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Service Design in the Optimisation and Limitation of Food Waste in Single Households

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Abstract

There is a growing population of single households in Finland and the need for sustainable solutions to containing and managing food waste is of great concern. The latest census reports show that 44% of Finns live alone and this number has been on the rise. The environmental impact of foods wasted in production and consumption is one of the largest contributors to greenhouse gases that we are currently combating. As an economic and environmental drain, wasting food has a large global and local impact and the investigation into its causes and potential solutions is paramount. The single household proportionally generates the most food waste when compared to other cohabitants. This is due to a number of different factors, including packaging of ingredients, portion control, and menu fatigue (the lack of interest in cooking at home due to available dishes in a person's repertoire).

This paper looks to explore the reasons behind the generation of food waste and using service design techniques develop a service or product to help limit the food that is being wasted in single households in Finland. This process was conducted using a co-design method involving 14 students over a 7 week period that explored different service design tools to articulate and develop a service catered to curbing food waste. Food waste for the research was identified as being edible food products that were discarded as a result of production waste, spoilage, and plate waste.

These causes of food waste were investigated over the 7 week period by utilizing probes and research into food trends and production methods. From the findings it was concluded that the single household currently is not aware of the impact of their food waste, nor does the single producer have an understanding of the different causes of food waste in their production.

The solution for this was developed in the ideation where a service product was developed that allowed the single user of today to monitor their food impact as well as combat the production, spoilage, and plate waste via an application. This application would allow the user to monitor their environmental impact of wasted food as well as provide the user with regular inspiration for meals that utilize all ingredients in a weekly purchasing cycle in order to reduce spoilage and plate waste by considering portion size.

Key Words: Service Design, Food Waste, Single Household

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1   Introduction

As the population increases the need for monitoring and controlling food waste (FW) has never been more important. There are a number of different programs and incentives in place to counteract FW in industries and production. However, there is a lack of development in the private smaller scale, with insufficient knowledge and resources allocated to combating FW. As people are becoming savvier and more discerning with what they eat and how it is produced, there is a growing need for services and programs that specialize in educating and promoting the economical use of food products at home. As stated in the UNEP Food waste report for 2021 'If food waste and loss were a country, it would be the third largest contributor to greenhouse gasses truly prompting a need for reform and betterment."

There has been a boom over the past few years in the single household market in Finland resulting in a staggering 44% of the population living on their own (Yle 2019). This growing population has created a new demand in the food sector for single serve portioning that is underdeveloped. The population of single households tends to suffer the most in regard to diet and FW. As this is the case there is a growing demand for services garnered towards single households and a focus on limiting these wasteful practices.

As the current economic climate continues to develop, households comprising of single residents is forecasted to continue in the same trajectory. This further highlights the relevance of a service design approach to analyze and develop new possibilities to curb the impact of waste generated. As written in the Food and Agriculture Organization of the United Nations (2021), the impact of food waste attributes to approximately 10% of the annual global energy consumption, once more emphasizing the need to take a critical analysis of methods of food consumption and sources of waste, in order to develop new avenues to reduce this impact.

The issue, however, is of considerable scope. The cause and solution to food waste can be varied and the problem is an unstructured one (Närvänen, Mesiranta, Mattila, & Heikkinen 2020). This refers to unclarity what constitutes as waste and a general inconsistency with what attributes to food waste in households and industry. This thesis will explore these different contributing factors in the single household in Finland and use service design methods and tools in order to analyse and design new approaches to the current problem.

2   Commissioner

At this point in time the design and thesis is produced without a specific commissioner in mind, but rather a specific demographic of users.

This demographic will consist of single household residents in Finland. This demographic is currently 44% of the population of Finland (Yle 2019) and on the rise. Rather than approaching a single commissioner for the paper, multiple industries will be examined and benchmarked in order to create an ideation that is influenced purely by user input rather than one specific industry. Throughout the design process input and tests will be conducted with potential users within the single household demographic of Finland.

3   Constraints

With any project there can be a number of constraints. The main issues with a project such as this, is that with no commissioner the data available will be outdated and opportunities to conduct more in-depth research will be limited. The scope of such a project will also face time constraints as deadlines will need to be met and future analysis would need to be conducted in order to truly understand the impact of the study. Prototypes and pilots will also be constrained as there are limitations placed under the working conditions due to Covid-19.

There are limits and constraints placed on the processes that are planned for the project, since the probes and prototypes require accurate measurements to be made by the participants. As this topic deals with FW there is a stigma, and as such a tendency to embellish figures and results so as to not appear wasteful. This needs to be limited and taken into account to the greatest degree possible. The skill level and knowledge of the participants in the process are also varied, which will of course provide the most general results and give a wider reach to the end service but may limit its end potential to perform its desired effect to the fullest. As the concept of food waste is a poorly defined phenomenon this will also limit the reliability of literature available on the topic. These factors all need to be taken into account for the final ideation and final tests.

4   Frame of Reference

The frame of reference encompasses the approach, ideas and conditions of a research project (Social Engineer Inc, 2021). This thesis is conducted in order to analyze the impact of food waste in Finland with the specific demographic being single households. As such, the frame of reference is centered around food waste, with the research approach being anchored by service design, co-design and the double diamond method. These design methodologies will be used in the research and ideation process. As the issue of food waste can have wide reaching impact, the frame of reference will focus mainly on environmental impacts, economic impacts and the current digitization of food solutions.
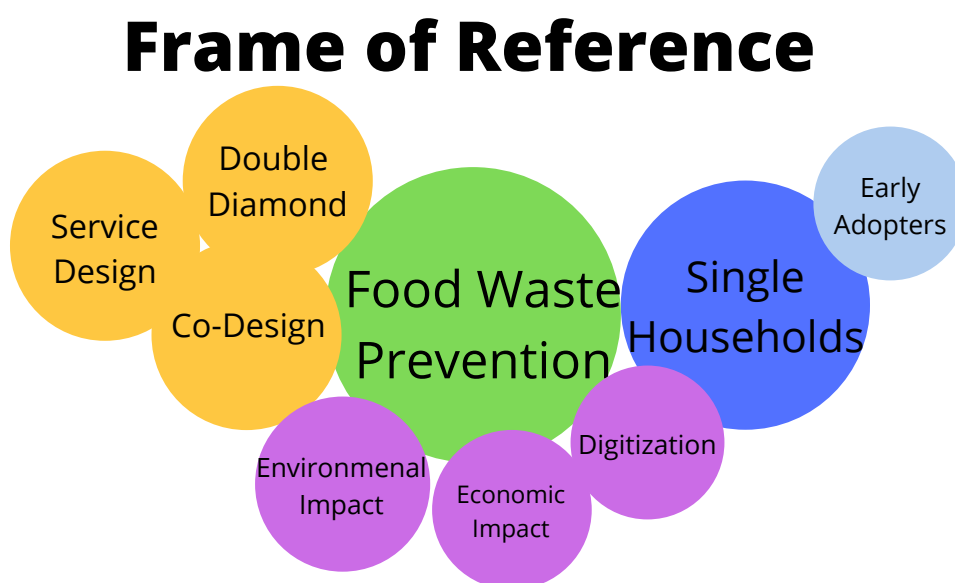
Figure 1 Frame of Reference

As seen in figure 1 above, food waste prevention will guide the research through the thesis. Utilizing a design approach, this will be analysed and directed towards a solution with the specific target demographic of single households in Finland.

5 Research Questions

There are a number of questions that need to be examined in order to draw the most accurate conclusions for the paper. The research questions are:

1) What is causing food waste in single households?

2) To what extent are single households monitoring food waste?

3) What are the cooking habits of single households?

4) How can food waste be reduced?

The purpose of these questions is to focus the research as much as possible and limit superfluous information that is not prudent to the problem at hand or in the design of the final product. The will also guide the research process and determine the methodology used to gather data and provide the necessary framework to conduct a structured research process.

6 Design Process

The service design process will follow the double diamond method. This method is particularly useful for a project of this nature as it provides the framework for research and analysis prior to development and design, and as such gives the project the possibility to ideate and test a number of solutions and rework the product prior to final solution. As seen in figure 2 the double diamond methodology employs distinct stages to separate the design process; Discover, Define, Develop, Deliver, and Solution. Each stage will be explored in this thesis in order to create the most viable solution. This design methodology is also frequently used in start-up design work, which has a particular merit for this project as there is no current commissioner but a plethora of outside data and information available (DesignCouncil 2018.)

(DesignCouncil, 2018)
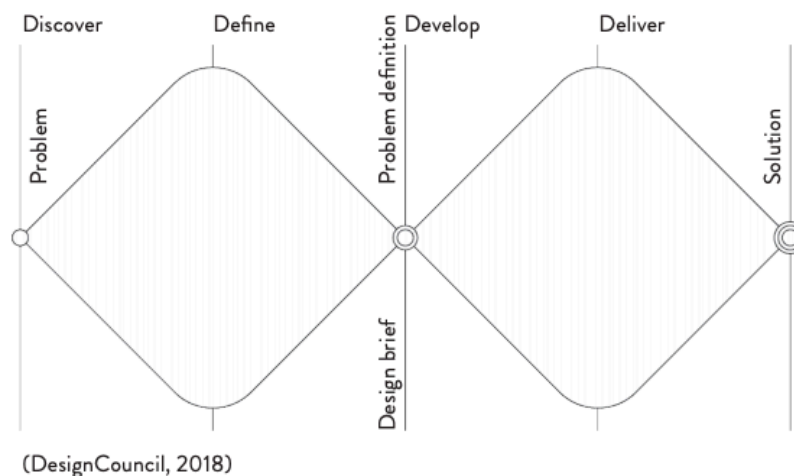
Figure 2 Double Diamond Method

The design process will also be heavily influenced by co-design methodology, which includes sparring and looping the design through different groups of individuals in order to gain a larger spectrum of input (Stickdorn et al. 2018). The methodology is hugely beneficial in circumstances where the individual conducting the design may have preconceived notions from previous experiences or expertise (ibid.).

The co-design process will be conducted in an accelerator business format. Accelerators help firms grow by providing formal training and mentorship relationships over the course of three to six months in rigorous, time-constrained initiatives. Accelerator programs aid

startups in progressing to the next stage of growth, expansion, and replication of results from previous accelerator programs. They help firms grow by offering formal education and coaching, as well as enhancing relationships, through rigorous, time-limited programs that typically last three months. Small developing enterprises are the emphasis of the accelerator sector, which assists startups with the potential to become national or worldwide players. (Seet et al., 2018.)

Many accelerator programs promote a lot of peer-to-peer education so that founders may benefit from others who have been in similar situations. Mentorship from successful businesses is also a big part of most programs. Additional frequent services include providing cash (occasionally in return for equity), a workspace, guided networking, and instructional seminars or workshops. (Seet et al. 2018.)

In this project, the co-design group works in an accelerator-like atmosphere for 7 weeks. The group workshopping the design is comprised of 14 university students who live in single households. The end result will be a co-designed service proposal for reducing FW in single households and to raise awareness of this issue, that can be implemented in an existing market. As a non-linear design process without an outside commission, the progress is largely sporadic and conducive to research data as it is made available during the iterative co-design process.

7   Process Timeline

The project will follow a relatively fluid timeline that is subject to change as new information and potential commissioners are made available. The process and progress of the project will be updated in a GANTT chart format to better visualize the timeline for the articulation of the work done (see figure 3 below).

Food Waste Thesis Project

MBA

PROJECT TIMELINE	Q1	Q2	Q3	Q4
Presentation				
REsubmission of Draft				
Desk Research				
Interviews				
Looping and probes				
Ideation				
Presentation				
Final Draft				
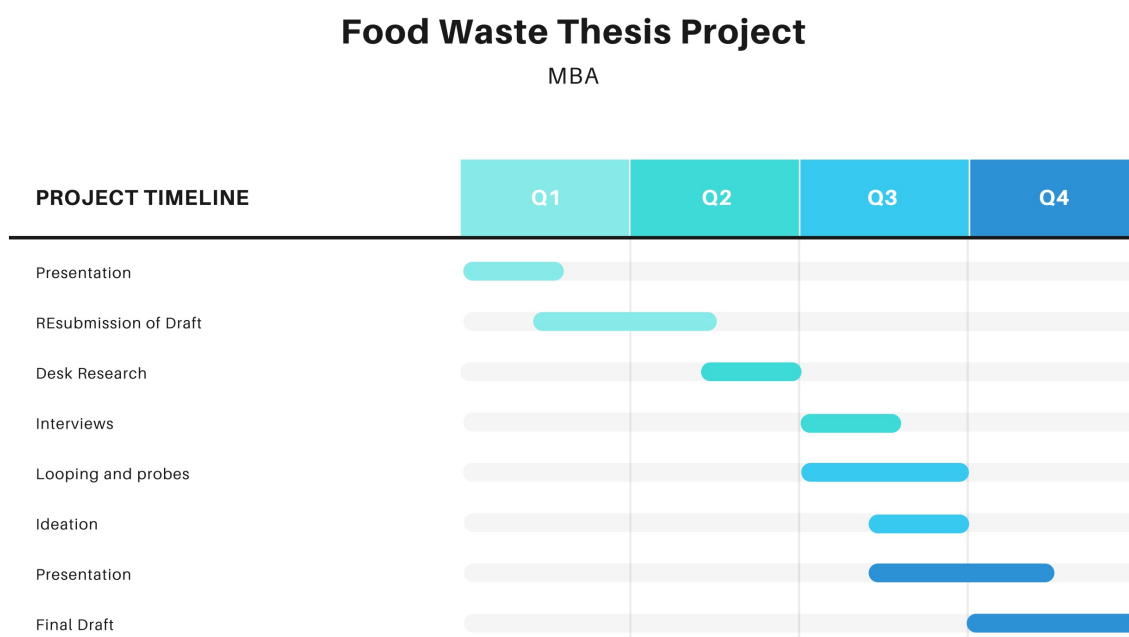
Figure 3 GANTT Chart

As seen in figure 3, the process is monitored on a quarterly basis following the initial presentation and has potential for flexibility and adjustments to be made as the project may dictate. As per the normal GANTT chart model of using a bar graph to visualize processes and timetables this project will utilize this tool to best monitor its progress. Q1 will consist of the accelerator program which is an intensive 7 week period of design and research, conducted with 14 participants from the university of NOVIA. Q2 will consist of desk research and forming the theoretical background of the project. Q3 will be spent on design of the ideation and delivery of the service. During Q4 the thesis paper and presentation will be finalized.

