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**AALBORG UNIVERSITY**  
STUDENT REPORT

**Title:** 'Am I fighting food waste?' A Qualitative Study of Perceived Food Waste and How Technologies Affect Household Food Waste

**Semester theme:** 10<sup>th</sup> semester, Master Thesis

**Project period:** 03 February – 09 June

**ECTS:** 30ECTS

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Number printed: 0  
Pages: [19]  
Pages Appendix: [270]  
Enclosures: []

**Synopsis:** Food waste is a known problem and is being focused on globally in order to reduce CO2 worldwide. There exist several applications with the goal of helping consumers to reduce food waste. Within HCI research food waste is studied with the objective to reduce food waste using prototypes, though to our knowledge little has been done to understand how existing technologies are used in households and how it is perceived in relation to reduce food waste. We have conducted 17 interviews focusing on households' food waste and everyday life structuring as well as experiences with the application Too Good To Go buying magic bags. In addition, we conducted thirteen diary studies for a two-week period documenting participants' food waste, leftovers, and purchases of Too Good To Go. Our findings suggest participants' motivation and attitudes differ and is liable to affect how food waste is handled in the households. Furthermore, we found how Too Good To Go and meal boxes both bring surprises and challenges, where the challenges of the unknown in magic bags could lead to more food waste for the participants' household. Surprisingly some of the participants found different ways of incorporating these issues into their daily lives.

Additionally, have we attached a report with reflections toward methods and how this project was affected by Covid-19.

**By signing this document, each member of the group confirms participation on equal terms in the process of writing the project. Thus, each member of the group is responsible for the all contents in the project.**

# Resume

Vores speciale består af en videnskabelig artikel og en supplerende rapport. I artiklen præsenterer vi et forståelses studie omhandlende hvordan madspild opfattes, samt hvordan teknologi som Too Good To Go og måltidskasser bliver anvendt i husstande, for at reducere madspild. Den sekundære rapport indeholder refleksioner om vores valg af metoder og hvordan denne undersøgelse er blevet påvirket af Covid-19.

Emnet 'madspild' er stigende inden for HCI forskning det seneste årti hvoraf flere undersøgelser har fokus på, hvordan teknologi kan bruges til at reducere madspild (eksempelvis [8], [30]). Tidligere forskning inden for HCI har udviklet forskellige prototyper, der bruger funktioner til at øge opmærksomheden samt viden om forbrugernes madspild, hvilket antydes at have en positiv evaluering med henblik på at reducere madspild [8]. Selvom meget HCI forskning er lavet med henblik på at forstå hvordan forbrugerne forstår og arbejder med madspild, til vores viden er der begrænset studier der arbejder på at forstå hvordan brugerne anvender eksisterende teknologi for at reducere madspild.

I vores kandidatspeciale bidrager vi til HCI forskning med viden omkring hvordan brugerne anvender Too Good To Go samt måltidskasser, der er eksisterende teknologier som kan anvendes til at reducere madspild. Dette er gjort ved at afholde 17 interviews med fokus på at undersøge deltagernes indkøbs-, og madvaner, samt deltagernes erfaringer med brug af Too Good To Go og måltidskasser. 13 af deltagerne deltog i et billede dagbogsstudie, hvor de i to uger dokumenterede deres husstands madspild. Dette blev gjort gennem uploading af billeder og tekst på Facebook Gruppe Chat, hvor der løbende blev kommunikeret mellem deltagerne og projektgruppen.

Vores resultater fra interviewene samt billede dagbogsstudiet er opsummeret i fire forskellige temaer (i) 'Motivation and attitude': forskellige typer af motivation og attituder adskiller sig fra deltagerne og havde en effekt på madaffald i deres husholdninger. (ii) 'Technology and food waste': de fleste deltagere stillede spørgsmål ved, om hvorvidt brugen af Too Good To Go reducerer madaffald i deltagernes husstand, eller om købet blot flytter forretningernes madspild hjem til dem. (iii) 'Surprise and challenges': Lykkeposen fra Too Good To Go indeholder ukendt mængde og indhold, hvilket blev opfattet forskelligt mellem deltagerne. Dette anses enten som værende en gave eller en stor udfordring at skulle få brugt. (iv) 'Regular and irregular use': Deltagerne brugte enten Too Good To Go samt måltidskasser regelmæssigt eller uregelmæssigt, hvor nogle deltagere fandt forskellige metoder til at håndtere store mængder varer.

Vi diskuterer vores findings mod eksisterende HCI forskning, som er præsenteret i tre temaer, (i) 'Technologies impact on food waste': Vores resultater viste hvordan dele af henholdsvis Too Good To Go samt måltidskasser ikke hjælper på at reducere madspild. Hvilket er kontroversielt fra tidligere HCI-forskning, der fokuserer på, hvordan forskellige aspekter af teknologier kan hjælpe med at reducere madspild for husholdninger. (ii) 'The effect of Too Good To Go and meal boxes on food habits': Resultaterne viser, at

planlægning og generelle madvaner kan have indflydelse på hvor meget og hvilken mad, der bortskaffes og bruges fra måltidskasser og Too Good To Go. (iii) 'Sharing food': deling af mad er et kontroversielt emne, hvor deltagerne ser muligheden for at undgå madspild ved at dele med andre mennesker. De fleste af deltagerne ønsker at dele mad, men de prioriterer, hvem de deler med, hvor deling og modtagelse af mad med eller fra fremmede ikke er en sikker oplevelse for alle.

Dette studie konkluderer ikke, om hvorvidt Too Good To Go eller måltidskasser reducerer madspild i forbrugernes husstand, vi har i stedet indikationer om at Too Good To Go og måltidskasser kan forårsage mere madspild, forårsaget af udfordringen med en omfattende mængde ukendt mad. For at forstå en konkret påvirkning på madspildet, er der behov for mere forskning.

# Preface

We are three Interaction Design master students at Aalborg University. Our master thesis consists of an article and a supplementary report. In the article, we present a qualitative study on food waste. Food waste is appearing in all types of households and is often presented in the media as a struggle in need of attention. This attention has already been given both within and beside the HCI research, where several studies have focused on understanding where and why food waste comes to be present for the consumer to creating products in order to prevent food waste. As Interaction Designers, we use user research in order to understand how consumers use technologies and how this is affecting household food waste.

This study is conducted primarily using interviews as data collection with 17 participants, where 13 participants conducted a photo diary study for two weeks. In the photo diary study each participant where to upload at least one picture a day of their food waste and pictures when they have used Too Good To Go. The results of this study show how magic bags from Too Good To Go both give the participants thrill of the surprise, but there are also challenges resulting in participants having more food waste. The effect on food waste is not definite but confirm how technology can have the opposite effect on food waste within consumers household.

This article contributes to the HCI research by showing how Too Good To Go and meal boxes could have an effect on households and how these households perceived food waste and use the technologies.

The secondary report contains reflections on our choice of methods and how this study has been affected by Covid-19.

# **‘Am I fighting food waste?’ A Qualitative Study of Perceived Food Waste and How Technologies Affect Household Food Waste**

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## **ABSTRACT**

Food waste is a known problem and is being focused on globally in order to reduce CO<sub>2</sub> worldwide. There exist several applications with the goal of helping consumers to reduce food waste. Within HCI research food waste is studied with the objective to reduce food waste using prototypes, though to our knowledge little has been done to understand how existing technologies are used in households and how it is perceived in relation to reduce food waste. We have conducted 17 interviews focusing on households’ food waste and everyday life structuring as well as experiences with the application Too Good To Go buying magic bags. In addition, we conducted thirteen diary studies for a two-week period documenting participants’ food waste, leftovers, and purchases of Too Good To Go. Our findings suggest participants’ motivation and attitudes differ and is liable to affect how food waste is handled in the households. Furthermore, we found how Too Good To Go and meal boxes both bring surprises and challenges, where the challenges of the unknown in magic bags could lead to more food waste for the participants’ household. Surprisingly some of the participants found different ways of incorporating these issues into their daily lives.

## **Author Keywords**

Food waste, Photo diary, Qualitative method, Food and technology, HCI, User behavior

## **INTRODUCTION**

In order for Denmark to reach the goal of being CO<sub>2</sub> neutral by 2050, food waste is one of the subjects being focused on [9]. A study has shown that consumers’ purchases of food with short expiration dates have helped the consumers reducing food waste the most [20]. In many stores, it is possible to find dedicated places for nearly expired food being sold at a lower price, yet 36% of the total food waste is found within households [33]. Studies have shown that especially fruit and vegetables are one of the primary discarded products, closely pursued by bakery and meat [34]. Yearly is 250.000 tonnes of food disposed of by the Danes and is according to the government an unnecessary use of resources [21, 28].

