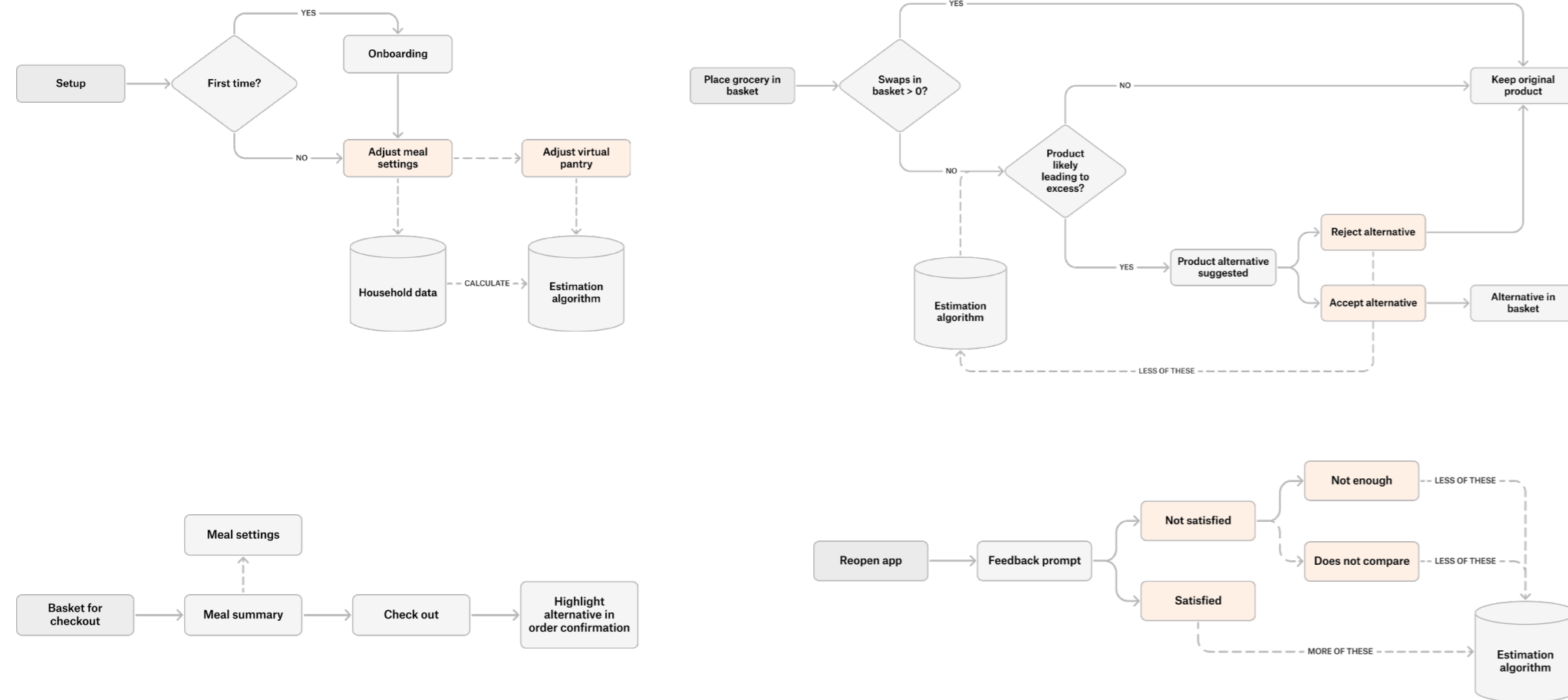
B Associative exploration