8 Discover

With the population of single households there is a need for new and innovative ways to inspire food consumption and conservation. The environmental impact of food waste created in non-industry practices is responsible for roughly 88Mt of avoidable food waste or approximately 143 Billion Euros in losses accrued from disposing of consumable foods (Albizzati, Tonini 2018). This is a problem that has vast environmental consequences and strong economic motivations for change. What is more, single households produce up to 20% more food waste than cohabitants (Silvennoinen 2020). As a result, they are the main consumer considered for the project.

The current population of Finland is made up of 44% single households (Yle 2019). The number has been growing over the years and the notable shift can be seen in the food industry. Ready to eat meals, delivery options, meal kits and a variety of snack and pre-fabricated foods have come into the scene and are aimed at these consumers. The market is large and this has been noted by the industry. That being said, there is room for more options and players as these all offer vastly different solutions.

The single household consumers are the current leaders in FW in kg per person (see figure 4). They often experience packaging of goods that are aimed at larger groups of people and many of the recipes that can be found online or in books are on average designed to be made for 4+ portion. This spurred on the project idea of taking the larger quantities of ingredients that are pre-packaged and dividing them up into an assortment of dishes that can be used throughout the week based on one 'bulk purchase'. (Silvennoinen 2020.)
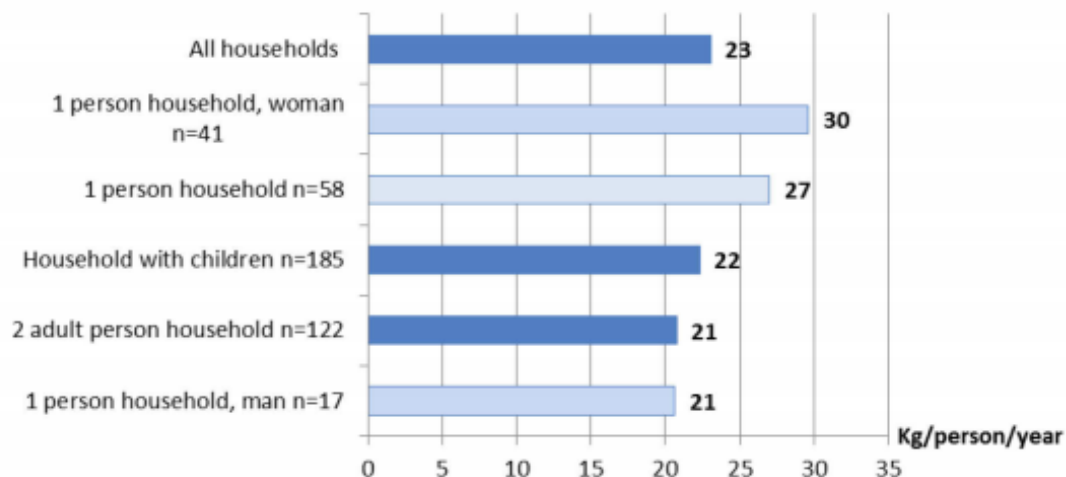
Figure 4 Food Waste(kg) Per Household (Silvennoinen 2020)

The amount of consumable food that is wasted should be addressed and the need for a service solution is imperative. The first being that single households have a tendency to over prepare food and as a result have 'plate waste', which is food that is prepared for consumption but due to the quantity unable to finish and too small to conserve for future consumption (Silvennoinen 2020). The second cause is spoilage,which is food that is no longer viable for consumption due to expiration or improper storage.

Approximately one-third within the edible components of food being product for human consumption tends to be lost or wasted each year, amounting to approximately 1.3 billion tons. From the beginning of agricultural production towards the end of domestic usage, food is wasted across each stage of production to consumption. The presence of food wastage is mainly present in a large amount in middle- and high-income nations, indicating that it is tossed away even though it is still safe for human consumption. Earlier in the food supply chain, nevertheless, significant food loss along with waste do arise. Food is lost mostly within the early as well as intermediate stages within the food supply chain within low-income nations; significantly lesser food tends to be wasted within the consumer level. (El Bilali, 2018.)

Food losses throughout developed nations are equivalent to those in developing countries, although much more over 40% of food losses that occur within poor countries happen at the post-harvest as well as processing stages, although greater than 40% of food losses in developed countries arise at the retail along with the consumer levels. Consumers' food

waste in developed nations (222 million tons) is just about as large as total net food production throughout Sub-Saharan Africa (230 million tons). (El Bilali, 2018.)

For about the last decade, the issue of food waste has emerged as an internationally recognized environmental concern. Not only has the subject of wasted food become such a humanitarian issue within a world, wherein 800 million people go hungry, but the environmental consequences of creating and discarding food can no more be neglected. Increasing food is produced as well as wasted as the world's population and urbanization expand. Furthermore, food waste in cities has serious health along with environmental effects that harm people and the environment. (Gustafsson et al., 2013.)

The demand on a highly limited agricultural land resources to generate far more food is rising as the world's population grows, as does its affluence and demand. Food waste exasperates the challenge of food security even further. Humans have lived in mostly rural locations for centuries, wherein food and agricultural waste, as well as fecal matter, have been recycled to soil on a regular basis. Furthermore, soils have only ever been exposed to intense agricultural methods and utilization of synthetic fertilizers during the last century across the world. Around 50% of garbage is delivered to landfills worldwide, but 13 to 33% of rubbish has still been dumped publicly in low- and middle-income nations. (Schanes et al., 2018.)

Food as well as other organic waste within landfills as well as dump sites may cause parasite and gastrointestinal problems in those who live and work nearby, particularly mothers and children. Vermin, flies, birds, as well as other transmitters of infectious illnesses, are attracted to organic waste within dumpsites, raising the health risk by passing down the food chain. Among open landfills all over the world, grazing animals for whom the meat and milk tend to be consumed by people could be found. (Seet et al., 2018.)

9 Define

In order to analyze the services provided and customer demands, preliminary research needs to be conducted. This is the define stage of the double diamond process as it sets to analyze the problem further by clearly defining parameters and focusing the design process.

In order to set parameters for the research one must first define what a service is. A service is a transaction where the consumer is not provided with a specific tangible good, but rather an experience alone or in tandem with a product (Gustofsson et al 2003). This will assist the research process as it will provide guidelines to rule out anything that is not a service from analysis.

The primary focus of FW in the project will be directed towards three forms of FW prevention and causes. These are specifically chosen in order to better set parameters for the project to create a well-constructed design with a focused research guidelines. These FW guidelines are defined as:

- Plate Waste: food wasted as a result of over preparation of consumable food.

- Spoilage: raw or processed foods that have passed by their consumable lifespan due to improper storage or surpassing their expiration date.

- Production waste: consumable foods that are discarded in the processing of the product that does not maximize the yield, or outright renders the end product partially or wholly unconsumable as a result of improper practices.

These definitions will be referred to throughout the project and are the underlying causes of FW that will be addressed for single households. These areas of FW were chosen as they reflect the most favorable option to the FW hierarchy prevention model (Papargyropoulou et. al 2014). The FW hierarchy defines the stages of FW in a descending order of favorability in terms of positive environmental and economic impact as illustrated below in figure 5.

Prevention
-Avoid surplus food generation throughout food production and consumption
-Prevent avoidable food waste generation throughout the food supply chain

Re-use
-Re-use surplus food for human consumption for people affected by food poverty, through redistribution networks and food banks

Recycle
-Recycle food waste into animal feed
-Recycle food waste via composting

Recovery
-Treat unavoidable food waste and recover energy

Disposal
-Dispose unavoidable food waste into engineered landfill with landfill gas utilization

Least Favourable Option

Figure 5 Food Waste Hierarchy

(Papargyropoulou et. al 2014)

This model in figure 5 will be used as it provides a framework regarding FW that articulates and encourages different methods of FW prevention with alternative uses and limiting surplus.

For the sake of consistency and added focus to the project the important cases of Food Sovereignty and Food Security will be omitted from the ideation and main research conducted. Food Security is the basic right of consistent access to healthy and affordable food (Mancarta, 2017). Food Sovereignty as defined by the La Via Campesina farmers organization is *'the right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture system'.* These topics address a growing concern in the global food production chain, and raise awareness to the issue of where food comes from and its cultural importance. The scope of this project will, however, be aimed at reduced waste in the end user stage of the food cycle and the potential beneficial impact this will incur.

9.1   Theoretical Background

In order to understand the design and the issues presented by food waste it is important to understand the theoretical background of the topic. In this chapter the concepts of service

design, delivery channels, food waste, and single households are explored. The research questions will guide the information gathered and the initial publication origins of the research conducted will be centred around Finland and the EU as these will provide the most relevant data and statistics pertinent to the design.

9.1.1 Service Design

As a practice of design, in the past two decades, service design and research field has developed into a design-led approach for service innovation (Meroni & Sangiorgi, 2011). Service design is closely related to an experience-centric approach for innovation. It is influenced by human-centered design (Cooper & Saffo, 2004), emotional design (Norman 2005), design thinking (Johansson-Sköldberg et al. 2013) and situational design (Visser et al. 2005). Following the principles of participatory design (Holmlid 2007) and co-design (Sanders & Stappers, 2008), innovative collaborative methods are also reflected in service design. With the experience-centric approach, the personal background and experience of users are used as a basis for the conception and development of high-quality services (Bate & Robert, 2007). For various innovative activities and purposes, service design depends upon innovative service tools as well as the user centric methods.

Snyder et al. (2016) emphasized that service innovation is a means of updating the society. He was of the view that innovation for disadvantaged and under-privileged groups of people has an area for growth. In order to make clear the society's commitment towards the disadvantage people, Hill (2002) advised that people should follow consumption adequacy approach as with this, there will always be a range of necessary goods and services at hand and help people realize the basic human dignity and self-determination. In operations management research, the service concept connects customer experience and service results through the method and content of the service design (Goldstein et al., 2002).

Design thinking may be a way to solve the issue of household food waste that could also bring forward new solutions to solve this food waste issue. There has been a little attentiveness regarding this issue in design research recently (Bucci et al., 2010), however, there are lower outcomes still. Therefore, there are still a lot of possibilities for involving the design community in complex problems and inspire practitioners to implement the design problem solving tools along with design thinking. However, in order for the design community to take part and make a change, it needs to acquire a solid knowledge base, as

well as "empathy" in design thinking, emphasizing the significance of qualitative and quantitative research.

The method of service design thinking is very similar to the method of qualitative research as described earlier. The point is to understand why users think in a certain way, not what the user thinks. Service design can also be described as a field of knowledge that covers the theories, methods and tools of creation and development services. According to Marc Stickdorn (Stickdorn et al. 2011), there are five principles that illustrate service design thinking; user-centered, co-creation, sequencing evidence.

- The user-centered principle describes how service users are included and are a part of the design process (Stickdorn et al. 2011). In this principle, the user's point of view is investigated in order to understand their needs instead of just relying on statistics and demographic data.

- The principle of co-creation means involving stakeholders in the creative process design services (Stickdorn et al. 2011). This is important because users are not the only ones affected by the service. Store employees or application programmers are also participants in creating and experiencing services, so their opinions are important. Create service value for customers by applying their knowledge in the creative process stakeholders can increase.

- Sequencing is a principle that describes the importance of treating services as a process that happened over a period of time, not as an isolated incident (Stickdorn et al. 2011) is not an infinite process either. A service can be expressed as a series of "touch points", which are the specific moments when the user interacts with the service.

- The principle of evidence expresses the importance of transforming abstract services into tangible parts and physical products of users (Stickdorn et al. 2011). By manufacturing when the user is aware of certain aspects of the service, it becomes tangible and noticed.

- The holistic principle is to describe the importance of bringing the service into context (Stickdorn et al. 2011). In what environment will the service be carried out? What is the value of companies providing services? These type of issues are important to consider when designing services.

9.1.2 Delivery Channels

It has been observed that the development of supermarkets and the enhancement of logistics and coordination systems, such as distribution centers and logistics platforms, are synonymous (Reardon & Berdegué, 2002). The best logistic practices should be undertaken by supermarkets and suppliers, in order to deliver high quality products to centralized distribution centers on time (Boselie et al., 2003). As compared to the non-supermarket channels, spending money on important equipment such as trucks, cooling sheds and cold chain, are necessary to deliver products according to the quality standards of supermarket.

 Supermarket has more stringent quality standards that are required, especially for perishable products (Neven et al., 2009). Prior research suggests that supermarkets buy and sell better quality food products with some anomalies as compared to non-supermarket channels (Minten et al., 2010). However, for this purpose, farmers must perform additional activities such as sorting, grading, cleaning, and packaging to meet specific quality standards of supermarkets and make sure that all the products of food have uniformity (Reardon & Berdegué, 2002). This means that supermarket suppliers must discard products that do not meet their standards or so-called "out-of-time" products at the door of the farm (Di Muro et al., 2016).