With the global focus on waste and particularly food waste, several technical platforms have emerged with the goal of reducing food waste within the industry and the private consumer household. Some of these technologies aim directly at reducing food waste from the industry (e.g. Too Good To

Go [18], “Mad skal spises” [26] and “RedMaden” [30]), all these are functioning by the store having food that not is salable and instead offered through the applications as offers the consumers can buy to a lower price. According to Too Good To Go, their application has saved over 5 million meals corresponding to approximately 13 thousand tons of CO<sub>2</sub> in Denmark [18]. Services such as meal boxes are also suggested as being a solution to reduce food waste through apportioned food [25]. Other existing meal boxes are the Grim Box, where the box consists of fruits and vegetables that otherwise would have been disposed because they are not fit to be sold in stores [19].

The subject ‘food waste’ has increased within the HCI research through the last decade with several studies focusing on how technology can be used to reduce food waste (e.g. [10] [36] [35]). Previous studies within HCI research have different prototypes using functions to increase awareness and knowledge, these functions are suggested to have positive evaluation toward reducing food waste [10]. Though to our knowledge little has been done trying to understand how consumers understand and work with food waste and furthermore how they use technologies to prevent food waste.

In this article, we conducted a study to understand how the private consumer households perceive food waste and how these households use Too Good To Go and meal boxes, and how this use could affect households’ food waste. This was done by having 17 interviews focusing on households’ food waste and everyday life structuring as well as experiences with Too Good To Go and meal boxes. Thirteen participants chose to participate in a two-week photo diary study where they documented through photos and text, of their households food waste, leftovers and magic bags from Too Good To Go. We present our findings in four themes describing the household motivation and attitude toward food waste and how technology are used and affects the households. We have found that the use of Too Good To Go and meal boxes indicate cases of moving food waste from the stores to consumers, resulting in more food waste. We discuss the impact technologies have on food, the effect Too Good To Go and meal boxes have on consumers’ food habits and how sharing food can be used to avoid food waste.

## RELATED WORK

This section is divided into two parts. In the first part, we have reviewed different studies on food waste and behavior from authors who research within ecology, universities, and municipalities, to define food waste and how it is created within consumer households. The second part of this section looks into existing research from the HCI communities, where most research have studied based on prototype all with the focus of reducing food waste.

### Understanding food waste

Food waste is a subject that has been increasing within HCI research and is described as complex and are to appear in different stages like stages planning, shopping, storing, preparing, and eating [31, 17, 16, 23, 29]. Though Schanes et al. adds another stage where food waste can occur in the management of leftovers, where there are different actions the consumer can perform, such as: saving food, giving the food to pets or leftovers would be disposed [31]. The appearance of food waste is affected by factors influencing the consumer such as food practices, food availability, price, diets, and liking [6, 27, 29].

Even though food waste is found complex, research has shown how households are forced by habits and routines causing a repetition of stages [15, 6, 27, 29]. Previous studies present findings indicating how the different execution of stage is liable to lead for more food waste, like whether shopping lists are used [13, 15]. Shopping without a shopping list is likely to increase food waste with the risk of overbuying [31, 17, 15, 14]. Though food waste is liable to happen in households' own residences such as food being forgotten because of the lack of storing system [13].

Habits and routines cannot necessarily directly be linked to the likelihood of food waste, consumers will also have various motivational factors, some studies have shown economy and personal benefits acting as strong motivations where the environment would act as a weaker motivation [31, 17, 29]. Van Geffen et al. agrees how consumers have different motivation and the impact of those will differ, where the motivation is found to be affected by consumers awareness, attitude and their social norms [17]. Quested et al. suggest another motivator as consumers' guilt, where a questionnaire showed guilt was a third reason for lowering food waste [29].

### Technology prevention to food waste

Sustainability and food waste are a covered subject within the HCI research, where studies have been made toward the prevention of food waste within the consumers' households. Blevins argues how technology can be used to support food through different technological features such as tracking and communities [3]. Studies within HCI can be sorted into the different stages, where there are multiple mobile applications and prototypes covering several stages, like planning, shopping, and eating [10, 36, 4, 14] and disposal [2, 35]. All studies have in the common of increasing the consumers' knowledge and perceptions [23, 11], which is also suggested by Lim et al. that argue the importance of these, but also add upon the time a task takes could prevent the effectiveness [23].

Both physical prototypes are directly connected with disposal by being formed as a trashcan and both use visualization as a method to increase consumers awareness toward waste [35, 2]. BinCam, consisting of a bin with a phone attached, functions by uploading disposed waste to a Facebook Group. The study showed increased awareness of the households' own behavior, though their reflection on increased awareness did not affect their already established behavior [35]. The study reveals findings such as ethical issues in relation to the social surveillance function of the Facebook Group, where participants expressed shame and guilt toward discarding some food or recycled wrong [35]. The Grumpy Bin uses an application, where photos of waste are issued and the consumers are allowed to decide the responsible of the food waste, though this application was to our knowledge not evaluated [2].

The mobile applications found within HCI research covers different stages, by having functions such as planning, listing, and sharing. Farr-Wharton et al. examine three applications on their impact on consumer knowledge towards food, where findings show how the three application does positively support raising awareness [10]. Similar findings were found through the application EUPHORIA, where Yalvac et al. argues how the depth of their application would be able to help consumer reducing their food waste, but this was never confirmed through evaluation [36].

Foster and Lawson suggest how social media's effect can be used for behavioral change [12], this was not particularly related to food waste yet applications were found within the HCI research supporting food sharing and the use of social communication [4, 10]. Burton et al. argue how sharing can be used to solve food waste to this they constructed the application AirShare [4]. Though AirShare was never evaluated, Burton et al. still argues how the acceptance of sharing is a challenge and would require the establishment of a network the consumers trust upon [4]. The same issues were found through Farr-Wharton et al. three applications, where they found the likelihood of sharing being dependent on a sharing hierarchy consisting of three states: known people, known communities and unknown people [10]. Here it is suggested how the level of trust and comfort is needed to be included but the use of social sharing of food could inquire behavioral change [4, 10, 12].

Even though studies indicate the creation of products and applications could help reduce food waste in the consumer household. Several technologies and applications exist today that focuses on reducing food waste either through saving food from being disposed of or consumers use services to organize their daily lives, though there lack knowledge of how consumers perceive and use technologies to avoid food waste.

## STUDY

We conducted qualitative interviews with 17 participants, focusing on understanding the participants' food waste, structuring of everyday life as well as experiences with Too Good To Go and meal boxes, additionally thirteen participants chose to participate in a two-week photo diary study. To form our study, we conducted an unstructured interview to cover areas

of interest for interview guide, followed by a description of our recruitment, procedure, data collection and data analysis.

### Framing the study

In order to frame the study, we conducted an unstructured interview with a participant who had previous experience using the application Too Good To Go. The goal with this interview was to investigate previous experiences with technologies and food waste. The findings of this interviews was used to form a interview guide for the study.

The interviewed participant lives in a household with a total of three: two adults and one child. Through the interview, we found that the participants household purposely worked toward having as little food waste as possible and the interview resulted in the following themes that would be used to frame the interview:

- Opportunities and challenges with content from Too Good To Go and meal boxes
- Technologies effects on household
- General opinion on food waste
- Challenges from food to food waste

Analysis of the interview with the participant showed that using Too Good To Go could potentially cause more food waste in participant households, despite Too Good To Go contributing to reducing food waste. Findings revealed additionally that the participant used meal boxes as a method to help reducing the households food waste. The findings of the unstructured interview led us to want to explore the following research questions:

*How is food waste perceived in households and how would households use technology as a tool to reduce food waste?*

In terms of technology, we specifically want to focus on understanding how Too Good To Go and meal boxes can be used as a tool to reduce households food waste.

### Too Good To Go and Meal Boxes

Too Good To Go (TGTG) provides a service between the food industry and the private consumer, selling mainly food and groceries there otherwise would have been disposed from stores [18]. The service is providing customers the opportunity to order a magic bag from a specific store, shop or restaurant and will contain excess food [18]. The user interacts with the TGTG mobile application in order to purchase magic bags, where stores are displayed near the buyers chosen location [18]. The design of the application can be viewed in Figure 1. In addition to the mobile application, TGTG has a webshop that sells food close to the expiry date, the use of TGTG webshop did we not include in our study.

Meal boxes is a service from restaurants or food delivery services, which gives a partly prepared dinner with recipes [24]. The meal boxes often contains recipes, commodities and prepared or semi-prepared food used for dinner and will provide food for a selective number of days [24]. There exist different food boxes containing ingredients such as seasonal

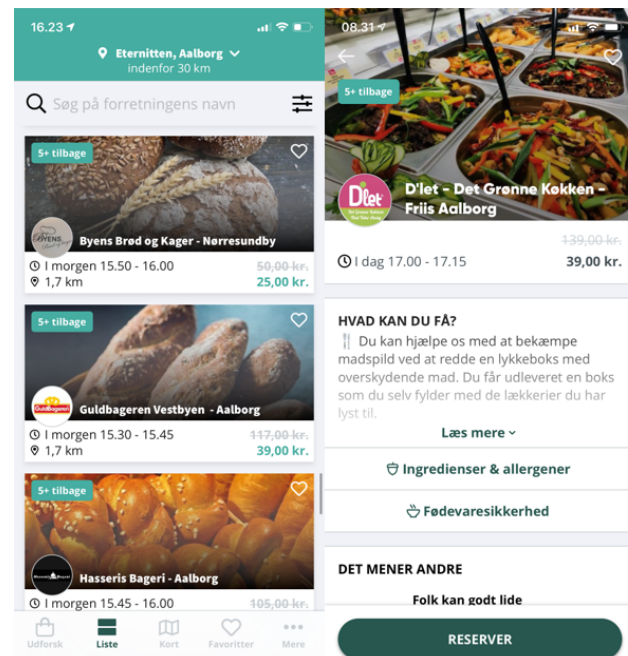


Figure 1. Left photo: Screenshot from TGTG's setup of nearby stores and restaurants. Right photo: Reservation of a magic bag

fruits and vegetables [1], fish [32] and fruits and vegetables that would otherwise have been disposed [19]. These food and meal boxes will be referred as meal boxes in this paper.

