EatChaFood: Challenging Technology Design to Slice Food Waste Production

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Abstract

This paper presents work in progress of *EatChaFood* – a prototype app designed to increase user knowledge of the currently available domestic supply and location of food, with a view to reducing expired household food waste. In order to reap the benefits that EatChaFood can provide we explore ways to overcome manual data entry as a barrier to use. Our user study has to recognise the limitations of the prototype app, and conduct an evaluation of the interaction design built into the app to promote behaviour change. Innovations in the near future such as the automatic scanning of barcodes on food items or photo-recognition will close the gap between perceived prototype usability and usefulness.

Author Keywords

Food, food waste, human-computer interaction, urban informatics, behaviour change, interaction design.

ACM Classification Keywords

Human-centered computing → Empirical studies in HCI; Empirical studies in interaction design

General Terms

Human Factors; Design

Introduction

People in industrialised societies are throwing away approximately 25% of edible food each year [8], with food waste being produced along the entire food supply chain. Ambler-Edwards et al. [1] argue that a significant portion of losses occur in domestic households. This waste is often deposited in landfills. Landfill on average contribute 8% of global annual greenhouse gas emissions [10]. Household food waste is characterised in four specific forms: original food, partly consumed/used food, leftovers (plate waste), and preparation residues [8]. Within the household, food waste production can be attributed to a combination of lifestyle choice and an amalgamation of incorrect knowledge about food itself. This combination of factors promotes behaviours that can lead people to produce food waste in the home.

Further, food is a relatively cheap commodity (in comparison to clean drinking water or electricity) in industrialised countries. This often encourages apathetic purchasing habits and does not necessarily consider implications of wasting purchased food. If food items expire before they can be consumed (i.e. reaches the recommended 'best before' date), they can just as easily be replaced during the next grocery shop. However, this often depends on the product, e.g., condiments may be held onto long passed expiration. Reflecting on this practice, the majority of household food wastages occur because of behaviours present during the purchasing and storage of food. Therefore, design interventions targeting behaviours at these phases may stimulate a reduction in expired household food waste.

Recently, human-computer interaction has been noted to be in a favourable position to assist in a behavioural change process, regarding environmental sustainability [4]. This presents an opportunity to use technology that builds on HCI concepts to facilitate a shift towards behaviours that reduce expired household food waste. The key elements that must be considered when designing technology to stimulate behaviour and attitude change include leveraging both engagement and interaction [c.f. 3]. Further, Bishop [2] argues that maintaining a new behaviour over time is a difficult challenge. While there have been many studies that have investigated how HCI concepts embedded in technology can be used to change behaviour (e.g.[7]), the majority have not been able to sustain new behaviours. We are interested in design interventions that both change existing as well as sustain new behaviours. However, different strategies may be necessary for each phase.

EatChaFood App

EatChaFood is a mobile app designed to encourage users to eat their food prior to expiration. It forms part of a three-year program of design research looking into ways how best to respond to user behaviours that lead to household food waste. The research has identified three key contributing factors of expired food waste in households:

1. Food supply knowledge: Does a person know what food items are available in their fridge and pantry?
2. Food item location knowledge: Does a person know the location of food items available in their fridge and pantry?
3. Food literacy [9], referring to the acquired knowledge and past experiences of a person in

Figure 1. An example of the main screen a user will see.

Figure 2. An example of food items belonging to a colour.

relation to, among other dimensions, food selection, preparation, and consumption, as well as food lifecycles.

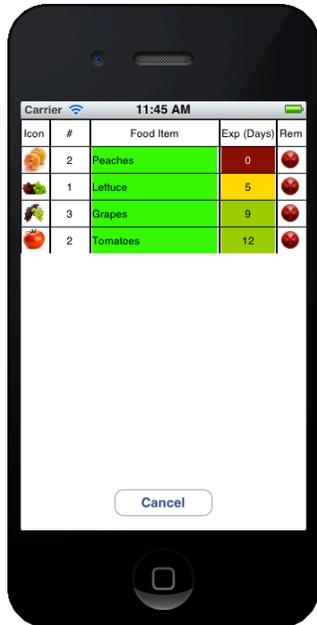EatChaFood is the third design intervention of the research program, and seeks to address all three identified factors. It does this by implementing some of the successful characteristics identified in the previous two interventions [5, 6]. The intention of EatChaFood is not to directly reduce household food waste; rather, by impacting the above factors and informing users of their shopping and storage practices, we hope to achieve a reduction in expired food waste. A similar approach was used with the previous two interventions, both contributing to a reduction in expired food waste of varying degrees.

EatChaFood provides a single account for all members of a household, and household data is stored online. Upon logging in, users are provided with an initial view of the interior of the household refrigerator. The photo is taken regularly by a camera installed within the household fridge [6] (e.g. Figure 3). Overlaid on this photo is a colour configuration specific to the household's fridge. The colour configuration is editable by any household member. Each colour represents a food type (e.g., green refers to fresh produce) and the location where a user will find a food item. Sliders enable users to increase or decrease the transparency of the overlay, enabling the user to view items in their fridge interior without obstruction. Figure 1 shows the interface of the main screen.

As food expires, the relevant section of the overlay would flash to alert the user. Upon selecting that section, the user is taken to a list of products for the corresponding food type. Figure 2 provides an example of this. The user is given the option to view a full list of their inventory ordered by food type.

Either option provides users with more details about each product with items ranked by expiry date (if available). Users can delete items when they are consumed and are also able to find a recipe that incorporates the items. Both the visual representation and detailed list of food stocks increase a user's knowledge of their currently available food supply. Furthermore, the colour-coded representation of item locations increases a user's awareness of where they can locate food items. The recipe system assists users in learning new ways to use their food before it expires. The expiry system provides users with assistance to i) know how long food should last when refrigerated and ii) to use their senses when determining if food is edible if it has passed expiration.

Responding to Design Challenges

Australian food infrastructure does not currently allow for information about food items to be easily codified at the point of sale. In some countries, such as the U.S., certain information can be appended onto a food item using a barcode, which can link to corresponding databases which include complementary information such as the food's name, type and expiry. This limitation in the current Australian food infrastructure causes the process of adding new items into EatChaFood to be unnecessarily user-intensive. This is a challenging problem to solve because a more user-intensive process may lead to reduced engagement. Therefore, there is a greater risk that study participants will either discontinue their use of the prototype app, or find it challenging to distinguish between these usability

limitations inherent in the nature of a prototype and the actual usefulness of the interaction design strategies being evaluated by the user study.

To ease the burden of manual data entry, a two step click-through process has been introduced: A user selects a food type, then the food item and quantity. Furthermore, we are currently responding to this design challenge by also exploring new ways of offering additional value and incentives to users. Extra features to be trialled that may justify the current burden of data entry include an advanced system that matches recipe suggestions to available food items as well as allows for personal recipe variations to be shared with others; communicating the availability of excess food items to friends or neighbours and publishing of fridge inventory lists or photos with other users for comparison or social purposes, such as potluck dinners. An evaluation of this process is currently being undertaken through testing the application with study participants. Two user studies, each involving five participants are currently being undertaken.

Conclusion
The EatChaFood app has been designed to facilitate a reduction in household expired food waste by increasing the awareness and knowledge of users about their stored food. We hope the implications of the findings will be valuable, building on current knowledge in interaction design and HCI with respect to both behaviour change strategies and food waste research.

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Figure 3. An example of a photo taken by FridgeCam.

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