9.1.3 Food Waste

For the very first time within human history, cities are home to more than half of the world's population, with that figure expected to climb to more than 70% by 2050. The requirement to ensure clean water, sewage systems, public transportation, retain urban sanitation, construct waste treatment facilities, offer additional healthcare and education assistance throughout cities that are constantly evolving is a huge task; nevertheless, cities also offer great opportunities with regards to energy, asset and service effectiveness, medical services, technical development, and environmental sustainability. Throughout the case of meat as well as meat products, setbacks along with waste are most significant in industrialized regions near the end within the food supply chain (FSC), as a result of high per capita meat consumption mixed with increased waste percentages by business and customers, particularly in Europe and the United States. Nearly half of all meat losses and waste occurs at the consumer level. Animal fatality throughout breeding as well as transportation owing

to slaughter may reflect the comparatively low amounts of waste generated through agricultural production along with post-harvest processing and storage. (Jain et al., 2018.)

It is reported that amongst 25% as well as 50% of food grown is wasted somewhere within the supply chain. For a myriad of reasons, this is a major worldwide issue. To begin with, wasting food whilst thousands of people across the world go hungry creates moral concerns and may result in a future food catastrophe. Furthermore, the wasteful utilization of natural resources, including water, electricity, especially land, has environmental implications, for example resulting in deforestation and land degradation) Additionally, dumping garbage in landfills pollutes the environment and creates methane, a potent greenhouse gas. Eventually, throwing food waste has an economic effect on a majority of the businesses and persons engaged throughout the supply chain, such as the final customer. For such considerations, governments, non-governmental organizations (NGOs), and economic industries engaged throughout the food supply chain, including agriculture, food production, packaging, retail, including catering, have begun to pay attention towards food waste. (Kowalska, 2017.)

Another of the primary issues with food waste though is that the costs are frequently underestimated and underrepresented, resulting in "hidden" expenditures. Increasing knowledge of such "hidden" expenses might be a stimulus for dealing with the issue, as firms grasp the size of the problem as well as its financial effect. Efficient waste management is crucial to increasing performance and profitability of supply chain participants, notably by reducing raw material and energy use and improving recycling and re-use operations, in an industry notorious for poor margins. This could have a significant influence on the environment, as well as alleviate food security worries throughout the globe, through much more effective utilization of resources as well as a reduction within waste going to trash. (Mena et al., 2011.)

Despite the fact that waste occurs at every level of the FSC, the reasons of waste differ substantially based on the stage. Regarding terms of waste creation, several stages have gotten a lot more attention throughout the years; for example, there are whole texts devoted to waste in agricultural and food manufacture. In addition, the literature examines the primary causes of food waste caused during distribution, such as incorrect packing, poor handling of materials, and prediction and storage errors. Consumer waste has gotten lesser attention throughout the years, but new research has offered a comprehensive assessment of consumer waste in the UK. (Quested 2011.)

At many points in the supply chain, waste is created. 6.7 million tons of food waste and 5.2 million tons of food-related packaging are generated by UK households alone. Numbers for the retail industry vary from 0.4 mt to 12 mt per year, with Waste and Resources Action Programme (WRAP) reporting a mid-range number of 1.5 mt (Quested 2011). All around the globe, legislation has also been utilized to avoid, minimize, as well as dispose of the waste (e.g., promoting recycling and energy recovery). The European Commission's Trash Management Strategy of 1989, which covers waste reduction, removal, and administration, is implemented through the Council Directive on Waste, which was first proposed in 1975 and updated in 1991. The EU Council Directive concerning Hazardous Waste was enacted to harmonize the handling of hazardous materials throughout the EU. (Schanes et al., 2018.)

Mena et al. (2011) conducted research within UK and Spain where the reasoning behind the food waste throughout the supplier and retailer interface was evaluated through interviews. In all, 43 interviews involving managers in the food manufacturing, wholesale, and retailing industries were undertaken. There were 24 in the United Kingdom and 19 in Spain. All of the interviewees included middle to senior managers, who were responsible for waste management in their companies. The results allow an emphasis into the following root causes with regards to waste in the industry and what areas to focus on. Mega-trends are important throughout this process. Industrial trends that impact the waste problem include an increase in demand with regards to fresh items and products that are out of season, and also a shift away from preservative-laden goods. These are significant determinants of the waste problem. Natural elements have an important role as well. These are waste-influencing elements that are linked to the goods or processes themselves. These considerations include things like fresh product shelf life, production as well as demand seasonality, weather changes, and lengthier lead periods for imported items. (Mena et al., 2011.)

For effective planning and control, adequate and reliable data is critical. If information is scarce, variances among forecasts and orders might grow, potentially resulting in waste. Moreover, deviations in the supply chain resulting from inadequate information exchange may magnify (that is the bullwhip effect). Several merchants were discovered to charge for point of sale (POS) information, whereas others gave it out for free. Improper information exchange methods can lead to waste as well as a loss of trust in the information supplied. Nevertheless, it was recognized that predicting a product's demand is a difficult and fundamentally imprecise undertaking that is influenced by a variety of variables, including

weather, seasons, marketing strategies, product launches, promotions, as well as special holidays like Christmas and Easter. (Mena et al., 2011.)

According to the findings, the business employs a range of forecasting methodologies, with some organizations employing a scientific approach and others employing more informal ways. Prediction error may be reduced by strengthening forecasting techniques and employing up-to-date data mining algorithms; nonetheless, it must be acknowledged that uncertainty will persist and also that forecast failure cannot be eradicated. The industry looks to be focusing on cost, efficiency, and availability. Despite the fact that waste has an influence on all of these criteria, it is not normally a crucial performance indicator and may be compromised in favor of other metrics. For example, interviews found that almost all mainstream stores have regulations requiring products to have a large percentage of their shelf life left (usually over 70 percent). This is especially troublesome for British own-label companies who are unable to sell their products through alternative channels including cheap stores. (Mena et al., 2011.)

Cold chains can assist in keeping specific items fresh and preventing spoiling. Mismanagement with regards to the cold chain, on the other side, either to equipment malfunction or inefficient operations, would certainly result in waste. Inability to uphold the cold chain, that may be reduced by the development as well as investment within newer and more dependable technology, can have a significant influence on waste, according to the study, although these scenarios are uncommon. Difficulties with the cold chain seem to be more common in Spain, wherein temperatures are greater than those in the UK, notably with vehicles bringing items to supermarkets, although not so much for the products held in warehouses, in which more sophisticated equipment is generally employed. To mitigate this danger, additional investment is required at this time. (Mena et al., 2011.)

Sweden generated approximately a million ton of food waste in 2010, as per the SMED (Swedish Methodology for Environmental Data), throughout the food supply chain. The garbage generated by households accounts for 67% of the total, of which 35% is reflected by avoidable food waste. In average, 72 kg of food is thrown away per person every year. The industry, on the other side, is responsible for only 17% of food waste. Most customers store a stock of perhaps never even used things that were purchased for a specific recipe or even for a momentous occasion which never happened, according to studies regarding consumer household storage behavior. These goods are eventually discarded. Consumers have certain

understanding of how to handle food in their homes, but they frequently do not act on that information. For example, people frequently set the refrigerator temperature excessively high, preserve vegetables inappropriately, retain leftovers for an excessive amount of time, and then use date marking to determine disposal even though it is no longer applicable after opening. (Timmermans et al., 2014.)

Preparing as well as shopping rituals, possessing or missing an evaluation of supplies, knowing or lacking information as to whether food could still be utilized, as well as contextual factors all play a role within consumer food waste behaviors (for instance certain purchase or consumption contexts). Demographics, family composition, confidence throughout packaging, as well as assessment of the "worth of money" at the time of purchase all impact food waste inside a diary study in Finland, whereas a study within Portugal found that young, male, as well as single customers wasted the most food. Moreover, a more uniform approach for date labelling would indeed be beneficial, as would a reduction in date labels which are largely misunderstood by customers (for example, "sell by" or "display by"). This should be complemented with customer education regarding the necessity of date labelling, restricted shelf life, temperature management, and safe handling procedures. The plurality of goods seems to be acceptable for freezing, and doing so reduces emissions more than discarding. Several retail chains in the United Kingdom have implemented WRAP-recommended retailer voluntary initiatives for waste minimization. (Schanes et al., 2018.)

A study in Finland conducted by the Luke research institute that has specialised in a number of different projects in and around Finland with regard to sustainability was carried out in 2020 with a special interest in food waste. The Luke institute has released a number of papers and projects that relate to the sustainability of the Food Industry as well as combatting FW.

In 2020 Luke released a study 'Food Waste Amount, Type and Origin in Finland – Focus on Households and Food Services' (Silvennoinen et al. 2020) highlighting the current situation in the country and which areas are of note in Finland. This study consisted of 380 households containing approximately 1054 participants independently monitoring their FW over the course of a month and noting which areas could be highlighted as pain-points and causes of FW. This was done with the assistance of a scale to measure consumable food that was discarded as well as a personal log to input the data gathered. From this study it was confirmed that the average Finnish household was not aware of the scale at which food is wasted and the cause.
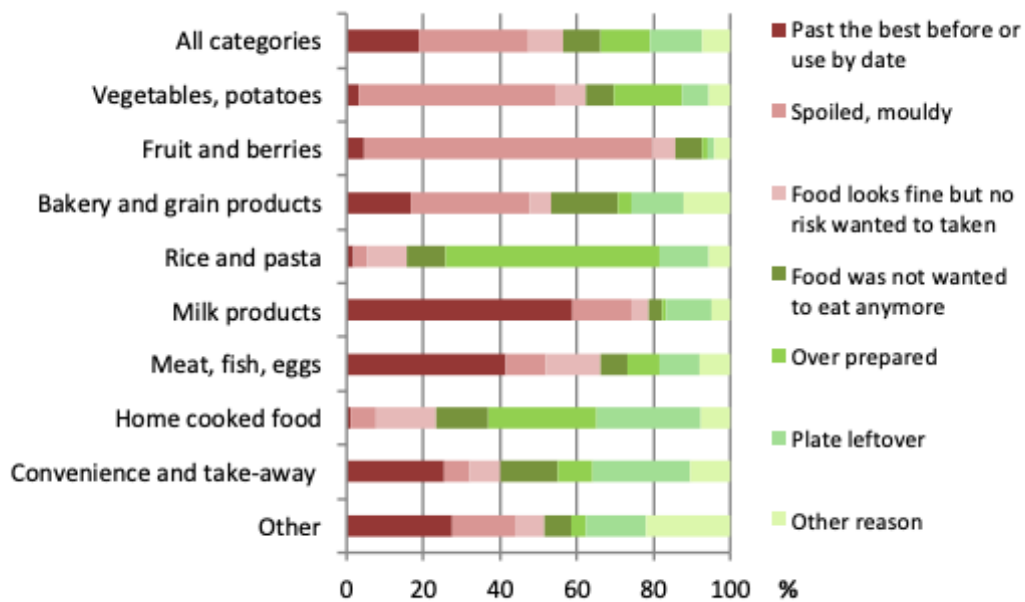
Figure 6 Food Waste and Cause (Silvennoinen 2020)

The graph in figure 6 from the study illustrates the food product and the common reason for discarding. Silvennoinen et al. (2020) state that the most preferable method in prevention of FW is by using all consumable products by maintaining strict purchasing habits to limit excessive foods as over purchasing has a high probability to lead to spoilage which renders any product unusable. This is further highlighted in the prevention stage. The study explores possibilities for assisting in limiting household FW. The key takeaways and findings from the study done by Silvennoinen et. al. (2020) was that planning, storing and cooking skills all needed to be improved in order to limit FW. In the planning stage there is a need for specified grocery lists that help curb impulse or excess purchases that could result in FW. Further emphasis on planning and packaging is highlighted in the study stating that for single and small households, packaging of goods is often too large and results in excess purchases, and as a result food is wasted. The recommendation being that a purchase of loose goods may be favourable over larger packaging. (Silvennoinen et al. 2020.)

9.1.4 Single Household

Research on household food waste is becoming more frequent. As the Food and Agriculture Organization of the United Nations (FAO) stated that approximately one third of the food produced in the world is discarded (Gustavsson et al. 2011; FAO 2013), scholars try to

explain why consumer behavior in the developed countries has caused food waste (Quested et al. 2013). The literature does not discuss in depth how food that is easily available in countries such as the United States and Brazil may impact food waste negatively. Consumers are more likely to enjoy a large amount of food service, but at the same time for the reason that they cannot redesign a meal, they are not always willing to reuse the leftovers left on the table. Leftovers are particularly regarded as "psychological contamination" or "used" food (Rozin 2012). Furthermore, in order to save cooking time, some households come into over-preparation mode and fill their tables with food (Porpino et al. 2015).

Food waste research shows that households play a significant role in wasting food (Jungowska et al., 2020). Therefore, the final consumer is considered to be highly taking part in the total food waste (Laurenti et al., 2017), especially in the consumption stage (Di Talia et al., 2019). According to other studies (Kasza et al., 2019), single households do realize the sustainable food waste issues, but their heedless food activities causes significant amount of food waste. A study on the role of packaging in consumers' practices revealed that a household discarded 1.9 kg of food on average. Single-households were found to waste 920 grams of food per person in a week. (Jungowska et al., 2020.)