### Participants

In this study we recruited 17 participants (fifteen women) between the ages of 19 to 63 (median age 31). Twelve of the participants lived in household with 1-2 persons household, where the rest of the participants differ with 3-6 persons household. Less than half of the participants are presented as students, where seven participants have full time job and four are not employed.

All participants expressed concern and interest towards food waste, however their level of actions did not coincide. Each participants was asked to asses the households attitude towards food waste on a scale from 1 to 5 (5 being very concerned about food waste, 3 is neutral and 1 is not concerned at all.), here all participants apart from two would asses themselves at four and five. All participants had the general agreement about them being attentive to food waste, but they differ in their own formulation. Eleven of the participants described their mindset toward food waste as being very attentive and would work directly towards preventing it from happening. Four of the participants would to some extend think about food waste, try to do something about it but it was not a priority in the household. The remaining two participants did not concern about food waste and would not actively work toward preventing food waste.

### Procedure

This study can be divided into four procedure steps, containing recruitment of participants, initiation of the study, setting up the chat, and finalizing the study with interviews.



*Step 1:* Our recruitment of participants included all types of gender, ages, and employment. The only requirement for participating the study was each participant needed to be above the age of 18, living in own household and lastly would agree to use TGTG during the study. The recruitment was carried out using several different strategies, where nine participants were recruited through different Facebook Groups, seven participants recruited through sharing our poster within own network and one participant was recruited through poster hanging in housing associations. Each participant recruited was asked before the study their familiarity with TGTG and their living arrangement.

*Step 2:* The introduction to the photo diary, we required at least one photo send each day and photos in relation to the use of TGTG. The photos was instructed to contain disposed food and if nothing was disposed, we asked the participant to inform us. Additionally, we provided the participant the options of sending other food related photos and reflections, but this was not a requirement. The study was designed with a duration of two-week, with the possibility of extension, this was accepted from one participant that extended the study with additionally ten days.

*Step 3:* The photo diary study was carried out using Facebook Group Chat as a tool for the participant to upload photos, videos, and reflections. Each participant had one Group Chat where we also had access. We had daily contact with each participant involving answering questions, thanking for sending material and sending reminder if necessary, an example of the Facebook Group Chat setup can be seen on Figure 2.



**Figure 2.** Screenshots of two Facebook Group Chat setup with participants.

*Step 4:* A week before the end of the photo diary study for each participant, we scheduled interviews. Each participant was interviewed with a semi-structured interview guide, that contained questions from our framing of the study and question emerging from analyzing the photos sent. The interview also included photos, that was used as elicitation.

## Data collection

The photo diary studies was used as elicitation to each participant for their interviews [5]. Additionally to the photo diary some participants offered reflections which also was included in the interviews. These reflections was not limited to only food waste but also the general relations to food and challenges experienced, we received a majority of reflections toward the subject off COVID-19 and how the participants were affected of this.

Each photo sent through the Facebook Group Chat was saved and renamed to a description fitting whether the food was saved, disposed or related to technology along with the date the photo was sent. All photos were analyzed during the study, where we looked for reasons for the food being disposed, which type of food had been disposed, general patterns, the volume of disposed food and saved food.

During the study, we received a total of 173 photos and four videos of not only food waste, but also food that was saved, food given to animals, magic bags, dumpster diving and meal boxes. We received averagely 12.6 photos (Max 25; Min: 5) from each participants during the two-week study. Though one participants agreed to extend the study, providing us with additionally eight photos. All participants had days reported as no food wasted, the highest amount of no food waste was eleven days and the lowest being five days. The received photos was primary taken on settings like a table, the sink and in the hand of the participants, where a few photos was taken from the view of the trashcan. All photos received was often followed with an explanation of what the photo illustrated and why it was disposed.

A week into the study, COVID-19 resulted into Denmark being on lockdown and all unnecessary contact was advised against. In order to accommodate this, we informed all ongoing participants of all interviews would be conducted online instead of doing it in their homes. During the photo diary study, seven of the participant had changes in the number of household due to some moving home to family, others having their children moving home. Several participants expressed concern in relation to use TGTG due to health and some store would close down their offers of magic bags, to accommodate this we advised all to consider their health first, but we still encourage them to use TGTG during the study. All participants but three that was introduced to the photo diary study during lockdown was done through online communication or through phone call.

After two-weeks with photo diary study of food waste documentation, the data from the study was collected, which includes any thoughts and descriptions from the Facebook Group Chats as well as photos. The data collected was used to adapt the semi-structured interview guide formed from our framing of the study, which contributed to a deeper understanding of participants' food habits and food waste. Following from each interview, we reviewed each answer and adapted the interview guide if necessary to other areas of interest. We structured the interviews by using sent photos, reflections and descriptions to photos as conversation topics for the participants who conducted the photo diary study. To structure the interviews,



slides were prepared adapted to each participant. The slides were created in Google Slides and showcased through Pear Deck, where it is possible to create interaction between the participants and the slides, as well as control over what the participants sees on the slides.

Present to the interviews were a lead interviewer, a secondary interviewer and a logger to take notes, each interviews lasted between 47 - 90 minutes. The interviews started with a brief review of the previously signed consent form, followed by a brief demographic survey covering age, employment, number of households and which city the household lives in.

### Data analysis

Interviews were transcribed for analysis. The transcription method was based on written language style rather than spoken language style of the verbal interviews [22]. We transcribed the interview to a more formal format by excluding pauses, “ehm” expressions and laughter [22]. We choose this type of transcription in order to create a readable story.

The analysis itself was performed using affinity diagramming, that was divided into three steps. The first step was to read through all the transcriptions, and note natural relationships in the form of groupings. The second step was to compile all the citations with groupings, into separate documents for the respective groupings. Each grouping was read through several times, were each citation was analysed towards meaning and context and the citations was either then regrouped or split into subgroups for better overview and analysis. The third step we summarized each grouping and subgroups, and extract the main points with associated quotes.

### FINDINGS

Our findings are structured into four themes, (i) 'Motivation and attitude', (ii) 'Technology and food waste', (iii) 'Surprise and challenges' and (iv) 'Regular and irregular use'. All participants are anonymized and will be referred to as P1-P17. We will refer to the number of participants by writing, for example (10/17), which refers to the 10 out of 17 participants.

#### Motivation and attitude

During this study we saw multiple examples of participants explaining their motivation for using TGTG and thinking about food waste, but all participants also had attitudes that would have an impact on their motivations. According to the Cambridge dictionary are motivation defined as “*enthusiasm for doing something*” [8] and attitude “*a feeling or opinion about something or someone, or a way of behaving*” [7].

The participants relations to food waste was found to be connected with how motivated each individual was, though the participants was able to have different motivations and these was liable to change [31, 17]. Though closely related to motivation was a participants attitude, this attitude is in reference for the participants thoughts, action and beliefs [16].

All participants viewed food waste as a problem, where all participant would use their senses (e.g. smell, look, taste) and length of storage to determine edibility. During the two-week photo diary study, we received a variety of photos that



**Figure 3.** Photos of uploaded by participants. Left photo: Leftovers from preparation to lunch, some leaves of a salad, one tomato gone soft and little cucumber. Middle photo: Molded lemon forgotten in fridge. Right photo: Leftovers from dinner.

included food that was partially eaten, leftovers from preparation, molded, forgotten, expired etc., see example of some the photos sent in Figure 3. Through our findings we found three recurring motivations factors the participants would use to avoid food waste: (i) economy, (ii) environment and (iii) wasteful spending.

(i) Participants related food waste directly to their economy as explained by P6, “... *I might as well throw away the money*”, where the participants found disposing food was equivalent compared to disposing the money instead of the food. (ii) Other participants showed motivation to avoid food waste in order to save the environment, several participants pointed out how it would be a waste of resources to buy food items, only to dispose the food later. The participants who would mainly use the environment as motivation was also mainly eating large quantities of vegetables and reduce intake of meat due to environment impact. One participants, who was motivated to save the environment, explained “*I don’t eat meat, for the sake of the environment. So if it (eating meat) makes sense, I’ll eat it. It will be more environmentally harmful if it is thrown out than if I ate it.*” P13.

