MIS Quarterly

SPECIAL ISSUE: IS & ENVIRONMENTAL SUSTAINABILITY

MOTIVATING ENERGY-EFFICIENT BEHAVIOR WITH GREEN IS: AN INVESTIGATION OF GOAL SETTING AND THE ROLE OF DEFAULTS

Claire-Michelle Loock
Information Management, ETH Zurich, Weinbergstrasse 56/58,
8092 Zurich, SWITZERLAND {cloock@ethz.ch}

Thorsten Staake
MIS (Energy Efficient Systems), University of Bamberg, An der Weberei 5,
96047 Bamberg, GERMANY {thorsten.staake@uni-bamberg.de}

Frédéric Thiesse
Information Systems Engineering, Julius-Maximilian University of Wuerzburg, Josef-Stangl-Platz 2,
97070 Wuerzburg, GERMANY {frederic.thiesse@uni-wuerzburg.de}

Appendix

The Velix System

In the following, we describe Velix, a web-based energy feedback system that motivates its users to reduce their electricity consumption, developed by our group in cooperation with an Austrian utility company. The system provides consumers with feedback on their electricity consumption and combines energy record keeping with game-like tasks that center around environmental sustainability. The utility considers the system an integral part of their energy efficiency endeavors and made the portal available to all of its private customers.

In addition to achieving immediate energy savings, the system was developed to experimentally investigate socio-psychological concepts (e.g., goal setting, social norms, cost projections) that may help to promote eco-friendly behavior. To render related studies possible, the system allows for randomly assigning consumers to different treatment groups (i.e., experimental conditions) and for recording electricity consumption data for each household. It is thus possible to compare the effects of different interventions on energy demand. For the study at hand, we used the portal to test hypotheses regarding the structural relations between defaults and goals, the impact of defaults and goals on energy consumption, and the moderating role of feedback on goal choice.

In order to gather a large user base, the utility company informed their customers via their customer magazine and teamed up with a local media corporation that placed ads in various newspapers and a news website. Moreover, the company gave its customers incentives for using the system in the form of bonus points that can be traded for products in an online shop. Between April 1, 2010, and December 31, 2011, a total of 10,700 consumers registered with Velix.

The sequence of user interactions on the web portal is structured as depicted in Figure B1. After registration, consumers can participate in the "meter hunt," a game-like instruction on how to find the electricity meter and interpret its reading. Participants who already know where to find their meter can directly enter the reading in the portal. Next, consumers are asked to voluntarily set a reminder to foster repeated system