Research has not yet solved the problem of why food is wasted. Some studies have tried to determine the cause of waste of household food. The behaviors recognized that caused food waste were: instead of planning the meals in advance, over-buying and over-cooking food; not following the shopping checklist, while buying food items; no food inventory before shopping, impulsive buying behaviors and discarding food that has exceeded its expiration date (Lyndhurst, 2007; Exodus, 2006; Parfitt et al., 2010; Stefan et al., 2012).

In environment related to food waste, the Theory of Planned Behavior (TPB)is often used to study the behavioral aspects of consumers (Russel et al., 2017). In order to predict human behavior, TPB is based on cognitive methods (Ajzen, 2001). The emotional perspective related to food waste that is considered crucial in the recent literature, is not noticed by TPB (Filimonau et al., 2020). Consumer behaviors in households can be properly predicted when emotion is included by integrating different theoretical methods, such as environmental psychology, interpersonal behavior theory, social practice theory.

9.2 Research Methods

In order to conduct the most effective research a number of methods need to be used. A broad spectrum will provide the most amount of viable data for analysis for the project. Mainly qualitative analysis will be conducted in order to get the general demand and demographic of the single household. Along with these methods a co-design strategy will be employed in order to gauge feedback and review processes as the project incrementally develops. This will allow for accurate personas and prototypes to be extrapolated for final review and for the design to be delivered.

9.2.1 Benchmarking

Benchmarking is the research done examining other industries and services in a similar field and how they operate (Holmlid et al. 2007). This will be done in order to see what best practices are currently on the market and how these can be developed further to best suit the desired target group.

The benchmarking for this project will focus on two businesses that operate currently in Europe that revolve around home cooking in order to gauge the market elsewhere. The companies chosen were 'Sorted Meal Packs' based in the UK and 'JOW' in France. These were chosen as they both provide insight to the current trends and needs of the single household in separate markets and both offer a similar service in providing inspiration for cooking by offering recipes as well as linking these to online purchasing options. The importance of combating 'menu fatigue' in home cooking is an important one, as the phenomenon of growing weary of preparing foods due to a lack of inspiration and recirculation of a short list of meals hiders discovery and appreciation of new products (Papargyropoulou et. al 2014).

JOW

JOW is a French online company that operates by providing a variety of recipe options which are then translated to a shopping list that can either be downloaded and used when the consumer is physically in a market/shop or alternatively the users' online account can be linked to an online retailer and the ingredients automatically delivered home or packaged for

pick-up. The company was founded in 2018 and is partnered with the French grocery providers Monoprix, Carrefour, Auchan, Chronodrive and E.Leclerc.

Figure 7 JOW Log-in Prompts (JOW 2018)

After making the 4 selections related to the user's preferences shown in figure 7, the service requires the user to enter the number of meals that they would like to cook and presents them with the meals that are recommended (see figure 9). These can be substituted should there be options that do not suit one's preferences or mood.

Figure 8 Recipe number (JOW 2018)
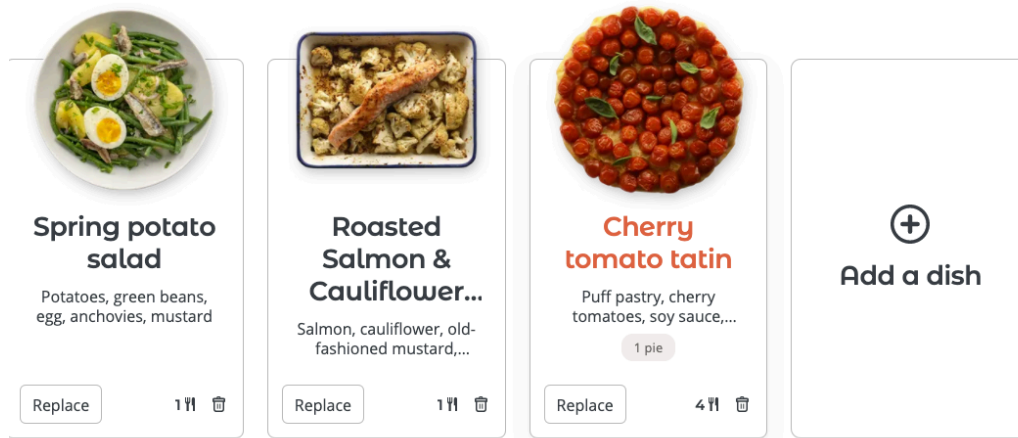
Figure 9 Recipe Recommendation (JOW 2018)

These recipes contribute to a shopping list that can then be ordered online and saved into a portfolio for use later. This service according to their own promotional material is designed to eliminate the need to second guess what to make for dinner and cut down on the 1-2 hours spent on average shopping. The service offers a considerable number of options for customization with the ability to change recipes and dietary restrictions as well as party size. The service however is limited in that it does not operate outside of France and New York and does not highlight the specific needs of single households. Shopping lists are available for the size of product necessary to complete each recipe without waste, however these items are not able to be purchased in said quantities as they are not packaged in these dimensions. (JOW 2018.)

Sorted Meal Packs

Sorted Meal Packs is a slightly different company as it started as an entertainment company focused on creating content for social media outlets catered towards food and home cooking. However, since its inception the company has expanded to cookbooks and a mobile application that is designed to create meal plans in order to similarly eliminate 'menu fatigue' and FW. The service follows a simple step process illustrated below in figure 10, not dissimilar to Jow.

Choose Your Pack

Choose a new Meal Pack every week! Each Meal Pack contains 3-5 simple and delicious recipes designed for 2 or 4 people.

Meat/Fish and Veggie options available.

Buy Your Ingredients

Check the Shopping List and buy the ingredients in your usual way – shop local, order online... it's up to you!

Get Cookin'

Follow the recipes using the written instructions and audio guides, plus handy cooking timers. Midweek meals, sorted!

Stress-Free Meal Planning

Pick a new Meal Pack each week – it contains 3-5 simple and delicious recipes, written by chefs and tested by normals, so you never need to worry about what to cook again!

Spend Less Every Week

Each Meal Pack smartly combines ingredients across the recipes to save you money on your weekly shop. The easy-to-follow shopping list means you can buy your ingredients in a way that suits you.

Eliminate Your Food Waste

Each Meal Pack has been created so you eat everything you buy, reducing one of the main causes of food waste. Simple.

Figure 10 Sorted Meal Packs App (Sorted Food 2010)

The service differentiates in that it does not link directly to multiple supermarkets and operates on a subscription basis in tandem with the company's cookbooks and audiobooks. This service also only caters to parties sized 2-4 and each menu item is designed to maximize the usage of each food item to minimize waste. The process also allows for recipes to be followed in multiple media options including audio and video to accompany the cooking process making for a different experience for the user.

These companies while working in the parameters of limiting FW and menu fatigue operate in slightly different models and as such provide a good benchmark to develop the service for single households in Finland. They each exhibit solutions for the most common causes to FW in households, however, they do not directly address the single household market which is the worst offender in the production of FW. As such, the benchmarking provides useful

insights into industry practices that have worked as well as focus the design approach to the specific demographic of singular households.

9.2.2   Service Safari

A service safari is the process of exploring and taking part in the service provided in person. This is in order to gain first-hand experience in a service and to analyze each step of the process via partaking in the service. Service safari will be utilized in order to gain first person insight into how the service is conducted and what a guest is expected to experience. Partaking in the service as a designer the researcher has the expertise to document and analyze the service in a different light to average consumers and provide deeper insight. (Holmlid, Stefan 200.)

The service safari process is used in tandem with benchmarking, as the services that will be analyzed are meal kit providers as well as other companies and services aimed at FW. The end results and overall effectiveness of the services will be notated. These insights will then be looked at in order to find ways to improve and what was ultimately the benefit of using such service.

The services that underwent this safari were: Ruokaboksi, Alepa kauppakassi, ResQ club, and Fiksuruoka. Each service was used and small notes on the experience were made by the assisting designer, specifically highlighting the benefits and differences between the services and overall effectiveness towards FW management. The use of an external designer was decided in order to limit biases that may arise from previous knowledge. The services were chosen as they are all operating in Finland and each provide solutions to combating FW in different areas of the supply and home production stages and combined allow for the greatest possible scope of information.

Ruokaboksi

Ruokaboksi is a mealkit service which operates in Finland, founded in 2017 (ruokaboksi, 2021). The service provides prepared ingredients for 3-4 meals that are home delivered at the start of the week. These meals can be varied to cater to different dietary needs and can be ordered as a 'Large' or 'Small' box providing meals suitable for 3-4 portions or 1-2 portions respectively. Included in each box is a recipe and pre-measured ingredients to be

used throughout the week. This service also stresses its environmentally friendly packaging practices. The primary function of the meal box service as stated in their own promotional website is (translated from Finnish) *'The food box is designed to ease the hustle and bustle of the weekday. The food box delivers dinner food ready-made, selected, dimensioned and delivered home with its ingredients and recipes. All you have to do during the week is prepare the food and save time on other things as well.'*

Alepa kauppakassi

Alepa kauppakassi is an online marketplace that allows users to purchase their groceries over the internet and receive home delivery. This experience is the closest resemblance to standard supermarket shopping. This service was examined to understand the benefits and convenience of online shopping and how this may have a positive impact on FW and what user experiences can be emulated or improved upon.

ResQ Club

ResQ Club is a company that was founded in 2015 and designed to combat FW in the restaurant sector by offering a discount of 50% off of excess stock or prepped foods. It achieves this by partnering with restaurants to facilitate a marketplace through a mobile phone application to sell and promote excess portions. The convenience in combating FW has proven effective with other companies operating in a similar model such as Too Good To Go. This marketplace has expanded to include various products in supermarket chains further increasing the potential reach and limiting FW. The user selects number of portions, or meals that they would like to 'rescue' from a list of available vendors based on geolocation further emphasizing the convenience aspect of the service. The service also allows the user to track their FW impact by highlighting the amount of carbon emissions saved by using the service.

Fiksuruoka

Fiksuruoka is an online marketplace for food products that are heavily discounted in order to limit FW. This service operates by only featuring items on their webshop that are in danger of being discarded due to expiration date or goods that are not seen as viable to be sold in supermarkets any longer. As such the heavily discounted products incentivizes the consumer to act and prevent FW. This service offers home delivery dependent on order size as well as pick-up points to collect purchases made.

Notes on each of the services were provided by the designer conducting the service safari including personal qualms and triumphs with these experiences. The notes provide a first-person insight into how the service operates. Looking at each service through the lens of a consumer helps to highlight pain points in the services and areas that can be improved or solutions which have proven effective and are worth replicating in other services.

Table 1 Notes on Service Safari

Service:	Notes:
Ruokaboksi	The pros of ruokaboksi are that it comes with recipes and the recipes even say which is the fastest meal to cook each week. The recipes also have nice unusual seasonings etc. so you can even learn something new. They also favor organic and Finnish produce. They pick up the boxes and cooler bags from the previous time when they bring a new box but I suspect they don't reuse them because the boxes always seem brand new. Often the boxes have some newer vegan stuff which I think is great for introducing them to the public. I also like that you can see how many people are in the queue before you when they deliver the box to be prepared. Cons are that there is no way to customize, for example, for allergies or dislikes. Just a couple of options (meat, vegetarian, kids) and sizes. Also, the vegan box has had tofu every single time which gets a bit boring, especially since alternatives abound. A bit pricey, but worth it for busy and lazy people.
Alepa Kauppakassi	Basically, brings you anything from the Alepa selection which is pretty decent but can lack stuff for specialties. Total freedom to choose whatever which is great but doesn't come with recipes. But good because when you order online, there is no temptation to buy junk. A huge minus is that they pack everything in a million plastic bags which is not environmentally friendly and the bright yellow bags are so embarrassing that no reuse possibilities because everyone will think that I would buy plastic bags when I run to the corner store. A few friends have said that they will not order again because of the plastic bag thing and neither will I.

ResQ Club	Restaurant quality food for a fraction of a price and total flexibility to order and pick up which is convenient. I like the world saving aspect of rescuing surplus meals and that the app keeps a tally on the amount of co2 I have saved. I am annoyed by the fact that not everyone selling there is selling genuine surplus but use it as a marketing channel and also that I can't bring my own tubs but am forced to take single use plastic tubs. A reusable container system, maybe with a deposit, would be an improvement. The mobile app, payment etc. is super easy. Unfortunately, it only works in the centers of big cities, periphery and small towns don't get to enjoy it.
Fiksuruoka	Nice for rescuing surplus food but it does not give you the holy feeling by telling you your positive impacts. Comes in cardboard boxes which is good. I have always picked mine from the nearest post which is a pain because the delivery fee incentivizes big purchases. A big selection always but also always different so can't count on it for everything. It only has pantry items, nothing fresh or that needs to be stored in cold. That leads to many of the products being in the junk food category, like cookies, crisps etc. but usually there is something organic and healthy too. I use it to stock up on the staples like coffee, spices, oil, sauces etc. and for that it's good. For some products, the best before dates are close or even passed. The delivery comes in a couple of days.

All these services offer solutions to FW and each focus on different areas of the market and as such provide useful insights to the pain points and potential for additional services to address these. The insights garnered from the service safaris highlighted a number of positive aspects of each experience. The comparative positive and negative insights were tabled in order to better visualize the areas that require improvement and what is most effective.

Table 2 Results of Service Safari

Positive	Easy to follow recipes
	Varied ingredients and products
	Positive environmental impact with products featured, packaging, and reinforcement
	Price
	Delivery
	Ability to customize and flexible dates/time
Negative	Negative environmental impact with packaging
	Unhealthy products
	Expensive
	Not accessible everywhere/convenience

In the ideation and design of the final product these insights will be vital in helping to alleviate the most amount of pain points whilst at the same time addressing and satisfying the positive aspects of each service that was analyzed in the service safari.