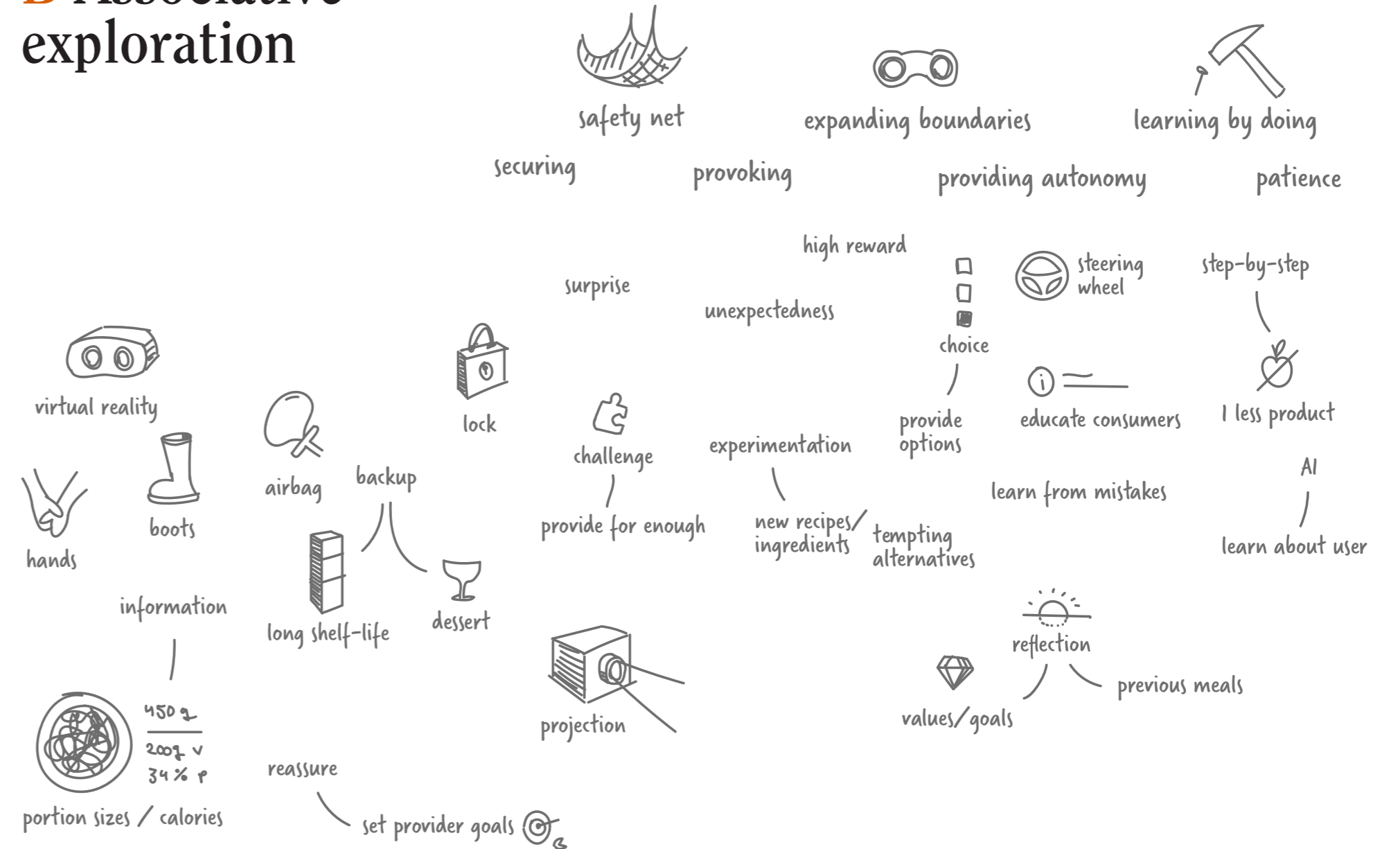
C Flowcharts