(iii) While participants generally would mention economic and environment as motivation, the majority of the participants related food waste as being wasteful spending in terms of disposing food. The action of disposing food was in general perceived as a wrongdoing and was something all participants was taught from child: “*You have to take advantage of it (the food), which would otherwise just have been thrown out. I get so upset when I have to throw out some food...*” P4. As illustrated, would disposing of food evoke emotions to the participants and in general they would formulate the action of disposing food as ‘not fun’, ‘annoying’, ‘wasteful’ and ‘sad’.

Even though the participants explained how the motivation would help them dispose less food, different attitudes was also expressed and was something the participant felt strong about. Some of these was the participants reluctance to share food with strangers based on the unknown of how others would cook food and storage of food in terms of bacteria, though some other participants did not share this concern but rather expressed missing a channel to distribute their leftovers. “*...I will not be able to give my children something from somewhere I did not know. Like from some random family in road yard, there is some hygiene in it...*” P15. Some of the participants would mentioning already existing sharing groups on

Facebook they would use to share food, this was especially seen with one participant who felt it as a duty to share in order to avoid food waste. We also found how some of the participants would share in relation to special occasions (e.g. birthdays, New Year parties), where they would act differently in relation to producing more food. Here some participant opted to sharing the food with guests and families rather than disposing.

Another attitude recurring was the value of food, that could be the determination whether food was saved or disposed. Several of the participants (12/17) mentioned of being affected by the value they give food. During the study we found how the participants would find some food less acceptable to dispose:

*"... But if there has been something on the plate, then we will not recycle it because we do not know what it has been in contact with like forks and bacteria... Now, if we got a steak and she (the wife) has eaten 2 chunks of it, then it may be save to say that we would save it and use it, because it is too expensive to throw out"* P9

We found examples of meat products where the participants would make an effort to save, where food such as vegetables would be disposed, because it was valued less than meat products. The value of meat was determined to exceed the general rule participants had toward saving leftovers of food. P5 explained how small leftovers of vegetables 'hardly worth saving': *"But often it is so that you just have a little bit of red onion where you are, it is hardly worth saving, because then you have 1 cm of red onion in the fridge or something like that"*. P5. Though the value of food was not only determined between vegetables or meat but also on the actual price value. These types of example was especially found when it was about a product the participants did not like, but also described as a practise they would follow in general. *"... Now if the cream cheese had cost 50 kr., then I would have eaten it, but this only cost 8 or 10 kr."* P11.

### Technology and food waste

Most of the participants (14/17) had used TGTG and meal boxes, though their experience varies from beginner to experienced. In relation to experiences with TGTG, participants expressed concern about how the technology benefits the participant or the store: *"... I don't know if it (TGTG) actually helps with reducing food waste, as least not in my household. It properly helps the store by moving their food waste home to me."* P2.

As illustrated participants felt TGTG could provide more waste and this was mostly related to the amount of food in magic bags, this was both verbalized during the interviews and analyzed from the photo diary study. During the interview several participants would express how they felt the food was moved to them from the stores. We have found three circumstances the participants would relate to this: (i) multiple items of the same brand, (ii) extensive amount of food, and (iii) nearly expired food.

A few participants would mention the first circumstance, (i) multiple items of the same type of food in a magic bag from

TGTG that could be challenging, were something the participants mentioned could lead to fatigue. An example of this were found in the data from the photo diary study, where one participant disposed two cheese spreads from a magic bag two days after it was bought. In this magic bag the participant received three cheese spread in total. The most popular circumstance found was (ii) the extensive amount of food, this was found both in magic bags and meal boxes. Several participants explained how the amount of food would be too extensive for the size of their household, leading the participants' household to eat some of the food and dispose of the unused afterwards. *"Okay, so we ate a little of it, but then again not. So we were forced to throw it out"* P3.

The extensive amount of food also appeared in meal boxes, though this was mainly directed toward vegetables in the meal boxes. Here the participants mentioned how the amount of vegetables exceeded the participants household need for the dish, this was mentioned by several participants. When asked further into the participant would only recall this problem existing within vegetables, where meat would fit for the participants' household: *"... we needed to use cabbage to some of the dishes and there was way too much for just one dish... well I think we have 1½ cabbage left and it is exactly the same with carrots"* P12.

TGTG's business consists of distributing food from the store to the consumer, with the goal of preventing food from being disposed of [18]. All participants expected food from TGTG would be near expiration date and quality lower, hence the store would need to dispose of the food. The third circumstance (iii) with a short expiration date was received as a challenge with time for some participants, were consuming the food before it becomes inedible. This was not unexpected but we found this interesting based on how each participant unanimously agreed that food could be consumed after the expiration date. Though this length would differ based on the type of food and the participants' preferences. Instead the participants often described the food being inedible by using their senses, one example of this was expressed from P8: *"... And if it (the expiration date) was something that had three months expiration date, then one week could go. There could also go fourteen days over (the expiration date)"*. Even though the length would differ based on the type of food and the participants' preferences. Even though food from TGTG was expected to expire within a short time, one participant bought a magic bag where the expiration date was not a problem, but instead contained still sellable food:

*"Many of the things would first expire Sunday. I was a little surprised. I thought it was something they would not be able to sell after today (Thursday)... So I was kind of like, 'Am I fighting food waste or is this just something they sell because it is good business?'"* P5.

### Surprise and challenging

The participant used in general three phrases to describe the unknown of TGTG: surprise, challenge and experience. All participants who used these phrases also provided equal positive and negative reflections on past experiences with magic bags. These experiences was related to either extensive amounts of



**Figure 4.** Examples of magic bags from TGTG extracted from the study. **Left photo:** Bakery magic bag with different bread and cake. **Right photo:** Grocery magic bag with two of the same item.

food or multiple of the same product, see Figure 4 for photos illustrating two of those experiences collected from the photo diary study.

Some participants would relate the magic bag as an opportunity to experience the surprising element of other kinds of food, e.g P2 said *“The good thing about it (magic bag) is that I get something I normally would not eat, like beetroot hummus...”*, where some participants are using the surprising element of the magic bag as an opportunity to try new dishes:

*“... It’s very fun to have this challenge. And that I do not become fatigued in the same (same type of dishes)...”* P6.

This illustrates how the magic bag could provide a positive experience of trying something new or different. Participants would express this as getting a gift by not knowing the content of the magic bag e.g P15 *“... it is like getting a gift, only you have bought it yourself”*. Though some participant also phrased the unknown of magic bags as challenging, P9 experienced this by getting two cartons of A38 where he explained *“... I haven’t worked that much with it (A38), all I know is that you can bake with it...”*. P9 recalled specifically this example in the relation of products, he never otherwise would buy or have previous experience with.

Other participants experienced not knowing the content of a magic bag as challenging. Some of the participants used a strategy in order to control the content of the magic bags, this was done by selecting stores where the participants could predict what type of food they would get. Buying magic bags from stores the participants already have experience with allowed the participants to predict the content of the magic bag. *“I don’t buy any of those bags from stores where I don’t know what I’m getting, because there I’m just going to throw out too much.”* P8.

Few participant also found the magic bag unfitting, this was described as two examples. The first example concerned if the food bought was enough to cover a full meal for the house-

hold. In the second example it was explained how sometimes a magic bag would contain food the participants household would normally not eat. This was also found within meal boxes, where some of the participants who ordered meal boxes would get food they usually would not buy, or like to eat.

*“We once got a case of vegetables... the stuff we got was what was in season, and this was not always something we liked.”* P4.

This illustrates how the surprising element of either meal boxes or magic bags from TGTG could give a negative experience instead of just a challenge. This was elaborated by some of the participants experiencing getting too much of the same product e.g P2 *“There are often something (in the magic bag) that I do not like or there are several of the same items, and then I fail to get it eaten”*.

### Regular and irregular use

Our findings showed how the majority of participants (14/17) either use TGTG or meal boxes irregularly or regularly. The two participants who have not made use of this, respectively, have no knowledge of TGTG, but are aware of the existence of meal boxes and have deselected due to finances. One participant knew about the existence of TGTG but has deselected to use TGTG during the study due to COVID-19.

Some of the participants used magic bags or meal boxes as a fixed part of their planning while others do it irregularly for various reasons. Three participants used TGTG regularly, where the participants used the purchase of magic bags as a supplement to the purchase of vegetables and bread. The participants who used TGTG regularly planned future purchase of magic bags, this would usually be planned a few days before the intended use, P17 explained their weekly planning of buying magic bags containing bread: *“The weekends where we have children and therefore 5 people in the household, I usually plan to buy TGTG for on Friday. Then we order so we have bread for the weekend.”* P17.

Eleven participants used TGTG irregular and would only purchase magic bags occasionally, this was mainly described either as ‘treat yourself’ happening once in a while or case of having guests. The respective participants explained ‘treat yourself’, as being the purchase of bread and cake as well as magic bags from restaurants. Several participants explained how the economy prohibited restaurant visits, but the purchase of magic bags from TGTG made it possible for the participants to experience food that they otherwise would not be able to afford. Here, P2 explained how buying TGTG made it possible to afford other types of food: *“I usually can’t afford to eat on Flammen”* P2, where P11 also supports this point *“In particular, I think sushi is delicious...”*. Several of the participants had tried different magic bags from TGTG, but the participants also chose not to use the magic bags regularly. Participants would describe the reason for not using magic bags regularly either being due to bad experiences or how they used the magic bag as a supplement.