9.2.3 Probes

Probes are a service-design tool where individuals are selected to test the service or a rudimentary ideation of the service, and to notate the experience for the designer to analyse (Stickdorn et al. 2018). These will be used as the target group is single households and it is ideal for gaining insights into what the end user will experience. The reason for using probes is as well beneficial as it limits the interference of the designer and allows the potential user to experience the service idea without outside influence from the project lead. For this project a service was created that consisted of a simple shopping list that was accompanied with three recipes each with the end desire to efficiently utilise all ingredients in the list in 3 separate dishes suitable for single households (appendix number1).

This probing process was performed by two participants, each within the target demographic of single household and age group. The skill level of each participant was given as 'intermediate' as rated by themselves and the trial process was monitored by a short questionnaire to be filled in after the completion of the meals (appendix 2) as well as a short answer question to gather insights to suggested areas of improvement and highlighting what was beneficial in regards to the basic service. The recipes and products produced were specifically designed not to require special equipment and the participants used were selected as there was no dietary restrictions between them.

The results from the probing offers a basic insight into how the service can continue to develop. As the probes acted independently from one another and without further instructions the questionnaires allowed for specific areas of the service to be rated and commented on and the results were taken into account for the continued design of the service.
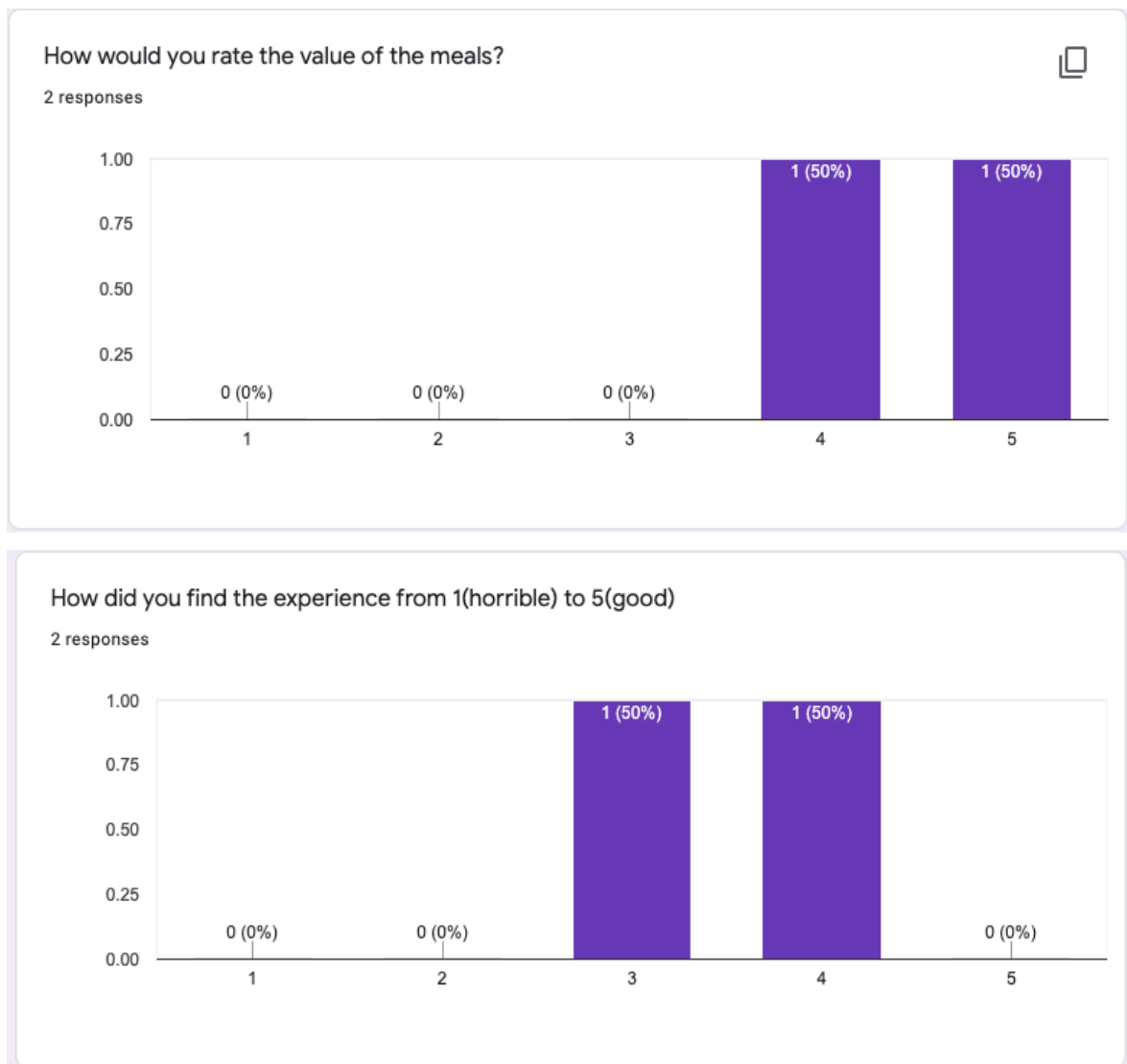
Figure 11 Results of Probes 1

From the results of the first two questions from the probes it can be seen that value of the meals was rated highly, however the overall experience was only slightly above a neutral 3. This indicates that the usability and experience of the service the probes underwent can be improved however the satisfaction of the value of the end result was good. The probes were then asked if there had been any residual food left after the experience

Were there food items left over?

2 responses

- Yes
- No

50%

50%

If yes how much?

1 response

some tomatoes and pantry items
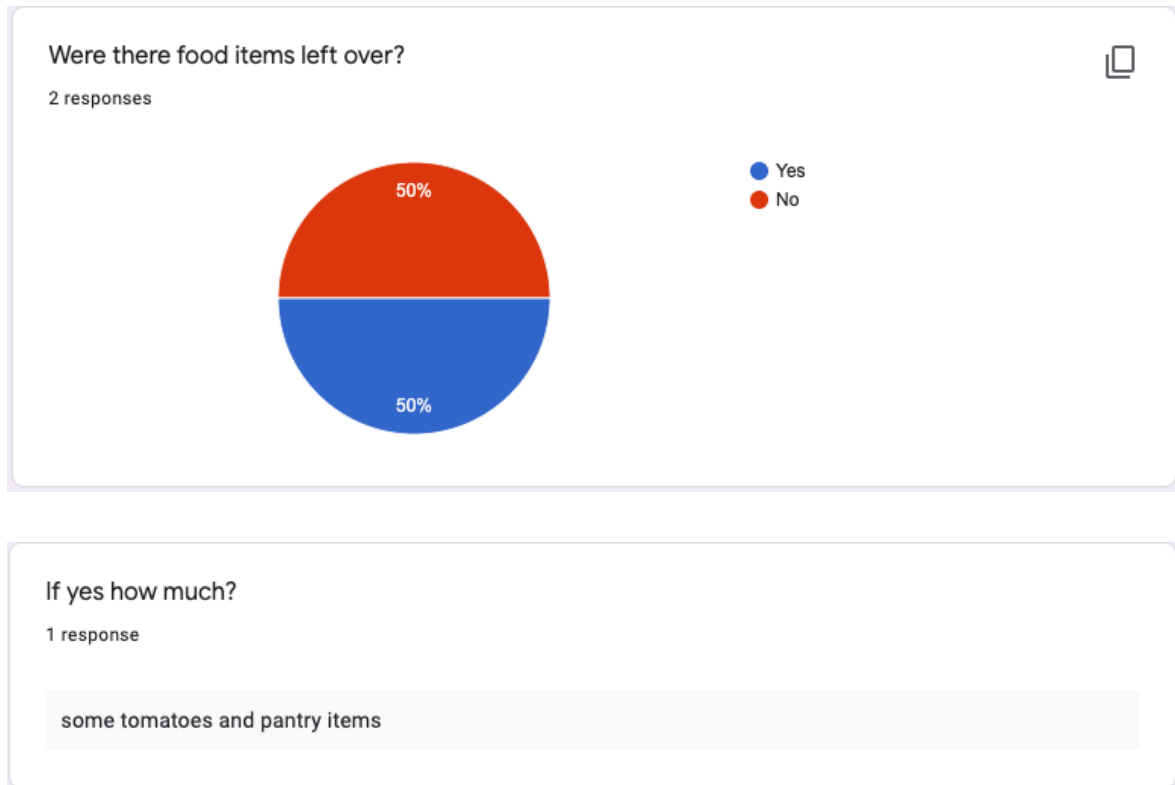
Figure 12 Results of Probes 2

These results show that the ability to omit pantry items and long shelf life products need to be taken into consideration. The more perishable tomatoes that were left after the process also raises a concern as this has a high probability of resulting in excess waste. After the assessment of the process it was seen that the probes would use the service again, however

there were areas of improvement in the notes of the probes, namely the portion size and the clarity of the instructions.
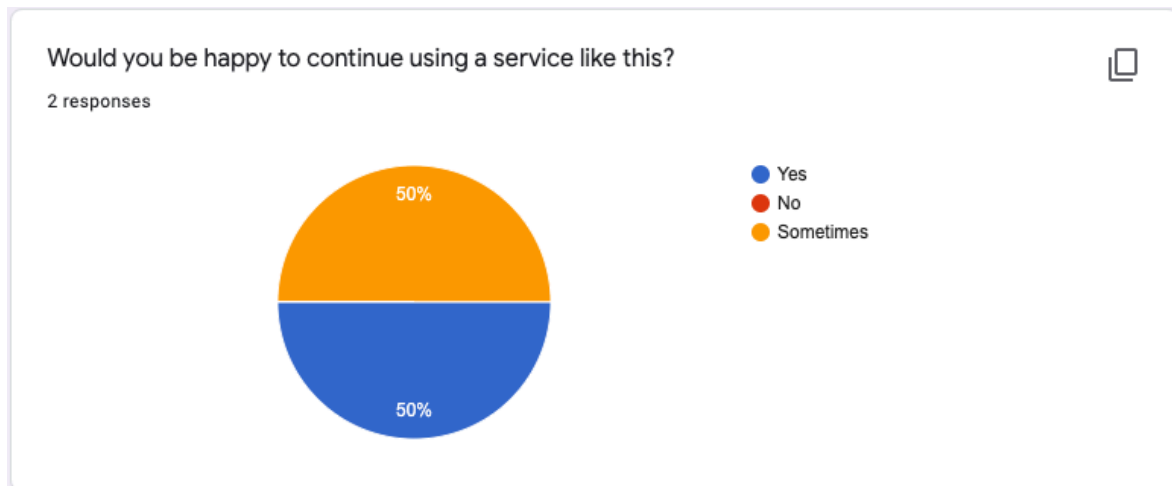
Figure 13 Results of Probes 3

Figure 14 Results of Probes 4

An emphasis of portion control and more clear cooking instructions are highlighted, however, the value and overall experience is rated as quite high by the test subjects. The need to highlight long lasting pantry ingredients is made apparent and the ability to omit them from future shopping crucial.

9.2.4 Service Advertisement

This research method is performed by creating a rudimentary advertisement that does not outright specify what the service is (Stickdorn et al, 2018). For this a 40 second advertisement was designed to highlight the FW aspects with limited information on how the service is to be provided/conducted. This was showcased to the 14 members of the accelerator focus group as an informal workshop. The members of the accelerator featured a cross section of students in the target demographic of single household, each with varied

levels of cooking experience. Screenshots of the advertisement can be found in the appendix 3.

Following the screening of the advertisement a short list of questions was presented to each participant of the study and a short informal interview process conducted to field any unforeseen questions or insights that the canvased participants may have. The questions asked were:

- What do you think this service does?
- Would you use this service as described by you?
- How could this service benefit you/others?

These questions were presented to the workshop group, which was divided into 4 subgroups consisting of 3-4 participants each to discuss their answers. The workshop host acted by monitoring and annotating answers made by each group and maintaining the schedule. The study results showcase how people that were aiming to explore the service were focused on ensuring that they would be participants of reducing food waste and they were actively learning more about the process of cooking. The respondents preferred effectiveness and efficiency in the service along with a good value for the service that was being provided to them. The participants seemed to be satisfied with the service provision and they believed that the service was aimed at creating convenience and ease for them throughout their utilization of the service. Their perception of the benefit arising from the service was that the service was aimed at reducing the food waste that was being produced. It is imperative to reduce the levels of food waste that is present within the current market and the cooking presence that tends to enhance the presence of food waste.

9.2.5 Netnography

Netnography is the process of collecting user reviews and insight from public online sources such as review sites, blogs, Twitter and Facebook (Kozinets 2014). As social media and online presence has become such a vital part of our communication, the amount of insight available can be very powerful to analyze. This will allow the research to have as broad of an insight as possible and help target pain points that may not be addressed in other forms of research.

The possible pitfalls of netnography to keep in mind are the reliability of the data provided as the anonymity of an online persona can create dishonesty, and the expertise of the person providing said data may be questionable (Kozinets 2014).

Two international and one local companies' ratings and comments were observed via user feedback given online. The companies chosen to analyze their online feedback were Jow, Blue Apron and Ruokaboksi due to their similarities and thus potential for comparison.