Technical specifications of the flow of the concept design.

High-level

Sub levels

D Screens

Overview of the designed screens of the single design concept.
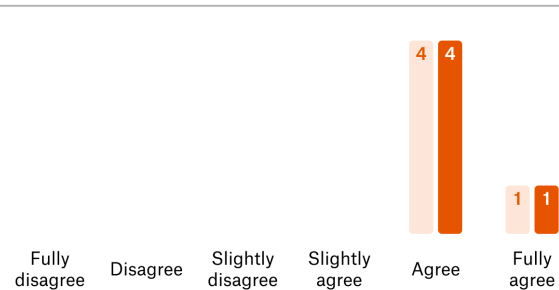
E Responses to statements

Quantitative data of responses to ten statements that were presented to the participants.

BEFORE THE TEST   **#** AFTER THE TEST

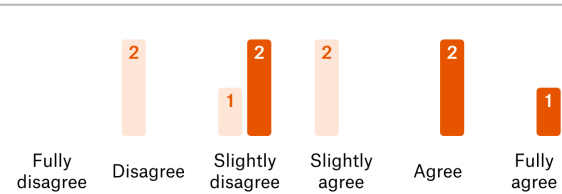## 1. I feel competent to buy exactly enough for a family dinner.

Fully disagree — Disagree (1) — Slightly disagree — Slightly agree (2 / 1) — Agree (2 / 2) — Fully agree (2)

2. I feel confident in being a good provider for my family.

Fully disagree — Disagree — Slightly disagree — Slightly agree — Agree (4 / 4) — Fully agree (1 / 1)

3. I feel like I am still learning how to reduce excessive purchasing.

Fully disagree — Disagree (2) — Slightly disagree — Slightly agree (1 / 1) — Agree (1 / 1) — Fully agree (1 / 2)

4. I find it easy to make the right choices regarding product quantities and sizes.

Fully disagree — Disagree (2) — Slightly disagree (1 / 2) — Slightly agree (2) — Agree (2) — Fully agree (1)

5. I am inclined to choose fresh products over frozen or long shelf life.

Fully disagree — Disagree (2) — Slightly disagree (1) — Slightly agree (2) — Agree (2 / 3) — Fully agree

6. When I buy too much, it is because of factors I cannot influence.

Fully disagree — Disagree — Slightly disagree (2 / 1) — Slightly agree (1) — Agree (2 / 4) — Fully agree

7. I think about the consequences of overprovisioning when shopping for ingredients.

Fully disagree — Disagree — Slightly disagree (2) — Slightly agree (2 / 2) — Agree — Fully agree (1 / 3)
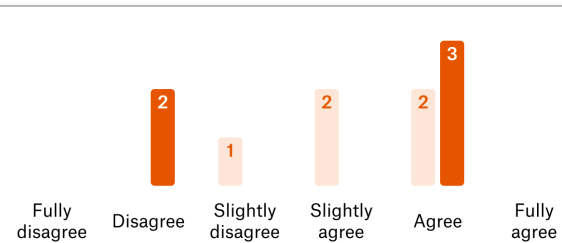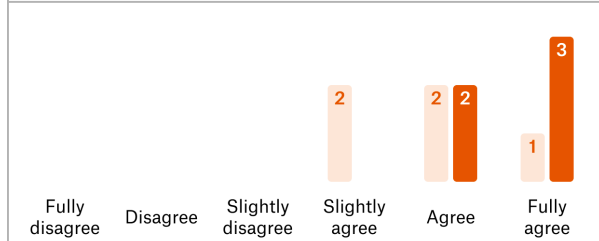
8. I am afraid to not have enough when buying less.

Fully disagree (1 / 1) — Disagree (2) — Slightly disagree — Slightly agree (1) — Agree (3 / 1) — Fully agree (1)

9. I am afraid to come short as a provider when buying less.

Fully disagree (1) — Disagree (1 / 3) — Slightly disagree (1) — Slightly agree (1) — Agree (2 / 1) — Fully agree
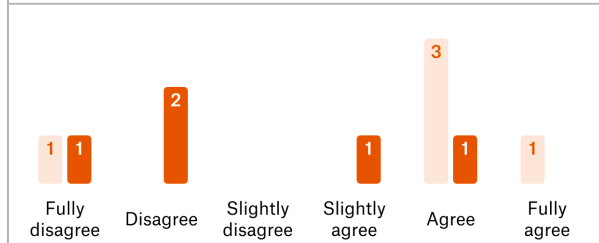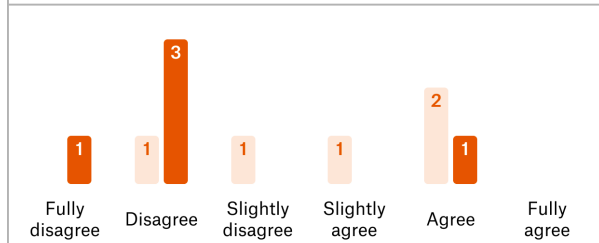
10. I find it easy to set the right example to my children regarding food and waste.

Fully disagree — Disagree — Slightly disagree (1) — Slightly agree — Agree (1 / 1) — Fully agree (1)

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