

Designing Mobile Technology for Motivating Sustainable Behavior Change

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1 Introduction

Much energy consumption is directly related to personal activities and experiences with digital and electronic devices such as air conditioning, heating, lighting, and consumption of electronics. Many times, it is up to the individuals to decide when, how, and why to use energy, depending on how they feel at that moment. Sometimes use of energy brings personal comfort (Wang & Fussell, 2014), e.g., having air conditioning on a hot summer day. Sometimes, energy consumption creates a sense of security (Wang & Fussell, 2014), e.g., leaving a light on when it is dark outside. By taking people's experiences of using energy into consideration, we aim to design persuasive technologies that are more successful at engaging people in behaviors that reduce their energy consumption.

2 Research Goals and Approach

Our research attempts to understand personal experiences of consuming energy and explore the design opportunities of using mobile technologies to support sustainable behavior change based on energy-consuming experiences. There are three key dimensions to our work. First, we examine people's feelings, experiences and expectations when using energy. Second, we explore the design space for mobile applications to motivate sustainable behavior change that take into account people's feelings and experiences of energy use. Third, we design a set of mobile applications and evaluate them with real users, to reflect our design choices and open up broader discussion for behavior change design.

2.1 Methodology

Our research has three components: *understanding* the experiences of energy use, *designing* mobile applications to motivate behavior change, and *evaluating and reflecting on* our designs. To understand people's experiences of consuming energy, we use mixed methods including surveys, interviews, observations, contextual inquiries, and diary studies. We then use a *set of design activities* (e.g., brainstorming, sketching, wireframing, prototyping, building) to design mobile applications based on the previous findings. Finally, we evaluate our designs with real users using behavioral testing to measure behavior change, diary studies, photo journals, interviews, and usability tests. The user evaluations may lead to *design iteration* (redesign) based on the findings.

3 Current Research

3.1 Supporting Experiences of Energy Conservation in Hotels

One of our current projects (Wang & Fussell, 2014) aims to understand how and why hotel customers use energy in a hotel room and identify design opportunities for new tools to motivate behavior change. In 2013 and early 2014, we conducted 13 diary studies with both leisure and business travellers. Then we conducted 20 interviews with hotel customers. We asked how they managed energy use, what made them consume energy, how they felt about energy consumption, and what might motivate them to use less energy in the hotel. We identified several key factors that influenced hotel customers' energy consumption: energy use as a way to prepare for the unknown and prevent feelings of insecurity (e.g., leaving a light at night for preventing stepping onto something), energy use to bring comfort and a sense of luxury, energy use as influenced by other hotel customers and personal reflections. We identified several design opportunities for motivating energy conservation in hotels based on our findings.

3.2 EnergyHome: An Mobile Application to Motivate Sustainable Behavior Change

Another on-going research is the design evaluation of a mobile application for motivating sustainable energy behavior among housemates who are sharing a living space together. According to Mankoff et al. (Mankoff et al., 2010), social media has a significant influence on motivating household energy conservation. Mobile technology, such as cellphones, can be a suitable media to persuade energy

conservation (Froehlich et al., 2009). In this study, we use smartphones to motivate energy-saving behaviors, and evaluate our mobile application design to understand the following aspects: 1) mobile design elements that are effective for motivating energy conservation, and elements that do not have any influence; 2) mobile design elements that are influential for increasing awareness of energy conservation, in particular, collaborative energy conservation vs. individual energy conservation; 3) user experience of interacting with our mobile application; and 4) whether or not the mobile application helps to establish energy-saving behaviors. We designed and developed a mobile application called EnergyHome (see figure 1). In order to test the design, we conducted a set of evaluation study including: *pre-surveys* to understand people's attitudes, values, and decisions of energy use, *diary studies* as people used the mobile application for a week, *post-surveys* to compare behaviors before and after using the application, and *interviews* to further understand people's feedback and experiences of the application. We have collected around 150 surveys responses, 45 diaries and 45 interviews by far. Currently, we are transcribing the interviews, and analyzing the surveys using statistical analysis.

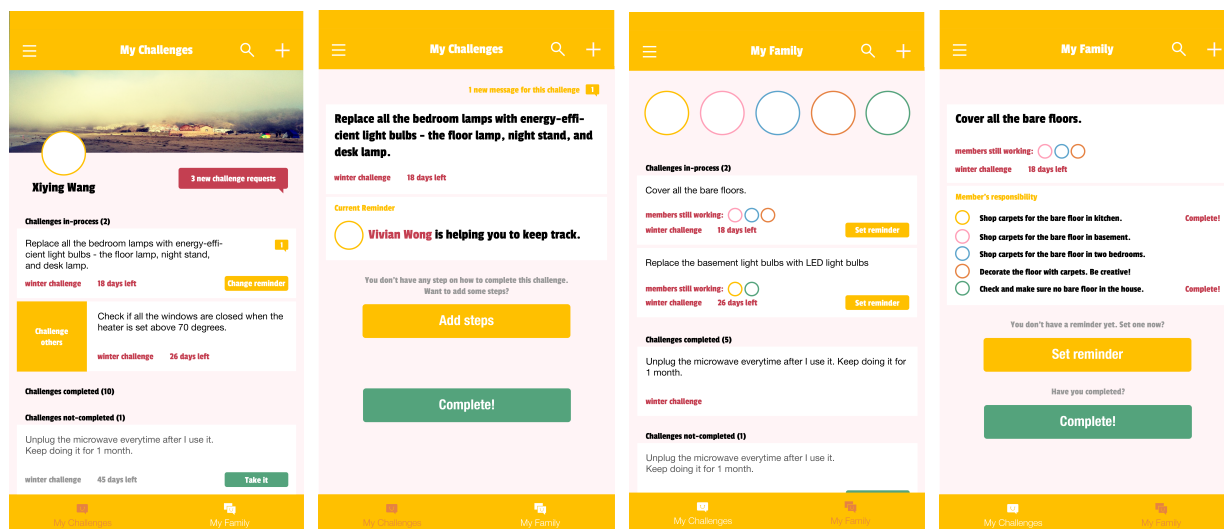


Figure 1: EnergyHome Mobile Application Designs

3.3 Cross-Cultural Sustainability

As our next step, we are planning to investigate the experiences, values, attitudes, and expectations of energy use in different cultures, e.g., China vs. United States, to find out if there is cultural difference in consuming energy. By evaluating EnergyHome in different cultures, we investigate whether motivational strategies and tool features should differ by culture and identify opportunities for designing persuasive sustainable technology with a respect for cultural differences and similarities.

References

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