Table 3 Results of Netnography

Company	Rating	Positive	Negative
Blue Apron	2.5/5 based on 379 ratings submitted to consumer affairs *(source: https://www.consumeraffairs.com/food/blue-apron.html?#sort=top_reviews&filter=none)*	Easy recipes Varied Delivery/packaging	Calorie count Delivery Freshness issues Subscription charges Expensive
Ruolaboksi	3.2/5 based on 59 google reviews *(source: https://www.google.com/search?q=ruokaboksi&rlz=1C5CHFA_enGB862GB862&oq=ruokaboksi&aqs=chrome..69i57j46i175i199i275j69i59l2j69i60l2j69i61j69i60.1924j0j4&sourceid=chrome&ie=UTF-8#lrd=0x46920bb6a4408337:0x2089017e637465b1,1,,,)*	Healthy Delivery convenient	Bland Subscription issues Portion size too small Delivery problems
Jow	4.6/5 based on 5.465 google play store reviews *(source: https://play.google.com/store/apps/details?id=com.wishop.dev.jow&hl=fr&gl=FR)*	Convenience Inspiration Ease of shopping Fresh	Shopping list not calculated for packaging size/portion control

These companies had very different scores in their respective ratings and each exhibited a number of pros and cons in regard to their service and efficiency. Jow had the most positive feedback and largely only had complaints towards packaging size of items not corresponding to recipes resulting in FW. This being a very crucial point in the combating of FW in specifically single households. A notion that was highlighted in the use of the different services was a desire for health and calorie information and benefits, as well as the negative aspect of taste. As a service combating FW the desirability of the end product is of utmost important, as a dissatisfactory product can have negative consequences to FW produced.

10 Develop

The data provided by the various research methods will be processed and analyzed in in the development stage of the double diamond process. It is important to remain impartial and critical of the data collected, and service design tools will be utilized in conjunction with the double diamond method. This will clarify the data and provide direction for the proposal. The data analysis method enables the research to be expanded through accurate clarification and it allows for the research to be shaped up in an efficacious manner. The analysis in this particular regard aims to enhance the presence of food waste reduction and there is focus on creating awareness surrounding the concept of food waste. For the participants within this research, various methods of data analysis are being put into place for increased efficiency within the research.

10.1 Persona

Personas are an avatar or fictional customer/user for a product that represents the target audience of the service. Personas are used in order to distill the essence and needs of the user segment to better focus the service to said specifications. Personas are built using the data collected from the research conducted throughout the project and reflect the audience canvased via surveys, co-design workshops, interviews and netnography of users found through benchmarking. (Stickdorn et al 2018.)

Four individuals were created, each with unique expectations and needs when considering single households. The personas are illustrated below in figures 15-18.

Tim Persona

Stats:

Age 24

Enjoys playing football, the cinema, going out for drinks with friends or the occasional hike

omnivore... Tim eats everything you put in front of him but is slowly learning to make food himself(particularly fond of thai food)

Just finished school and is starting his first job in marketing

Needs:
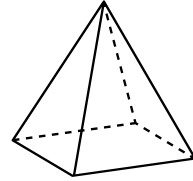
To find new balanced meals to cook with a novice level of knowledge

find time to allocate to all his activities and friends with his new work...

Wants to make a good impression at new work

Challenges

- Lack of knowledge
- Time
- Skills
- Focus elsewhere
- Equipment

Potential Solution

Tim needs the ease of being able to quickly get his shopping done and know what he is going to be eating the next few days to help balance his busy schedule and learn while doing it.

Figure 15 Persona 1 Tim Persona

Per Sonni

Stats:

Age 32

Has a passion for building and working in his shed, enjoys going out with friends to play billiards or rock shows

Primarily the staple of meat and two veg knows a thing or two in the kitchen but loves nothing more than to go out for a burger

Works in construction as a foreman

Needs:
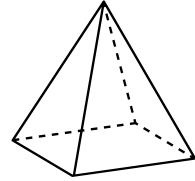
Recently single and looking to get better at cooking more varied meals for himself

Set a goal to try new things and improve homelife

Simple instructions that don't overwhelm, nothing too exotic so ability to omit things that are too out of the ordinary

Challenges

- Time
- Energy
- Equipment
- Skills

Potential Solution

Per is ready to try a few new things and set to try and better his skills in the culinary department. He could benefit from a service that doesn't lock him in and lets him learn at his own pace.

Figure 16 Persona 2 Per Sonni

Sara Persson

Stats:

Age 20

Plays boardgames with her friends when she finally has the time and sings in a band

Pescatarian but considering making the full switch to vegetarianism(its hard tho and getting more inspiration is tricky even tho Sara is a good cook)

Currently in second year of University studying for finance, working part time as a waiter at a local restaurant

Needs:
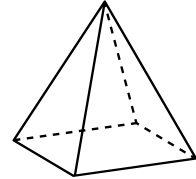
To find new vegetarian meals to cook with a good level of knowledge

Is super conscious about food-waste both because of cash and environment

Just moved into her own flat and discovering the challenges of cooking for one

Challenges

- Time
- Needs new avenues for inspiration
- Equipment
- Changing diet
- Budget!

Potential Solution

Saras drive to minimise food waste and save money(and the planet!) needs some help with varied meal options that utilise all the ingredients instead of eating the same thing 4 days in a row....

Figure 17 Persona 3 Sara Persson

Juliette Âme

Stats:

Age 28

So far its been creative outlets at home, painting, writing and movies mainly. Made a few new friends but still adjusting

A bit of everything and a shift to more plant based, but nothing hits the spot quite like traditional French cuisine

Recently moved to Finland from abroad to work for a small technologies company

Needs:
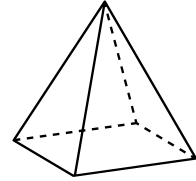
To figure out what is good to make and buy in Finland, in terms of local recipes and produce to better get to know the country. She CAN cook just would like to learn WHAT to cook here

More affordable French red wine...

Challenges

- Needs new avenues for inspiration
- Equipment
- Changing diet

Potential Solution

Juliette would like to know a bit more about the country and feels there is no better way to do that than through the plate. A service where she can see and learn more about the local produce and recipes would be a great benefit

Figure 18 Persona 4 Juliette Ame

These personas each exhibit different sections of the most prominent potential users found from the research conducted. Young independent users who are new to single households require different needs than the slightly more mature users, however finding a design that benefits the greatest cross-section of these individuals will be the most effective way to reach

the largest potential audience and needs to effectively reduce FW in single households. The personas are designed in order to provide a true reflection of the target audience that is aimed at being explained. This target audience assists in the provision of an accurate representation of the individuals that fit right into the glove and aim at creating efficiency within the research analysis. As a correct image is presented with regards to these users, it can be correctly seen how the processes need to be shaped up for improved outcomes.

Tim has been shown to be a young male who enjoys cooking his own meals and is gradually exploring his cooking skills. His cooking skills are relevant to the process of food waste because if he would not cook a good meal, he would end up wasting that food. Therefore, Tim is the ideal expression of a candidate indulging in food waste constantly. He also has a lack of knowledge, which may contribute to his food waste as he is not aware of the highly adverse consequences of indulging in food waste.

Per Sonni is another candidate for food waste as he is learning to cook with the arrival of his time to get married. He is ready to learn how food is made and therefore he may indulge in a high level of food waste owing to bad cooking that he may have initially or misshapen food that may not be presentable for anyone coming to his house.

On the other end of the consumer spectrum is Sara Persson, who exhibits the characteristics of the studied potential users who are very conscious about the food products that they consume, as well as, external environmental impacts that their consumer habits may entail. Sara has the added pressure of not having a sizeable disposable income which further emphasizes the importance of limiting waste. These factors create a desire that may have a similar design but yield different needs, and understanding these is crucial in the ideation process.

Juliette Âme represents the foreign demographic in Finland. The expat community is one that is growing in Finland and the influx of foreign inhabitants includes cultural and societal hurdles that need to be considered for the creation of the service. The foreign single household will have different expectations of a service. In the foreign persona created from the canvased demographics includes inspiration to both local and foreign cuisines that consider a different desire and use.

Therefore, it was explored how personas may assist you in better understanding your users' requirements, perspectives, behaviours, and objectives. Creating personas might assist you in stepping beyond your comfort zone. This could assist you in recognising that various people have varied requirements and desires, as well as assisting you in identifying with the user for whom you are developing. Personas simplify the design process, direct your ideation activities, and can assist you in achieving the objective of providing a positive user experience towards the targeted user group. Rather than developing goods, services, and remedies depending on the design team's tastes, several human-centered design approaches have made it common practise to collect research as well as personify specific trends and common themes as personas. As a result, personas do not depict actual people; rather, you create personas on the basis of real data gathered from a variety of sources. Personas bring a human element to what would otherwise be cold data in your study. Once you develop persona profiles for normal or atypical (radical) consumers, you would be able to identify trends in your research that will help you identify the sorts of individuals you want to design for.

10.2 Customer Journey Map

Customer Journey Maps are used in order to create a path that the potential user will undergo, in understanding this the design can highlight areas of frustration and frame the steps that a consumer goes through in order to best break down each action that the consumer has. This mapping process focuses on specific stages of a consumer from discovery of a service to retention, creating a lifecycle of the service and focusing on different aspect that the user may have; activities, goals, touchpoints, barriers and ultimately experience (Stickdorn et al. 2018, 129).

Customer activities follow what the consumer does during each phase of the service. The goals allow the viewer to understand what is important and motivating each stage of the process. Through this process it is also evaluated what the customer interacts with while traversing the lifecycle of the service in the touchpoints. The barriers encourage the designer to consider the pain-points and anything that may hinder the full use of the service. This mapping also contains and tracks the mood and emotional state of the user as they interact

with the service in order to empathize with the consumer and take these into account when designing the service.

As this is a theoretical service there was not one specific persona chosen to be the subject of the mapping but rather an amalgamation of the four personas created was used to visualize the different stages. The design will follow the process of discovering the service through its natural progression to retention and recommendation, thorough understanding of each will create the best opportunity in the ideation stage.

Customer Journey—Map

A visualisation of the customer experience utilising the product

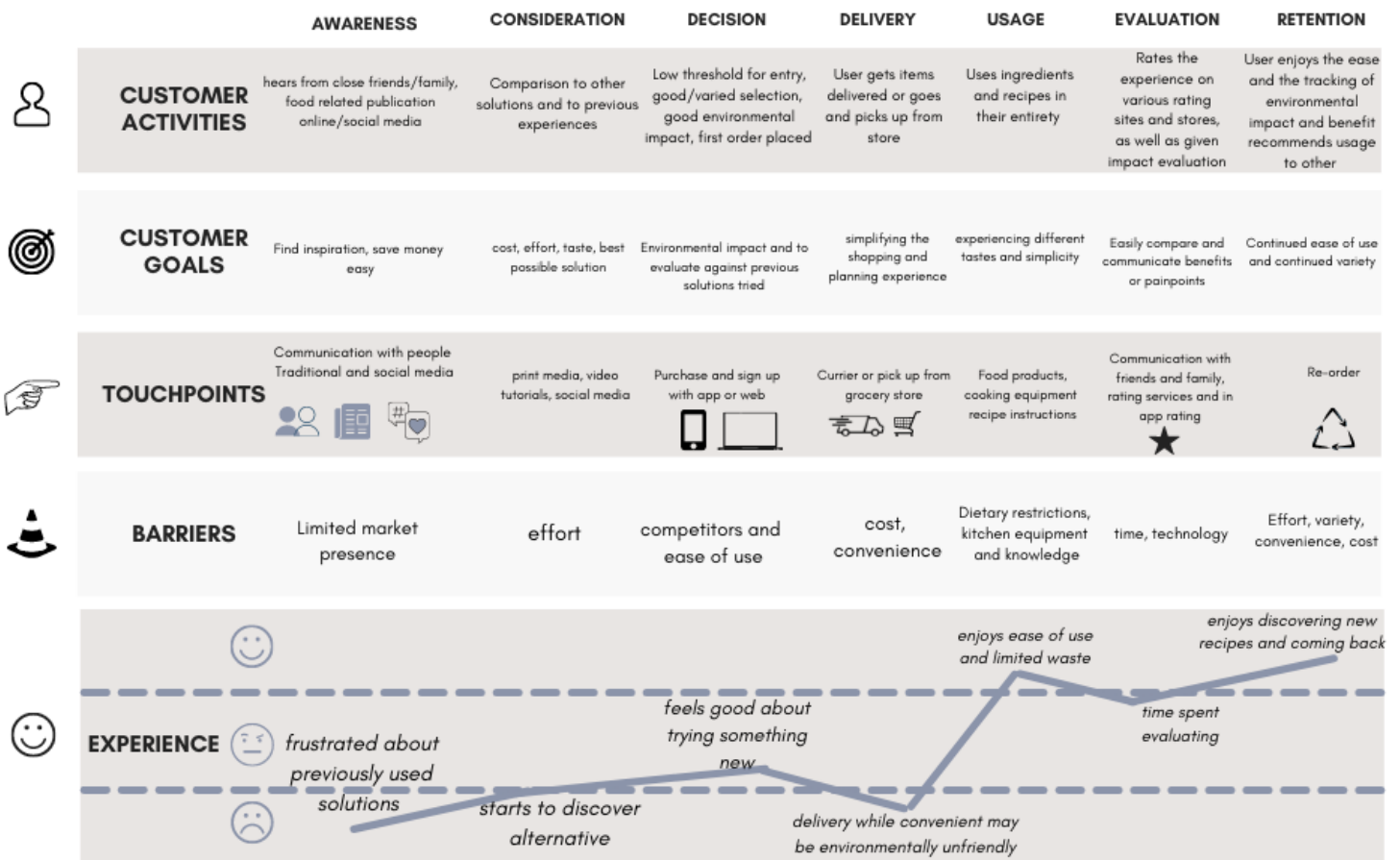|		AWARENESS	CONSIDERATION	DECISION	DELIVERY	USAGE	EVALUATION	RETENTION
👤	**CUSTOMER ACTIVITIES**	hears from close friends/family, food related publication online/social media	Comparison to other solutions and to previous experiences	Low threshold for entry, good/varied selection, good environmental impact, first order placed	User gets items delivered or goes and picks up from store	Uses ingredients and recipes in their entirety	Rates the experience on various rating sites and stores, as well as given impact evaluation	User enjoys the ease and the tracking of environmental impact and benefit recommends usage to other
🎯	**CUSTOMER GOALS**	Find inspiration, save money easy	cost, effort, taste, best possible solution	Environmental impact and to evaluate against previous solutions tried	simplifying the shopping and planning experience	experiencing different tastes and simplicity	Easily compare and communicate benefits or painpoints	Continued ease of use and continued variety
👉	**TOUCHPOINTS**	Communication with people Traditional and social media	print media, video tutorials, social media	Purchase and sign up with app or web	Currier or pick up from grocery store	Food products, cooking equipment recipe instructions	Communication with friends and family, rating services and in app rating ★	Re-order ♻
🚧	**BARRIERS**	Limited market presence	effort	competitors and ease of use	cost, convenience	Dietary restrictions, kitchen equipment and knowledge	time, technology	Effort, variety, convenience, cost
🙂	**EXPERIENCE**	frustrated about previously used solutions	starts to discover alternative	feels good about trying something new	delivery while convenient may be environmentally unfriendly	enjoys ease of use and limited waste	time spent evaluating	enjoys discovering new recipes and coming back

Figure 19 Customer Journey-Map

It is seen from the customer journey map that there is a considerable rise in mood, however, the aspect of delivery while convenient does pose a dilemma for the environmentally

conscious. The barriers address the need for a cost-effective design that allows a very low barrier for entry and can reach the largest potential user group. The goals of the consumer are clearly marked and highlight the need for a large variety of options as well as a flavorful offering.