Similar to TGTG, participants also used meal boxes either regularly or on irregularly basis. Seven participants used meal boxes regularly for periods of time, where the participants

who primarily selected meal boxes did so during busy periods, or as supplementary purchases of fruit and vegetables as a substitute for grocery shopping. *“Well, in periods I buy. So every 14 days I get a lot of vegetables from Grim, so that is what helps determine what is on the food plan, so it is a little co-defining...”* P8. Here, P8 explains how the use of the meal boxes helps to define the meals in the household. Surprisingly, one participant (P12), started using meal boxes regularly due to COVID-19, with the motivation of supporting local providers. A follow-up interview with P12 showed that this use of meal boxes was still used and she had planned on using meal boxes as a supplement to dinner during busy periods.

The participants explained how high prices, huge amounts of food, and the regular changes of content, would be reasons for not regularly use the meal boxes. Several of the participants explained how even though the meal boxes would be adapted to the size of the household, they would still experience disposing of food. This caused several of the participants not to use meal boxes for longer than short periods of time. Three of the participants had used meal boxes a few times, this was either in response to a discount on the boxes, appealing contents of the boxes or to try the concept. For these participants, the purchase of the meal boxes has never been used regularly, due to the high prices of the boxes.

All participants who used either TGTG or meal boxes recalled the amount of food as the primary challenge and while others were multiple items of the same food or disliking the food. Though it surprised us how some of the participants had found a solution for this. The most recurring solutions would be freezing or do additional cooking in order to avoid disposing the food. Few participants found ways to solve these challenges, one way was using the knowingly high amount to their own advantages, like in relation to social occasions with guests, where P12 explain: *“... It has been Penny Lane because I know we were having guests and then I knew we could save money on bread and cake from there.”* P12. As argued the magic bags would be used in relation when having guests, namely with the economic benefit. Though it should be added that this relation with guests only was made towards magic bags from TGTG bought from bakeries.

Participants used another solution for the extensive amount, this was through sharing their food with families, friends and neighbors. *“... I would give it to friends, acquaintances, and neighbors. It might be a bit difficult with people you don’t know...”* P17. The participants also expressed concerns towards sharing with strangers. Though the participants who shared, would only do so when it was determined they have had their use and was determined that they would not be able to consume the food.

## DISCUSSION

We have studied how participant households attitude is towards reducing food waste and usage of TGTG to buy magic bags from stores and understand the usage of meal boxes as a part of the household food habits. Our findings show how the participants have different motivations and attitudes towards food waste. Additionally, we found how the uses of TGTG

and meal boxes expressed situations where food was being moved to their household, this was mainly concerned about the amount of food experienced from the magic bags and meal boxes. Here some participants found the unknown content of magic bag either as a challenge or a surprise. How participants use either TGTG or meal boxes was found to be either regularly or irregularly. Besides our findings, we identified three contributions in this paper that advances HCI knowledge on food waste and technology supporting food waste.

Firstly, we observed the use of TGTG and meal boxes, where some aspects were suggested to not help stop food waste but instead help generate it within the participants’ households. This can be conflicting from previous HCI research focusing on how different technologies approaches can help stop food waste in general and for the household. Secondly, we focused on the effect of TGTG and meal boxes on food habits, where the use of TGTG or meal boxes can be affected by the user’s food habits. It shows that planning and general food habits can have an effect on how much and what food is disposed and used from meal boxes and TGTG. Thirdly we found sharing food is a conflicting topic, where the participants see the opportunity to save food by sharing it with people, but how the sharing can be limited to the trust of the participants of the food sharing. It is clear that most of the participants wish to share food but they prioritize with whom they share with, firstly with people they are familiar with. Where sharing and receiving food with or from strangers is not a safe experience for everyone.

## Impact of technologies on food waste

Previous HCI research focuses on how technologies can help reducing food waste within consumer households [e.g. [10], [15], [36], [35]]. Studies have shown how technologies can be used to create awareness for consumers and help the consumer with visualization of the origin of their food waste. As Farr-Wharton et al. study showed, would the presence of mobile application function as help for the consumer to prevent food waste, such as avoiding overbuying of food [10].

Our findings indicated how three circumstances could be the cause of the increase of food waste from the magic bags: (i) extensive amount of food, (ii) multiple items of the same food, and (iii) nearly expired food. We are not able to provide knowledge of how technology can help with food waste reduction, our findings instead suggest how the unpredictability about the amount and type of food could result in more food waste. We discovered how getting multiple items of the same food could lead the participant feeling fatigued and would then lead food to be disposed. TGTG reports how their application has saved over 5 million meals in Denmark [18], however, our findings suggest how food from TGTG magic bags could lead to more food waste within the participants’ households, but further research needs to be done in order to determine the impact.

Previous studies have used visualization and knowledge in application and product to increase awareness towards food waste [10, 36, 14, 35, 15]. One of which was found through Ganglbauer et al. that aimed to understand and presenting functionalities for a mobile application, one useful function



for visualization was having the application to create a list of all food items that were in stock within the household [15]. Similarly in Farr-Wharton et al. focused on how the application is able to influence the consumers' knowledge, findings also suggested how the increased knowledge of the present food in the fridge supports the consumer's ability to use the food before it becomes inedible [10].

Based on previous studies we have found how the knowledge of food would contradict the main goal of the TGTG application, which uses the magic bags where the participant does not know the content beforehand [18]. Our findings suggest how the unknown of magic bags actually proved to be something the participants enjoy and find excitement about and was referred to as a gift but compared with previous HCI research would the lack of knowledge and visualization from TGTG be a possibility of increased food waste.

### **The effect of TGTG and meal boxes on food habits**

As a part of the TGTG concept, it is unknown what the buyers of a magic bag will get, where it is only possible to buy within a category e.g. bakery, stores and restaurants. Schanes et al. argue that there are several stages related to food, where waste can occur. The stages is planning, shopping, storing, preparing, eating [17, 16] and management of leftovers [31]. These stages are affected by how they are executed [13, 15], and can be important to understand the use of TGTG in every stage to avoid food waste. As an example, how to prepare dinner with the unknown food you got from TGTG or how to plan a magic bag as a part of the weekly dinner plan.

In our study, we found that the limited access to knowledge of what the participants would get from a magic bag, can be problematic since it is hard to plan after food they do not yet know what is. Furthermore, other factors are present when using the food from TGTG, these factors were subjects such as the amount of food, the liking of the food and whether or not there are multiple items of the same food. As shown by Ganglbauer et al. food waste is affected by how the consumer is executing it and planning [15, 13]. Few persons in our study did think the magic bag as a part of their planning, where P17 as example bought bread from TGTG when she knew her kids would come home for the weekend, to make sure that the bread from TGTG would be eaten instead of being disposed of.

Similar is seen with the meal boxes, where food would be delivered partly prepared. The selling point of meal boxes is helping with some of the stages Schanes et al. have categorized which is planning, shopping [31]. Ganglbauer et al. found that planning can be very time-consuming in a busy everyday life [15]. Our study found a challenge of meal boxes is the management of the leftover commodities. For the participant to handle the food better, the other stages where food can be disposed need to be covered as a part of the process of buying meal boxes.

In our study, we found that the participants were divided concerning not knowing the content of magic bags and meal boxes. This was partly due to how types of food and dishes would regularly change. Some of the participants thought positively

off not knowing the content of magic bag, where they found this as an opportunity to try out new dishes, types of food and commodities. Other participants considered it as a limitation not knowing what was in the bag, because it could either be food they did not like, food they did not know how to use or the same amount of food in huge quantities. Even though some of the participants found the magic bag as an opportunity to try out new food, the majority of the participants did buy magic bags from the same place to predict what they would receive. This strategy from the participants indicates that they preferred knowing the content in order to better plan or know how to use the food they will get from TGTG. Lim et al. [23] and Farr-Wharton et al. [11] both supports that knowledge concerning food supply can help against food waste. Comparing how knowledge could be used to decrease food waste, our findings indicate a problem of not having knowledge about the content in the magic bag. The lack of knowledge indicates the possibility of an increase in food waste.

### **Sharing food**

Some HCI research focuses on food waste and how to prevent it. Food sharing as a subject is covered within HCI research to prevent food waste [15, 10, 36, 4]. Some studies have focused on different technological solutions fully or partly supporting food waste, with sharing food as a subject included [10, 36, 4].

