

Household food waste prevention: How to design and evaluate technological interventions?

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ABSTRACT

We present an overall plan of implementing a mobile social persuasion system to reduce household food waste, a topic that has received little attention in sustainable HCI. Questions and challenges, however, remain. The HCI and sustainability community workshop could help in the discussion of what methods are expected to be effective in the tracking of daily food behaviors in a natural manner. It could also help in how to evaluate technological interventions based on lessons learned from other applications.

INTEREST IN THE AREA

There is a significant need for an effective solution for the prevention of food waste in households. Food waste harms climate, water, land and biodiversity [1] and contains all other resource losses such as energy, water and CO₂ needed to produce, transport or process wasted food. In developed countries, consumers are responsible for up to half of the total avoidable losses within the food chain [5] [2]. Regardless of these numbers, food waste has received little attention in sustainable HCI research. Instead, sustainability research has mainly focused on areas such as sustainable energy consumption, resource consumption, green transportation and reducing CO₂ emission [3] etc.

Our interest lies in understanding how persuasive and pervasive technology could prevent food losses throughout consumers' every day lives. The mobile platform is such a technological delivery medium with increasing reach and worthwhile investigating for the application on food waste practices. With the potential and popularity of social media [4], we are further interested in understanding how social influence strategies can be used in such technologies to prevent food waste. We believe that the study of social behavior around food practices is a key area of daily life which could have enormous impacts on the

design, use and hence the acceptance of technology aiming at food waste prevention.

To explore social behavior around food practices, we are in the process of developing EUPHORIA (Efficient food Use and food waste Prevention in Households through Increased Awareness), a mobile social platform for food waste logging and tracking, in-home food visibility, eco-feedback of wasted food and food sharing.

PLANNED RESEARCH

EUPHORIA is a community based system that allows individuals and group of users to log their every day food related behavior and redirect these, through social influence, towards more sustainable food related practices aiming at promoting sustainable lifestyles. The system detects potential food waste within a community and hence respond by providing recipes aiming at food waste prevention. To promote social interaction and to gain more effective food waste prevention, the system provides social recipes through a group based recipe recommendation system. A social recipe is a combination of available ingredients from different households that need to be consumed, which is expected to provide an innovative and pleasurable experience around food practices such as planning, purchasing, cooking and inter-cultural encounter.

Before implementing the group based recipe recommendation, we will first aim at exploring and capturing variations in human behavior around food waste to identify opportunities for social computing. The mobile application that can be used within a group of users will be deployed and evaluated in three phases. In the first phase, food consumption and food waste behavior will be monitored and modeled. Here, we aim at quantifying and understanding consumers' everyday practices, food intake and food waste flows related to context (e.g. time, temperature, type of day etc.) in order to specify determinants of food waste. In the second phase, the mobile application will allow visibility of users' own as well as others' in home food availability and eco-feedback of wasted food. Visibility of others' in home ingredients are expected to motivate the sharing of critical food items before doing more groceries. Eco-feedback could increase users' awareness and understanding about how their food waste behaviors affect the environment. Results from this second phase are expected to give us an indication of

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social interest in other users' food related behavior and food waste patterns as well as how it affects behavior. Through the study of groups of interconnected users, we aim at the ability to see the potential for social solutions applied to food waste. This information could provide us with better indications on moments for susceptibility for persuasion and behavior change. In the third phase, a social recipe recommendation system for food ingredient sharing will be implemented. This concept is based on connecting users' in home food availability, which if combined, results in a social recipe aiming at collective food waste prevention and sustainable and healthy food practices.

This research will be done in a longitudinal fashion through a participatory design process. We will apply an empirical approach to test the effects of social visibility, eco-feedback and social recipe recommendations on food waste prevention in a real context.

QUESTIONS TO THE COMMUNITY

Food practices are culturally integrated in personal lifestyles. The application of technology in the area of sustainable food practices can, therefore, be a sensitive and complex topic to introduce in users' daily lives. We expect a need to stress the role of society in the trust and acceptance of technology. Our first question to the community is how this could be effectively done. How can societies be motivated in collaborating in long term evaluation of sustainable research? Specifically, if sustainability research includes a complex issue such as food waste behavior. Should we, for example, distinguish methodological approaches applied to energy consumption vs. a more personal, intimate and culturally established activity such as food consumption?

In line with our planned research on behavior tracking and pervasive and persuasive methods to reduce food waste, issues could arise on privacy matters. Our second question is how to find the optimum balance between sustainable food practices and privacy? In our case, users have to manually input data and choose what information to share with others which allows them to control outgoing information. In turn, influence strategies can be based on the available information. In order to get a more complete insight into reasons of food waste and how to effectively prevent them, societies should be motivated to provide food related data.

Another aspect worth mentioning is that the suggestions of social recipes using available in home ingredients that have the potential to otherwise get wasted, will touch on the health issue. The third question to the community is how to balance between sustainable food practices and healthy food consumption? Should we always consider the health issue in sustainable HCI, and if so, what aspects should we focus on? How can we prevent unintentional and unforeseen situations such as a reduction in the variation of food intake.

Furthermore, as technology must be considered in its natural contexts, the main methodological challenge in our research is whether our approach can reliably capture food and/or waste data at the consumer level. By using strategies such as a shopping list, eco-feedback, social visibility and

notifications we hope to motivate users to input data. As global data seem to be unreliable and inconsistent, there is an importance of collecting local data as it is more informative in terms of reasons of food waste. From this perspective, we ask the community the fourth question on how HCI can contribute to monitoring determinants of household food waste? How can we quantify food data reliably (purchases and food waste)?

Finally, a fifth question to address is how to make better use of knowledge from outside HCI that could have mayor relevance for sustainability research? Currently, as reliable and local data around food consumption is lacking there is insufficient proof for policy makers to focus on sustainable food practices, specifically food waste. First, there is a need of integrated collaboration between behavioral scientists, engineers, designers, economists, nutritionists as well as media to get the word spread out. We also need to collaborate tightly with society to increase the chances of acceptance of proposed technology. How can we allow for autonomy while developing (persuasive and pervasive) technology that is motivating.

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BIOGRAPHIES

Veranika Lim

Veranika Lim is a PhD candidate at the Technical University of Eindhoven in the Industrial Design Department. She obtained her degrees in Cognitive Psychology and Cognitive Neuroscience from Leiden University. She further gained experience in applying her background in fundamental research to Industrial Design at the Technical University of Delft, Human Factors in Aviation at the Flight Deck Display Research Lab in California and Service Design at Logica and Madeira Interactive Technologies Institute. She is interested in multiuser interactions mediated through technology, sustainable HCI, as well as cognitive concepts such as perception (implicit and explicit), attention, awareness and values and its effects on the decision making in sustainable practices.

Fulya Yalvaç

Fulya Yalvaç is also a PhD candidate at the Technical University of Eindhoven in the Industrial Design Department. She obtained a degree in Computer Science from the Middle East Technical University and worked as a software engineer in industry for 5 years. Her expertise is in object

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