A common feature of customer journey maps are the aspects of the business during each stage of the customer journey. These have been mapped separately as they represent two sides of the same coin and as such are more easily interpreted in an entirely separate map. This allows for a better comprehension of what the business goals are and what measurable metrics need to be considered to monitor and improve the service.

Business Journey— Map

A visualisation of the Business model at each user stage

	AWARENESS	CONSIDERATION	DECISION	DELIVERY	USAGE	EVALUATION	RETENTION
BUSINESS GOAL	Increase the reach of awareness to potential users and customers	Increase awareness of benefits and value of service	Increase users meal variety and improved shopping experience	Increase interaction between local grocers and users	Ease of use, concise clear, and maximising products yield	Obtaining clear and concise evaluations and feedback of service and improving	Maintaining a loyal user base that gains value from service and cooperative positive environmental impact
KPI	Number of users and website traffic	Conversion from sign up to purchase	Number of transactions	Number of meals delivered	Number of repeat orders	Online Rating	Number of repeat orders
ORGANIZATIONAL ACTIVITIES	Creating and distributing marketing materials both in an online space as well as print media	Creating campaigns that highlight the value of the service	Consistent variety in menus offered, positive environmental impact, ease of use	Easy to understand and purchase ingredients	Unique and interesting recipes that are easy to follow	Develop products and added services based on user feedback	Add new features and campaigns and improve visibility of positive impact
RESPONSIBILITY	Marketing & communications	Marketing & communications	Product development & Design	Logistics & Accounting	Product development & design Customer service	Product development & design Customer service	Marketing & Product development
TECHNOLOGY/ SYSTEM	CRM, Analytics, Social Media metrics	CRM, Analytics, Marketing automation	CRM, Analytics, algorithmic menu sugestions, Inventory systems	CRM, Logistics systems, Inventory systems, e-commerce	CRM, help desk	CRM, help desk, ratings and feedback software	CRM, Analytics, Targeted Marketing Social Media metrics

Figure 20 Business Journey-Map

From this stage the service can more clearly focus and understand what each function of the stages are and what department would be responsible. This creates accountability for each

stage and also highlights the systems and tools necessary in order to maintain the service. With each stage, there is also a highlighted goal of the business and how best to measure these goals to continue the growth and improvement of the service.

10.3 Business Model Canvas

Business model canvases are a tool that break down each aspect of an industry into key components; value propositions, customer segments, customer relationships, channels, key activities, key resources, key partners, revenue streams and cost structure as well as two subcategories risk and opportunity. This tool allows a designer to look closer at each individual aspect of a business or proposal in order to better understand each component. This in turn allows the designer to articulate these for outside perspectives to quickly gain a vast insight into the business based on a short overview. (Stickdorn et al. 2011.)

The business model canvas has been a popular tool as it can easily be updated and has the ability to show congruity between different segments. For the proposed design, a theoretical business model canvas was created that visualizes the potential configuration of the service.

The canvas illustrated in figure 21 was built with information gathered in the research phase and incorporated customer feedback and segments based on personas that were designed via the studies conducted.
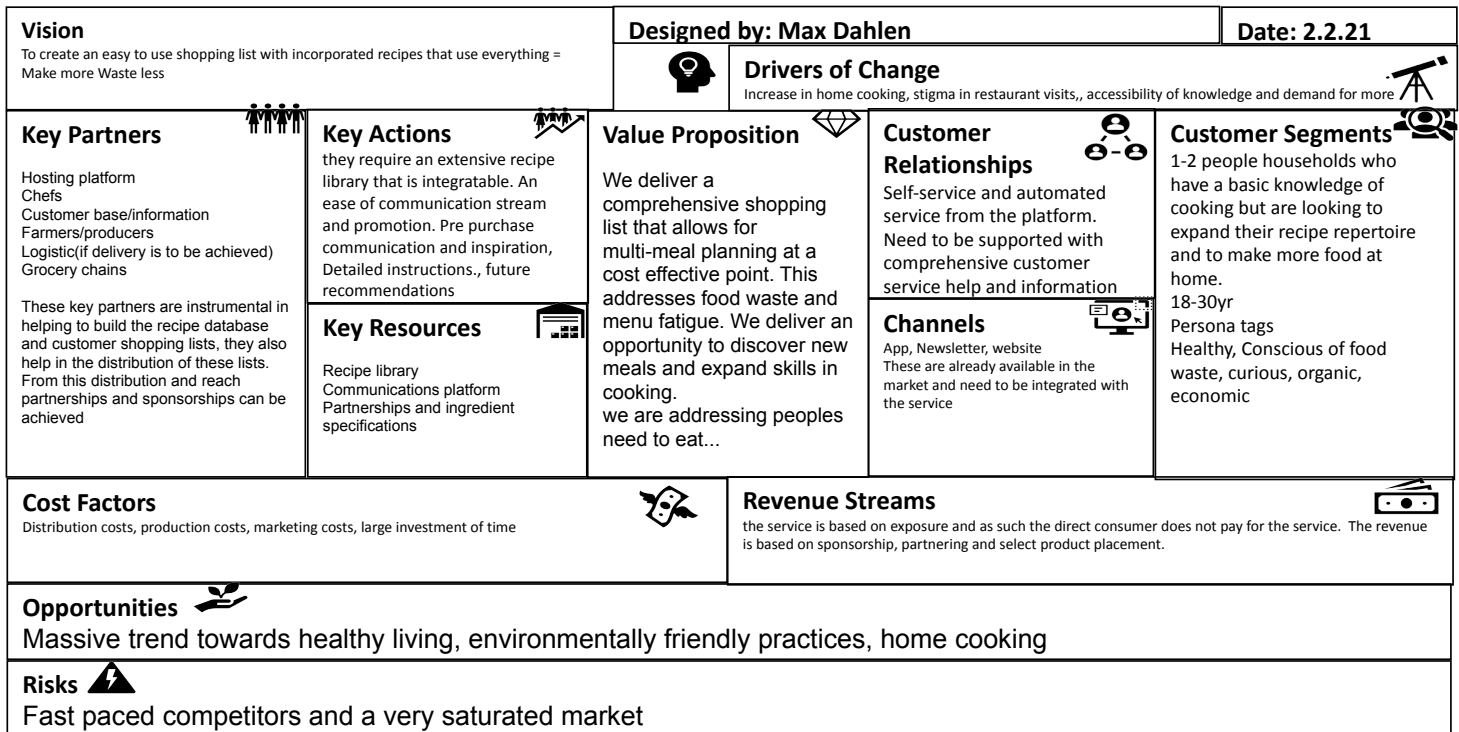
The Business Model Canvas

Vision			Designed by: Max Dahlen		Date: 2.2.21
To create an easy to use shopping list with incorporated recipes that use everything = Make more Waste less			**Drivers of Change** Increase in home cooking, stigma in restaurant visits,, accessibility of knowledge and demand for more		

Key Partners

Hosting platform
Chefs
Customer base/information
Farmers/producers
Logistic(if delivery is to be achieved)
Grocery chains

These key partners are instrumental in helping to build the recipe database and customer shopping lists, they also help in the distribution of these lists. From this distribution and reach partnerships and sponsorships can be achieved

Key Actions

they require an extensive recipe library that is integratable. An ease of communication stream and promotion. Pre purchase communication and inspiration, Detailed instructions., future recommendations

Key Resources

Recipe library
Communications platform
Partnerships and ingredient specifications

Value Proposition

We deliver a comprehensive shopping list that allows for multi-meal planning at a cost effective point. This addresses food waste and menu fatigue. We deliver an opportunity to discover new meals and expand skills in cooking.
we are addressing peoples need to eat...

Customer Relationships

Self-service and automated service from the platform. Need to be supported with comprehensive customer service help and information

Channels

App, Newsletter, website
These are already available in the market and need to be integrated with the service

Customer Segments

1-2 people households who have a basic knowledge of cooking but are looking to expand their recipe repertoire and to make more food at home.
18-30yr
Persona tags
Healthy, Conscious of food waste, curious, organic, economic

Cost Factors

Distribution costs, production costs, marketing costs, large investment of time

Revenue Streams

the service is based on exposure and as such the direct consumer does not pay for the service. The revenue is based on sponsorship, partnering and select product placement.

Opportunities

Massive trend towards healthy living, environmentally friendly practices, home cooking

Risks

Fast paced competitors and a very saturated market

Figure 21 Business Model Canvas

As the canvas depicts, the business will focus mainly on the customer segment of 1-2 households and a relatively young demographic as these were the ones found to be the cause of most FW. This segment also had a limited knowledge of food production and waste management and as a result were the main focus for the customer segment. This allowed the canvas to be inundated with further information on what communication channels best suited this demographic and the value that could be brought from the service. The completed business model canvas was a vital method in the design process as it best highlighted the potential value of the service and by which means to best approach it. It was a step which summarized the goal of the service and how to achieve viability.

10.4 SWOT

Using the data gathered and creating SWOT analyses will also help to focus and highlight the information. SWOT analyses are used in a number of different industries to categorize and focus the Strengths, Weaknesses, Opportunities and Threats (Madsen, 2016).

The analysis uses the data collected and portrays it in a clear and easy to understand table format exhibiting both internal and external factors that have an impact on the service and business and synthesize these into a concise framework (Jurevicius, 2013). This form of analysis will better help to articulate and visualize the pain points and hurdles that the industry faces as well as highlight the areas in which they are succeeding.

The analysis will help the service concept identify what benefits it offers that are unique to the demographic and how it is set apart from what is currently available in the marketplace.

Figure 22 SWOT Analysis

The SWOT analysis helps to identify the issues in the service and what areas create the greatest opportunity for design and improvement. As a theoretical design there are constraints and weaknesses that need to be addressed from lack of backing and industry knowledge. These hurdles are the ones that create a large potential for failure. SWOT analyses provide a clearer view of where pitfalls may occur and as such a unique approach or design can be created by acknowledging these and circumventing them.

The strengths and opportunities of this design are many. As the design has a great deal of fluidity due to not being specifically tied to an industry, there is a great deal of flexibility in how the design interacts with users. As the design approaches viability, the highlights of the strengths need to be accentuated in order to better understand the unique selling point of the service and create better understanding for the designer.

11 Deliver

Considering the different tools and insights gathered from the research phase the delivery process incorporates the information obtained and creates the service proposal. The delivery is a theoretical practice and acts as a visualization of the best possible service to address the highlighted needs of the potential users and creates a unique offering. Equally important in the consideration is the need to address the potential pain-points that were made available in the research phase.

The designed service is a mobile and web application that will allow users to add desired recipes for a given week that utilizes the full extent of the ingredients by incorporating each purchased item into multiple varied meals. The design of this will allow users to create simple meal plans for their week that has flexibility, low cost and offers the required knowledge in order to best limit FW. As the main causes of FW were seen in over preparation, lack of knowledge, and a diminished desire to consume the purchased food, this service would alleviate menu fatigue and educate the user in what areas they are saving FW and what meals to make with ingredients to maximize yield.

The designed service will follow a simple flow. A user downloads the required app or accesses the web portal. These touchpoints were decided on as they are the most prevalent in the demographic studied. From there the user would register what dietary requirements or restrictions they may have, and from there how many meals that week they wished to prepare. From this information the service would provide 3-5 varied recipes that can be made

with a modest shopping basket that fully utilizes each ingredient, limiting the waste potential. The flexibility and low cost will allow for a larger potential of single households to use the service, as well as the targeted and specific portion control of solitary users allows each user to easily scale up their serving sizes should they desire to.