Our findings indicate how the participants would prefer to share food in order to stop food waste in situations where they either believe they can not eat it all themselves or just wish to share some of the food. We found how participants would have sharing hierarchy, starting with people they know, such as family, friends, or neighbors, where the participants show more reluctance in sharing the food with strangers. Similarly is found in Farr-Wharton et al. where they through their study found how people of communities would share with the following order: Known persons, known communities, and unknown people [10]. This coincides with our study, where most of the participants were asked about who they would share their food with, answered known persons such as close friends, relatives, and neighbors. Some of the participants in this study shared the concern of how the food is prepared and stored, and what possible bacteria that the food could have had. Furthermore Farr-Wharton et al. argues an issue of strangers approaching houses to collected shared food which he defines as reduced comfort [10].

As a part of our study, we found that most of the participants bought TGTG, where a few of these did not want to buy from restaurants. The participants mainly mentioned reason for not buying from restaurants were mistrust in how the restaurants handled the food and the bacteria which Farr-Wharton et al. explains as low trust which makes it unlikely to take shared food [10]. There are indications that an important factor in sharing food is by trusting those of whom the food is shared between, this was addressed in Burton et al. study, where they designed an application allowing the consumer to chat among each other beforehand sharing the food [4]. Using chat functions can be used as a tool to minimize trust issues

between strange, which was emphasized by Farr-Wharton et al. [10] to be a problem when sharing food.

### Limitations

There are some possible limitations in our study that are related to how our results can be generalized. First, we acknowledge the limitation on the number of recruits. The recruited participants do not represent the general population in Denmark, which is seen, among other things, by the fact that the majority of participants assess their households to be attentive about food waste. Therefore, there is a need for greater differentiation between the participants in order to reflect the population in future HCI research within food waste. Secondly, 13/17 participants are asked to document their own food waste in their households, using the photo diary which worked by uploading photos in a Facebook Group Chat. Because the participants themselves were responsible for documenting their food waste, situations could occur where food waste was not documented. While our analysis of the photo diary study showed that our participants have generally had several days without food waste, it is important to consider the lack of documentation during the study. Finally, there is a limitation on participants' use of TGTG during the study, which is due to COVID-19. Only some of the participants used TGTG despite the requirement to use TGTG at least once during the photo diary study. For future HCI research, we suggest a more active use of technologies that focus on saving food waste within a study, such as the use of TGTG.

### CONCLUSION

We have in this paper studied 17 participants through interviews and some participant through photo diaries, where we aimed to understand how a consumer households perceives food waste and how they would use Too Good To Go and meal boxes as a tool to reduce food waste.

We have identified a total of four finding themes covering 1) 'Motivation and attitude': Different types of motivation and attitudes differs between the participants and has an effect on food waste within their households. 2) 'Technology and food waste': Most participants questioned whether the use of TGTG help reducing food waste within the participants household, where three circumstances was expressed for the reason to more food waste: (i) multiple items of the same brand, (ii) extensive amount of food, and (iii) nearly expired food. 3) 'Surprise and challenges': TGTG consist of the content to be unknown, this was perceived differently between the participants that equally found both the magic bag as surprising in terms of a gift but also found challenges of not knowing the content. and 4) 'Regular and irregular use': Participants will either uses TGTG and meal boxes regular or irregular, where some participants would uses these in their weekly planning.

Participants perceives food waste varies and are directed by their motivations and attitudes. The determination of food waste are based on participants using their senses where food waste exist when food are determined to be inedible. This study do not conclude whether TGTG or meal boxes reduce food waste within consumers household, we have instead suggestions of TGTG and meal boxes could cause more food

waste caused by the challenge of extensive amount of unknown food received. Though participants found ways to solve this challenge. In order to understand the impact, more research is needed. We contributes to HCI research with findings of how the participants households perceived food waste, and how the use of Too Good To Go and meal boxes could have an effect on households food waste. However, we recognize the value of more differentiation between participants to reflect the population in future HCI research within food waste.

### ACKNOWLEDGMENT

We would like to thanks all participants that helped by taking part of this study by sharing photos of food, reflections and experiences.

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# Supplerende rapport: Refleksioner over metodiske overvejelser

## 01 Introduktion

Under vores specialeforløb har vi afreporteret vores studie i en videnskabelig artikel '*Am I fighting food waste?*' *A Qualitative Study of Perceived Food Waste and How Technologies Affect Household Food Waste*. Valget af en videnskabelig artikel, har afgrænset en række metodiske refleksioner. Vi præsenterer refleksioner i denne minirapport for at afdække og reflektere over vores metodiske valg og hvordan disse har påvirket vores studie. Vi inddrager de metodiske valg vi har taget i forhold til vores primære og sekundære dataindsamling, ydermere har vi inkluderet vores rekrutteringsmetode, hvor vi inddrager den proces vi foretog til rekrutteringen af deltager og hvordan disse fordeler sig i henhold til alder og beskæftigelse. Afslutningsvis har vi inkluderet refleksioner omkring påvirkningen af Covid-19 på vores studie og hvilke udfordringer der har fulgt at disse udfordringer.

## 02 Metode

Her vil vi reflektere over vores overvejelser bag anvendelsen af de valgte kvalitative metoder. Vi inddrager heriblandt reflektive overvejelser i henhold til udførelsen af interviews, billede dagbogsstudie og rekruttering af deltagere.

### 02.1 Primære dataindsamling: Interview

For at forstå dataen vi har fået igennem billede dagbogsstudiet har vi valgt at bruge interview for at kunne forstå dette projekt dybere (Lazar, Feng, & Hochheiser, 2010, s. 189-191). Igennem vores projekt valgte vi at bruge to typer interviews. Først (i) ustruktureret interview, for at forstå problemområdet. Efterfølgende (ii) semistruktureret interview, for at undersøge selve problemområdet.

Indledende til at forme vores spørgeguide og interesseområder (i), havde vi først nogle få introducerende spørgsmål til det ustruktureret interview, hvorefter vi havde nogle hovedemner vi ville ind på for at få en bred forståelse for at forstå hvordan husholdningen generelt håndterer mad og madspild, hvad deres holdninger var til dette, hvordan de brugte Too Good To Go som en del af deres mad, hvilken effekt dette havde eller kunne have samt hvad deres holdning til at dele mad var.

I vores anden fase (ii) brugte vi semistruktureret interview, som den primære dataindsamling, hvor ønskede vi at forstå deltagernes vaner omkring mad og madspild, samt forstå deres brug af Too Good To Go og måltidskasser, til at supplere indkøb samt for at undgå madspild.

De semistrukturerede interviews baserede vi til dels på det indledende ustruktureret interview hvor vi fandt hovedemner og generelle spørgsmål herunder. Herefter er de semistrukturerede interviews også baseret på den data vi har fået igennem deltagernes billeddagbog. Denne struktur med semistruktureret interview baseret på billeddagbog og det indledende interview giver mulighed for en mere fleksibel, personlig spørgeramme til at bringe personlige synspunkter ind i datasamlingen.

### *Fordele og ulemper*

Brugen af det ustruktureret interview var hovedsageligt for at skabe en forståelse af området madspild og hvordan en bruger vil gøre brug af teknologi i forbindelse med reducere af madspild. Fordelen ved denne type interview, er som nævnt fra Lazar et al. at det gør det nemmere at udforske et emne (Lazar, Feng, & Hochheiser, 2010, s. 189-191). Det ustruktureret interview blev udført med en deltager, hvor det varede ca. 1 time, her blev flere emner dækket indenfor madspilds vaner og brugen af Too Good To Go og måltidskasser. Vi bemærkede indledende ved vores ustruktureret interview at deltageren begyndte at evaluere Too Good To Go appen, hvilket udgav resultater i henhold områder såsom afhentningstidspunkter for en lykkepose. Det ustruktureret interview gav os interesseområder og formulering til en spørgeguide, som kunne bruges til den primære dataindsamling.

Det har dog også været nødvendigt at være opmærksom på nogle af de problematikker der har været ved dataindsamlingen igennem de semistrukturerede interviews. Først stiller det semistruktureret interview høje krav til intervieweren, der skal være ekstra opmærksom på signaler til at kunne tilpasse spørgsmål og rækkefølgen af spørgsmål og emner. Yderligere er det vigtigt at kunne forstå hvornår det er passende og muligt at stille opfølgende spørgsmål til at kunne uddybe emnet, som eksempel inde i madvaner og madspild der kan være et emne der bringer skam hos deltagerne der også kan være problematisk (Thieme, et al., 2012, s. 2345). I sammenhæng med disse overvejelser omkring semistruktureret interview er vi stillet i denne særlige situation at dette projekt foregik under COVID-19, der havde en effekt på om hvordan man skulle kunne holde kontakten til deltagerne af projektet. Det er vigtigt for intervieweren under et semistruktureret interview at kunne opfatte både verbale og ikke verbale signaler til at kunne omformulere eller bytte om på rækkefølgen af spørgsmål. Samt at kunne aflæse om deltageren er ved at reflektere over et spørgsmål, for at undlade afbrydninger. Her har det kunne være svært at kunne registrere alle ikke verbale signaler da intervieweren og den interviewet ikke kunne se hinanden, også selvom webcam ville have været en del af interviewet vil det nødvendigvis ikke være alt kropssprog man vil kunne opfatte. Vi er bevidste om at den manglende brug af webcam under studiet kan skabe problematikker med at aflæse verbale og nonverbale signaler mellem interviewer og deltager. Dog blev det udtrykt af deltagerne at det var nemmere at snakke om madspild uden brug af webcam. Her udtrykte særlig en deltager at så skulle de ikke bekymre sig om udseende og kunne snakke mere hæmningsløst.