A monitoring aspect of the benefits and impact of the use of the service will be incorporated in order to increase knowledge and motivation in users to prevent FW, as a large concern of the public was the lack of awareness of impact of simple discretions in FW monitoring.

As the service is theoretical, a mock-up of the mobile service was created that illustrates the flow of the service designed.
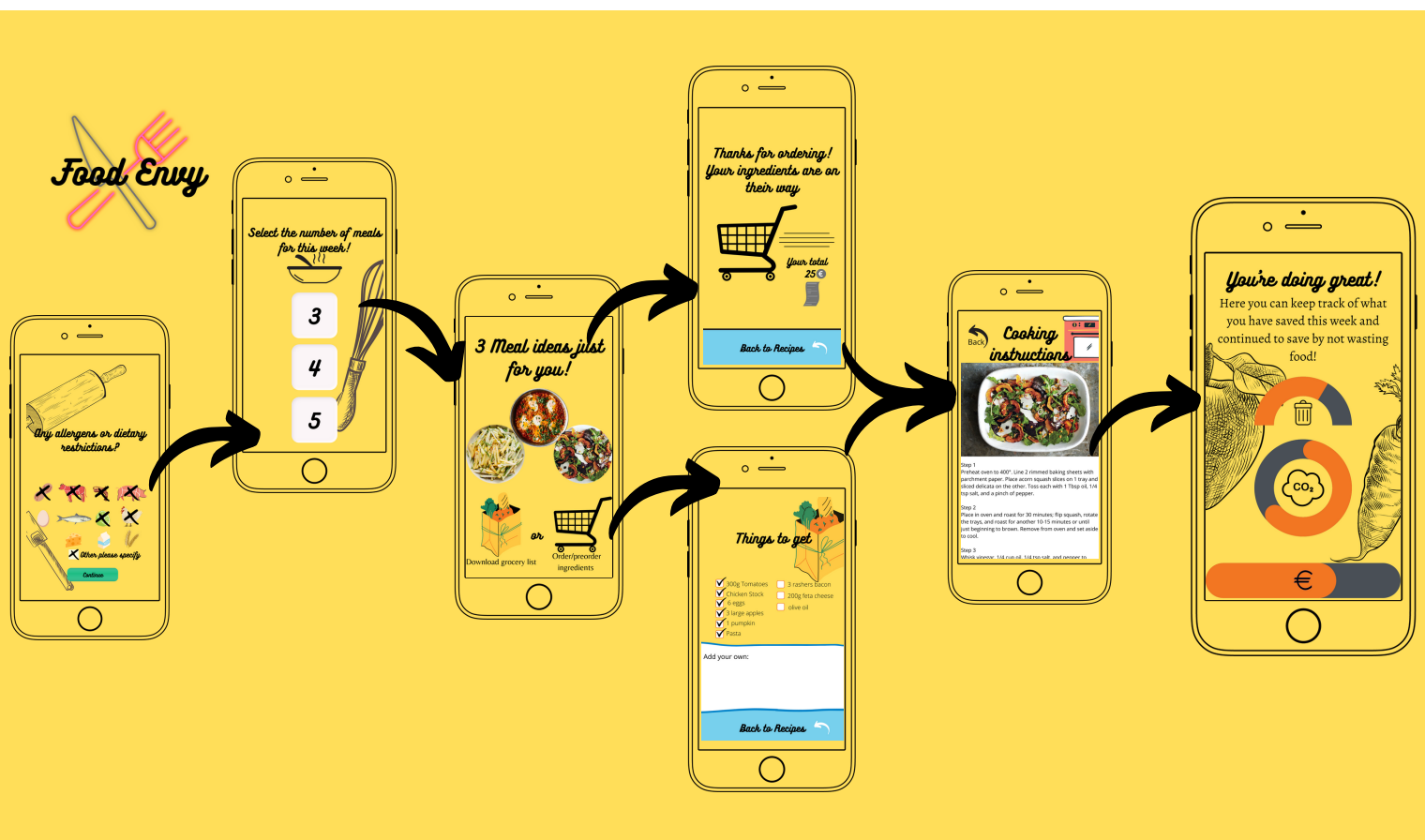
Figure 23 Flow Of Service Design

The design for the service revolves around limited waste and low cost, and as such the monetization of the service to maintain functionality was considered. In order to limit the cost basis for the end user the monetization aspect of the service would be from commission based sales through grocery chains that would employ the service as a means to promote customer loyalty as well as upsell.

This ideation best allows users to gain information and value in an act of preserving and preventing FW. While there are other services that provide similar aspects as seen in the benchmarking and service safari, none of the tested services are specifically targeted to uniquely single households, and the few that are fell short in delivering to single users. This presents the ideation with an opportunity to improve in this specific area and truly limit the FW created in the single household, which currently has the highest impact and potential.

12 Conclusion

With the use of the research methods listed and prototyping, this paper aims to extrapolate new workable solutions for single consumer households in order to combat food waste and menu fatigue.

The ideation of the service in its infant stages revolves around creating a shopping list that incorporates all ingredients in a variety of ways in order to maximize yield and creativity for the consumer. This in turn will create less FW as well as allow for an aspect of discovery. The ideation created is designed to solve these issues, however, without more real-world application it is truly more a theoretical design result and no concrete conclusions can be drawn as of yet with the information gathered and provided.

The design that was produced from the outcome of the research conducted and from the processes used is one that accurately addresses the single household need for limiting FW. As the ideation and design address the three main causes of FW as mentioned; plate waste, production waste and spoilage, they are a considerable step in the right direction in the prevention model (Papargyropoulou et. al 2014). When piloting the prototype, consistant feedback was gained in the accelerator and test groups, each giving the ideation concrete data to improve and thus better the final product.

This effort, as stated, however is in need of further testing and an ability to test real-world solutions for a longer period of time is necessary. The concept of FW as an issue on the whole is one that needs to be tackled from many angles and any one solution will not be enough. The design is successful in that it addresses the researched causes of FW as well as the unique needs of the single household. Providing users with new ideas for usage of produce addresses the need for education and menu fatigue that is so common in single households. The monitoring aspect of the service allows individuals to follow and track their impact on a larger scale and creates an incentive to be more conscious about FW.

The research questions were each utilized in the process of writing the thesis and conducive of the information gathered. Each research question can be answered as a result of the information gathered and a solution is presented at the delivery of the design.

What is causing food waste in single households?

Currently there are a number of factors that contribute to FW in single households. The main areas of impact on FW in single households are a result of over production, or 'plate waste'. This can be attributed to packaging of raw foods not being optimized for single households and encourages over production of food which quickly can lead to spoilage and waste. The effort that is used in order to produce meals at home is often one that is difficult to justify in a single household, which leads to pre-planning and meal preps that are designed to be consumed through ought the week, however as seen in figure 6 (Food Waste and Causes) the desire to consume these foods deteriorates and is conducive to waste.

To what extent are single households monitoring food waste?

Single households are currently not very active in monitoring food waste. This is because the majority of solutions to limit FW are in the packaging and pre-consumption stages of the FSC. There are a number of tools that have been developed in order to limit FW in single households, such as single serving meals, kits and applications that allow single households to limit the amount of food wasted. However, there are few services and little evidence to suggest single households monitor their food waste production. Conversely, the interest and desire to limit FW in single households and the demand for a solution to the issue were seen.

What are the cooking habits of single households?

Single households are varied in their cooking habits. As illustrated in the 4 personas, single households have different expertise and dietary restrictions. This leads to very different cooking and consuming habits. Single households therefore present the largest and most varied demographic. From this however there were trends and similarities in the habits and practices in cooking in single households. The growing demand for healthy, fresh food, convenient and interesting meals was observed. Utilization of meal plans and meal kits is a growing trend in the single household as it provides convenience and optimization of ingredients and time and has become a large influence on the cooking habits of single households.

How can we reduce food waste?

Reducing food waste is a very large issue and there is no one solution to the problem. In order to incrementally reduce FW it is necessary to educate on the proper handling and storage of food items in order to maximize usability. Limiting the amount of food wasted in the preparatory and storage stages of consumable food items is one of the best ways to limit food waste, as this limits the potential for waste. Proper planning and reduction in over production and purchases is also crucial to limiting the potential for FW.

This paper, while theoretical, is also purposed to raising the awareness and knowledge of average consumers as to how FW has had, and continues to have, an impact globally. As the growing demographic of single households in Finland evolves in the future, services catered specifically to them are ones that need to be developed. While the increase of single households grows as well as a desire for transparency in the FW industry these services will continue to find new solutions to these issues. As an opportunity to expand users' knowledge of FW and consumer habits this paper has found a viable design and service that can be implemented.

13 Analysis of Learning Process

The process required considerable use of various service design tools and methods and as such was a good exercise in design. The process was limited by time constraints as well as the limitations presented due to the lack of a commissioner. The process however was aided by the use of an accelerator development program which allowed multiple tests to be conducted and multiple service design tools to be implemented in order to build the ideation of the final service. This process acted as the catalyst in place of a commissioner and helped focus the results and have the consistent feedback loop necessary for a design project when the designer has previous knowledge of the subject matter.

The concept of service design is explored in the project and the end result is a product that was designed through the lens of a service designer. As a service design project, correct usage of tools and implementing multiple strategies is paramount, as it allows the designer to conceptualize multiple viewpoints and usages into one viable service, and to illustrate and articulate said service. Viewpoints and empathy are the key components in service design as it is through these that the most suitable product or solution can be created. Understanding potential users or uses is the building block of service design and having the knowledge and input from these is how successful designs are created. Taking these insights and concepts once gathered and illustrating and articulating them is tertiary and cannot be done without a

justified and concise study of the subject-matter and service. This is achieved in this paper and this project. Each component is justified via the tools used and the concept is illustrated in an appropriate manor.

The conclusion found in the project is satisfactory as it is based on a design that was created via a plethora of tools and insights from potential users and external designers. However, while satisfactory, it can be expanded on with more concrete testing and the aid of real-world metrics. This is what the next step for the design would be. Presented with the opportunity to implement the service in an already existing marketplace would give the design the possibility to continue to refine. This is a potential outcome for the project, however, not necessary for the creation and presentation as a service design concept.

In the learning process other service design tools could have been considered and utilized in order to gain a wider insight to the subject matter and allowed for a more comprehensive ideation. As the service design followed a relatively narrow target group this could have been expanded with the use of an online survey that could have gauged the insights of a more varied cross-section of the single household, with more varied age and background. This could have provided useful insights that had not been considered by the research conducted nor the participants in the co-design.

The journey in learning about and understanding service design and eventual application in this project was enlightening and has provided me with an interesting arsenal of tools that can be applied to different facets of industries and services. Being able to analyze and understand the service design process has been very beneficial. It is a process that many industries unwittingly are conducive of but not necessarily aware of and gaining intimate knowledge of it is a learning process that has been illuminating.

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Appendix 1: Probe menu

Items	Menu1	Menu2	Menu3
Fresh: Tuna can Chicken Tomatoes Garlic Lemon Olives Capers Parmesan Spinach Chili Cream Halumi Pita Pantry/staple: Olive oil Spaghetti Dried oregano	Pasta puttanesca Heat the oil, garlic, chilli and oregano in a large sauté pan for 2 mins. Stir in the capers, olives and tomatoes and cook for 5 mins. Add the tuna and lemon zest and juice, then continue to cook for 10 mins. Meanwhile, cook the spaghetti according to the pack instructions. Once cooked, lift with tongs straight into the tuna sauce. Toss with the spinach and season. sprinkled with Parmesan	Chicken and cream spinach Cook chicken until golden brown in oven safe pan with olive oil on one side, about 4-5 mins and turn and cook an additional 4-5 mins. Remove the chicken breasts to a plate, reduce the heat to medium, and add the minced garlic to the pan. Cook the garlic about 2min. add the spinach and a pinch of salt. Stir and cook until the spinach is wilted. Stir in the cream and parmesan cheese. Bring to a boil and add back the chicken and place in the oven at 180c for 6min. once out squeeze half a lemon and zest over the chicken and sauce	Halumi pita with olive and caper tepanade Make a salsa with the tomatoes, chili, garlic olive oil. In a blender place the olives, capers and olive oil and lemon juice and blend till a paste is made. Slice the halumi into equal slices and fry in olive oil until golden on each side. Toast the pita in an oven at 150 for 1 min, slice open and place the tepanade, salsa halumi and remaining spinach

Appendix 2: Questionnaire for completion of probe process

Menu Probes
Completing the week how was the experience?

1. How did you find the experience from 1(horrible) to 5(good)

   Mark only one oval.

	1	2	3	4	5	
Horrible	◯	◯	◯	◯	◯	Good

2. Were there food items left over?

   Mark only one oval.

   ◯ Yes

   ◯ No

3. If yes how much?

   _____

4. How would you rate the value of the meals?

   Mark only one oval.

	1	2	3	4	5	
Horrible	◯	◯	◯	◯	◯	Good

5. Would you be happy to continue using a service like this?

Mark only one oval.

◯ Yes

◯ No

◯ Sometimes

6. What would you like to see improved?

_____

_____

_____

_____

_____

Appendix 3: Screenshot of commercial

Food Envy

Make more, Waste less

01

02

Cooking for one

Do you struggle finding recipes to make at home for just you and are starting to get tired of the same 5 things you cook every week?

03

You want healthy/new

But don't know what the hell to do with this
pumpkin other than a weeks worth of pumpkin
soup?

→

04

**Uninspiring recipes and lack of
diversifying creates roughly 30Kg
of annual food waste in single
households**

→

Download weekly shopping list and recipes with Food Envy

This makes food shopping less frequent and a lot cheaper too.

→

Make More Waste Less...