Yderligere skal man under et interview der foregår online være opmærksom på digitale komplikationer hvor en af parterne af interviewet kan have mistet forbindelsen, eller ikke har kunne for den type teknologi man havde tiltænkt til at fungerer. Det har til gengæld givet deltagerne af interviewet rig mulighed for at kunne deltage i interviewet da vi ikke har skulle planlægge fysisk møde.

Som en del af vores interview var emnerne i stor grad omhandlende deres vaner og holdninger omkring madspild samt hvordan Too Good To Go og andre teknologier kunne have en effekt på deres madspild, samt den holdning de kunne have til dette. Retrospektivt, kunne vi godt have gået dybere ind i et aspekt af overvejelser omkring madspild. Få af deltagerne gav udtryk for skam og satte nogle tanker i gang udelukkende ved at skulle tage billeder og sende til os. Dette kunne have været et område, der kunne have givet en dybere forståelse for hvordan dette aspekt og skam og tanker kan have en effekt på deres vaner af madspild. Yderligere er der nogen af deltagerne i

sammenhæng med COVID-19, har givet udtryk for, at de har taget hjem til familien og andre nærmeste under denne krise.

## 02.2 Sekundær dataindsamling: Billede dagbogsstudie

Vi besluttede tidligt i processen at lave et billede dagbogsstudie med fokus på brugers madspild. Dagbogs studier er kendt inden for HCI-forskning og bruges ofte for at dække område i mere naturligt omgivelser (Lazar, Feng, & Hochheiser, 2010, s. 138). Denne form for billede dagbogsstudie hører ind under experience sampling method (ESM). ESM er en kendt undersøgelsesmetode for at forstå følelser, handlinger og tanker i en brugers dagligdag (Larson & Csikszentmihalyi, 1983). Vi brugte billede dagbogsstudie som en sekundær indsamlingsmetode for data, da madspild er et komplekst område (Schanes, Dobernig, & Gözet, 2018). Vi antog derfor, at madspild kan være svært at beskrive, og vil kunne ske i situationer som en forbruger ikke selv er opmærksom på.

I forbindelse med opsætning af billede dagbogsstudiet blev der opsat krav til hvor længe studie skulle køre og hvordan det skulle udføres. Indledende startede vi med at opsætte de informationer vi gerne ville have ud af studiet, som blev udledt fra vores ustruktureret interview:

- Hvilke typer madspild har husholdningen?
- Hvorfor bliver det smidt ud?
- Hvad er deres forhold til madspild?
- Hvordan påvirker Too Good To Go deres madvaner og dermed madspild?

De ovenstående informationer vil kunne dækkes ved hjælp af interview, dog fandt vi det fordelagtigt ved tilføjelsen af billede dagbogsstudiet, som en mindre forstyrrende teknik til at indsamle data og refleksioner hos husholdningerne og dette blev brugt som elicitering under interviewet.

Ifølge Palmer er nogle af de mest kendte begrænsninger i henhold til dagbogs studier: upræcis genkaldelse, lav kontrol og at det er en krævende opgave (Palmer, 2019). For at omgå disse formede vi studiet som mindst muligt omfattende for deltagerne ved at lave studiet til at billede dagbogsstudie, som ifølge Carter & Mankoff finder det at tage billeder værende en nem opgave for deres deltagere, men også vil være tidskrævende i henhold til analysen og forståelse af billeder (Carter & Mankoff, 2005). På trods af arbejdsbyrden der vil komme ved analysen, valgte vi at lave et billede dagbogsstudie hvor deltagerne skulle tage et billede af deres madspild og uploade dette til en Facebook Gruppe Chat og derved mindske sandsynligheden for at deltagerne finder studiet trættende. Valget for dette lå for at skabe mindst mulige forstyrrelser for brugerne med den antagelse af at de er trygge ved at tage billeder og hyppigt bruger sociale medier.

Billede dagbogsstudiet blev formet med opgaven at der skulle sendes minimum et billede pr. dag af madspild og billeder når teknologier blev brugt, andre billeder og videoer relateret til mad samt refleksioner var velkomne men var ikke opstillet som et krav.

Vi vurderede at studie skulle have en længde på to uger for at undlade risikoen med træthed hos deltagerne. Ved enden af de to uger blev interviews aftalt med deltagerne og alle fik tilbudt at forlænge studiet, det blev kun taget imod af en deltager. Nogle af de andre deltagere oplevede træthed ved studiet og mistede engagement.

Vores valg af studie og krav blev generelt modtaget godt af deltagerne som alle udtrykte positive og lærerige oplevelser. De fleste deltagere udviste ikke tegn på at have problemer med at dele deres madspild med os, dog var det nødvendigt ved alle deltager at sende påmindelser om billeder, hvis vi ikke havde hørt fra dem. Her oplevede vi både situationer hvor der var blevet taget billeder, som ikke var sendt og situationer hvor deltagerne havde glemt at tage billeder.

Vi vidste på forhånd med dette studie at vi ikke ville modtage alt madspild og fik det også bekræftet af deltagerne som informerede os om at det ikke altid var muligt at fange billeder fra husstanden hvis f.eks. børn havde smidt noget ud. Formålet med dette studie var at få indblik i deltagerne liv og deres refleksioner, som i dette studie har resulteret i 173 modtagne billeder og 4 videoer.

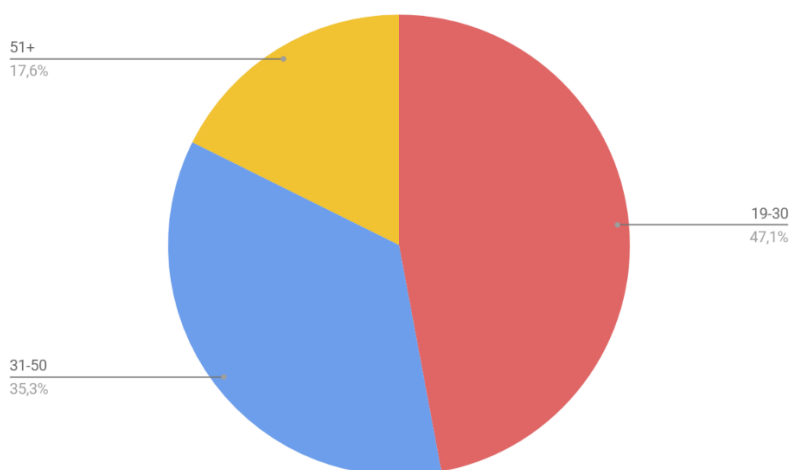
### 02.3 Rekruttering af deltagere

Til dette studie rekrutterede vi 17 deltagere i alt, hvor af 13 deltog i et billede dagbogsstudie. Vores rekruttering af deltagere havde ikke mange krav til selve typen af personer vi inddrog, men et krav til at deltagerne skulle være villig til at bruge Too Good To Go under billede dagbogsstudiet.

#### *Rekruttering*

Vores mål for rekruttering til studiet var ikke begrænset til et antal, men blot at ramme så mange deltagere som muligt. Til dette opsatte vi to kriterier som var 1) enten at brugerne have kendskab og erfaring med Too Good To Go eller var villig til at afprøve det under studiet og 2) at deltagerne var mindst 18 år gamle. Grundet vores tilgang til at skaffe som mange deltager som muligt, gjorde at vi ikke igangsatte en screeningsproces i henhold til at sikre mangfoldighed i vores resultater. Dette ledte til ujævn fordeling i husstandenes størrelse, alder og type af beskæftigelse.

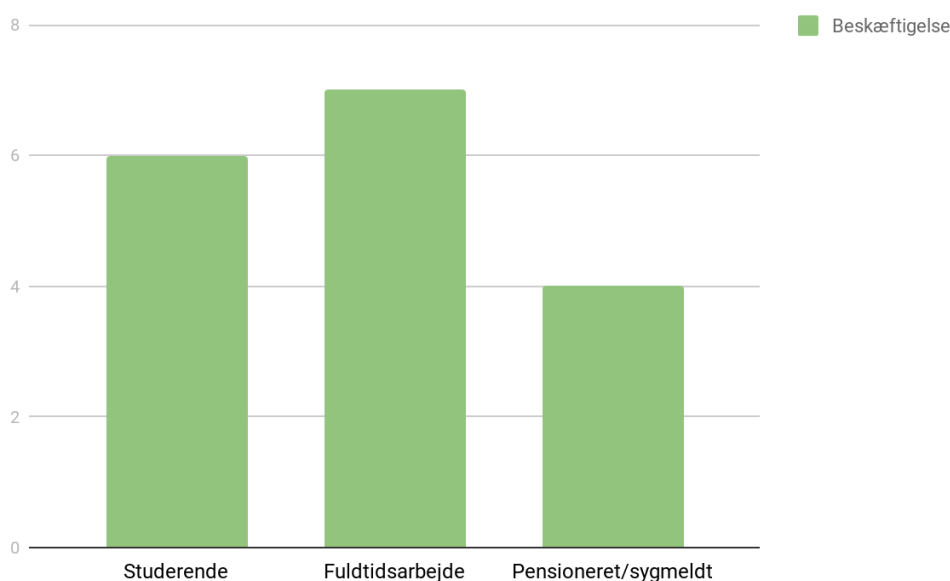
11 af deltagerne boede i husstande, hvor størrelsen varierede mellem 1-2 personer. Størrelsen på husstandene antog vi kunne have en effekt angående emnet madspild. Overvejende til fremtidige studier kunne være at rekruttere ligeligt størrelser husstande.



Figur 1: Alders fordeling af de 17 rekrutteret deltagere.

Indledende til vores rekruttering havde vi ingen kriterier, som udledte at over halvdelen af deltagerne var mellem 19-30 år, aldersfordelingen kan ses på Figur 1. Vi rekrutterede efterfølgende

yderligere fire deltagere med kriterierne at de skulle være over 30 år og ikke være studerende for at opnå mere mangfoldighed i vores studie. De fire ekstra rekrutteringer udlignede en ulighed i deltagers beskæftigelse, dette vil kunne lede til forskellige bevæggrunde deltagere vil have for at gøre en bestemt handling. Fordelingen af deltagernes beskæftigelse kan ses på Figur 2. Lige under halvdelen af deltagerne var studerende og derved have en økonomisk bevæggrund for at være mere opmærksom i henhold til undgå madspild. Dette blev også illustreret under studiet, hvor flere af deltagerne som var studerende, påpeger økonomiske grundlag.



Figur 2: Beskæftigelse fordeling af de 17 rekrutteret deltagere.

### Rekrutteringsmetode

Rekrutteringen af deltager benyttede vi os af forskellige strategier, heriblandt opslag i Facebook Grupper, deling af plakat gennem eget netværk på Facebook og brugen af plakat.

De fleste deltagere blev rekrutteret via en Facebook Gruppe, hvis formål var at dele erfaringer med Too Good To Go, altså deltagere som allerede havde kendskab med teknologien og afprøvet denne. Overordnet set har det sociale medie Facebook været den nemmeste måde at rekruttere deltagere på og også være den mest tidsbesparende måde. Alle deltagere blev rekrutteret via Facebook, undtagen en deltager som reagerede på en plakat.

Overvejende kan det reflekteres over de typer mennesker vi rekrutterede, kom relation til vores eget netværk, og vi har derfor vi kunne antage, at det var muligt at deltagerne ville dele vores aldre. Som nævnt ovenfor havde vi udelukkende haft størst succes ved brugen af Facebook som rekrutterings medie, hvor vi til fremtidige studier kunne overveje andre typer af rekrutterings medier.

## 03 COVID-19

Dette kandidatprojekt har forløbet under COVID-19, som har haft stor betydning for Danmark og resten af verden. Denne betydning har påvirket de metodiske valg til at studere madspild og deltagernes supplerende brug af Too Good To Go og måltidskasser. Dette afsnit vil afspejle

hvordan projektet har været påvirket af COVID-19 samt hvordan det kunne have været anderledes uden begrænsninger fra COVID-19.

### 03.1 Påvirkning af husstande

Under billede dagbogsstudiet med deltagerne så vi løbende ændringer i deltageres husstandsstørrelse. Grundet COVID-19 valgte mange af de studerende deltagere, at flytte hjem til deres forældre, og få af deltagerne som havde fraflyttende børn oplevede at børnene flyttede hjem igen. Dette har resulteret i nye indkøbs- og madvaner, som ikke normalt afspejler deltageres adfærd. Ser vi på ændringerne af madspild i husstandene, er det normalt at madspildet mindskes ved flere i en husstand (Quested & Luzecka, 2014), dette var dog ikke altid tilfældet under billede dagbogsstudiet, da vi hos nogle af de studerende der var flyttet hjem, oplevede en decideret uenighed mellem dem og deres forældre, i forhold til hvad der var acceptabelt at smide ud. Denne refleksion var et interessant samtaleemne under interviewene, da det gav indsigt i hvordan deltagerne normalt selv definere madspild og håndterer det, samtidig med at de stiller sig kritiske overfor hvad forældrene gør. Selvom nogle af deltageres sendte data ikke afspejler deres normale hverdag, forsøgte vi alligevel at håndtere det gennem interviewguiden. Foruden ændring i husstandens størrelse, havde Covid-19 påvirket deltageres indkøbsvaner på flere områder:

- Få begyndte udelukkende at handle online dagligvarer samt måltidskasser.
- Flere begyndte at handle mere ind, fordi husstanden spiste mere.

Disse ændringer afspejler ikke husstandenes normale indkøbsvaner, hvilket kan have betydning for madspildet i perioden. Under interviews kom det dog frem, at der var en generel opfattelse af, at husstandene ikke havde mere madspild, men at de til gengæld var blevet bedre til at få spist det der i forvejen var i husstanden, herunder specifikt mad fra fryseren. Hertil forklarede flere af deltagerne, at de var blevet mere opmærksomme på hvad der i forvejen var i husstanden, med henblik på at kunne reducere antal indkøb i husstanden.

### 03.2 Fravalgte Too Good To Go

Deltagerne var blevet bedt om at anvende Too Good To Go under billede dagbogsstudiet, men grundet mulige risici med COVID-19 udtrykte flere deltagere bekymringer omkring smitterisiko ved afhentning af Too Good To Go. Forinden billede dagbogsstudiet var vi opmærksom på en risiko med at deltagere ikke ville bruge Too Good To Go, dog øgede COVID-19 denne risiko. På trods af denne risiko, opfordrede vi fortsat alle deltagere til brugen af applikationen, dog skulle deltagerne overvejende selv vurdere dette. Denne manglende brug af Too Good To Go har resulteret i begrænset nye oplevelser med køb af lykkeposer og at interviewene derfor måtte fokusere på tidligere erfaringer. Denne retrospektive tilgang resulterede i at det ofte var negative erfaringer eller meget positive oplevelser med Too Good To Go der opstod under interviews. Dette hænger sammen med peak-end effekten, som handler om at man husker de mest intense øjeblikke, hvilke er dem som definere den endelige oplevelse (Doll, 2019).

### 03.3 Studie uden påvirkning fra COVID-19

Designet af vores nuværende studie har været bestående af online semistruktureret interviews samt billede dagbogsstudie faciliteret gennem Facebook. Størstedelen af alt kommunikation mellem os og deltagerne har derfor været faciliteret online gennem brug af Facebook Gruppe Chat, Skype samt Microsoft Teams. Facebook Gruppe Chat blev både brugt til interviews og faciliteringen af billede

dagbogsstudiet, hvor Microsoft Teams og Skype udelukkende blev brugt til interviews. Nogle af ulemperne ved denne indsamlingsmetoder var blandt andet begrænset mulighed for at se deltagernes kropssprog samt manglende kontekstforståelse.

For at studere menneskers håndtering af madspild samt oplevelser med Too Good To Go, uden begrænsning fra COVID-19, kunne studiet have set anderledes ud. Her ville en essentiel tilgang være at anvende kontekstuelle interviews. Ved brugen af kontekstuelle interviews ville det være muligt at observere deltagerne i deres private hjem, udføre forskelligt arbejde (Beyer & Holtzblatt, 1998). Her ville det være relevant at observere deltagerne i) mens de laver mad, med henblik på at undersøge håndtering af madspild og madaffald, ii) under og efter de har spist et måltid, med henblik på at observere hvordan eventuelle madrester håndteres, iii) i processen om at bestille Too Good To Go, med henblik på at undersøge hvilke overvejelser der gøres, hvilke forventninger der er, hvordan reaktionen er ved at se indholdet af lykkeposen samt håndtering og strukturering af indholdet.

Disse tre forslag til kontekstuelle interviews ville bidrage til indsigt i deltagernes organisering af fødevarer, strukturering af køleskabe og fryserer samt eventuelle redskaber til opbevaring af fødevarer. Disse aspekter kan fremstå ligegyldige og usynlige for deltagerne under konventionelle interviews, men værende højst aktuel for forskningen, hvilket kan medføre at deltagerne ikke føler det er værd at nævne under et almindeligt one-on-one interview enten in-person eller online (Beyer & Holtzblatt, 1998). Det kontekstuelle interview vil derfor kunne bidrage til kortlægges af arbejdsprocesser i husstandene i specifikke situationer, hvilket skaber en fælles forståelse af konteksten og dannelse af udgangspunkt for videre designforløb (Beyer & Holtzblatt, 1998). En anden fordel ved kontekstuelle interview kunne være muligheden for at se deltagernes løsninger og måde at strukturere sig på. Her oplevede vi i dataindsamlingen at flere deltagere havde systemer og forskellige måder at opbevarer ting på, som var tidskrævende at beskrive online.

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