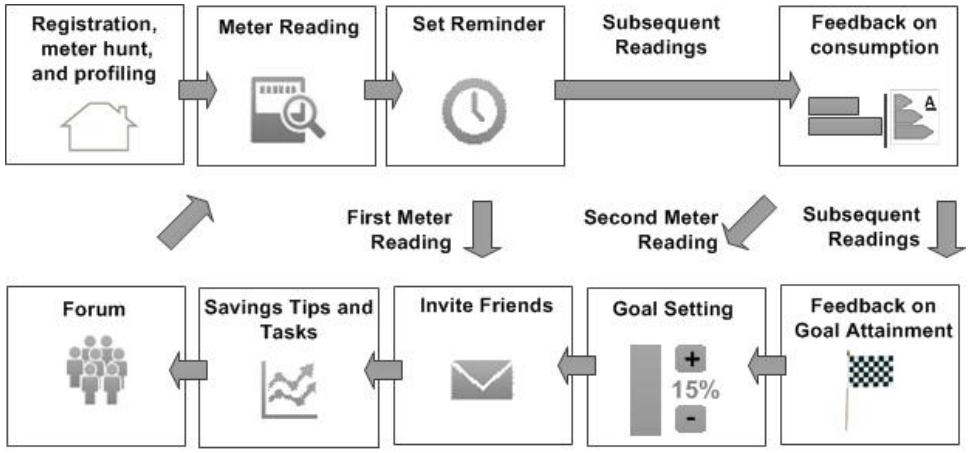

Figure B1. Experience Chain in Velix

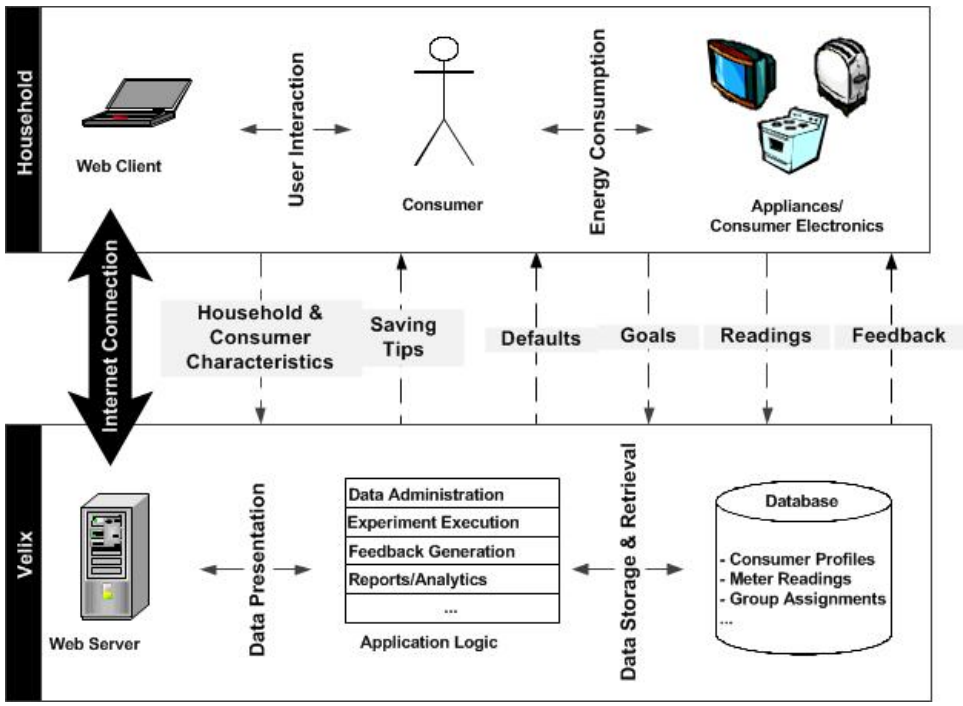

Figure B2. System Architecture and Data Flows

usage, either in the form of an e-mail or a text message sent to their mobile phone at intervals and times as selected by the users. Since it is not possible to determine household consumption with only one meter reading, several subsequent functionalities of the portal, such as neighborhood comparison, efficiency check, goal setting, and feedback on goal attainment are not enabled at the time of the first login but only briefly explained as an outlook to the next visit. However, during the first visit, consumers can invite other potential participants, receive savings advice, and read or write comments in a moderated forum. Following a subsequent meter entry at least one week after the first data input and after the completion of the household profile, consumers receive feedback on their performance. To provide tailored information for each consumer, the household profile includes data on the number of inhabitants, the size of the apartment or house, the type of space and water heating system, the number of household appliances, and the address/location of the residence. Figure B2 presents an overview of the system's architecture and the resulting data flows.

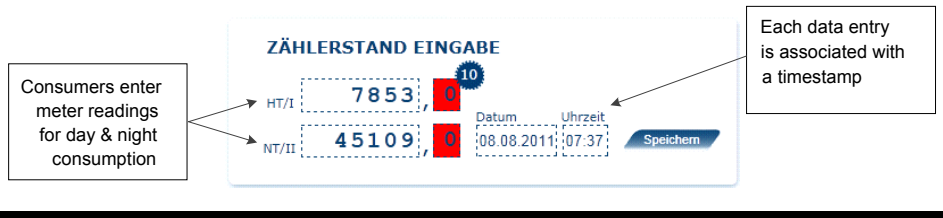

Figure B3. Data Entry Form for Meter Readings

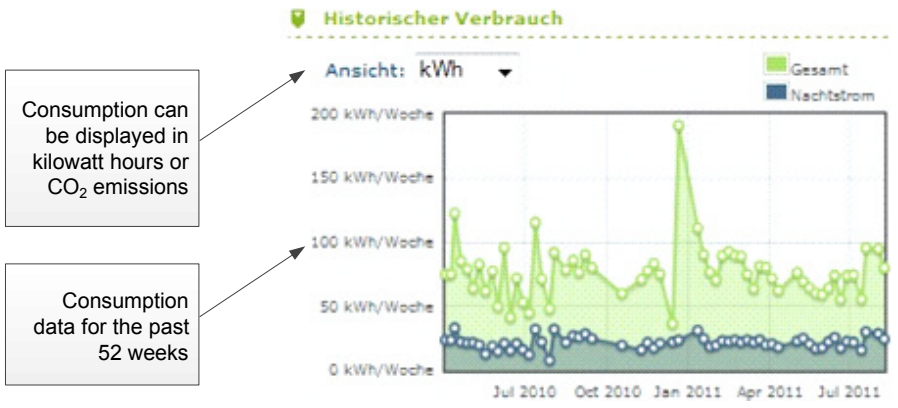

Figure B4. Graphical Depiction of Consumption History (Total and Night Only)

For the present study, every consumer was randomly assigned to different goal setting conditions upon registration. As described in the article, our study design distinguishes among three different categories of consumers: no-goal subjects (G^-D^-), goal and no-default subjects (G^+D^-), and goal and default subjects (G^+D^+). The first two groups represent our two control groups. We further divide treatment group G^+D^+ into three subgroups to compare the effects of low-, medium-, and high-level default goals on energy-saving goal choice and actual energy savings. Based on the assignment, the system provides each consumer with a different goal-setting functionality. The consumer is provided with feedback on goal attainment as soon as he or she enters the next meter reading. The time lapse between goal choice and feedback is at least one week. After having received feedback, the consumer could set a new goal. The consumer always remained in the same experimental condition throughout the study. In the following, we provide details on the most prominent Velix features including the goal-setting functionalities from the consumer's perspective.

As mentioned earlier, Velix currently depends on manual data collection by its users since no widespread smart metering infrastructure was available that allowed for conducting experiments with different treatment groups when the portal was launched in 2010. Meter readings may be entered at any time, as depicted in Figure B3. The website stores consumption data separately for day and night consumption at the household level. To motivate consumers to periodically enter their data, the system can be configured to send automatic reminders via e-mail or SMS. Between April 1, 2010, and December 31, 2011, consumers entered 319,169 meter readings. Checks to ensure the validity of the transferred meter readings are outlined in the article. In the long run, the portal may easily be extended by a smart metering interface without having to change any of the higher-level functionality and without qualifying the statement made in the study at hand.

Users can retrieve the historical data in the form of a table that depicts all of their meter readings entered in the past 12 months. In addition, the user may request a graphical depiction of his or her consumption history over time (see Figure B4).

Beyond the quantitative notation, Velix provides feedback on consumption efficiency in two ways (see Figure B5). On the one hand, the portal contrasts the weekly electricity consumption of each household with the corresponding average in the consumer's neighborhood. On the other hand, the consumer's current efficiency level is indicated using a scale from "A" (high efficiency) to "G" (low efficiency). To determine said efficiency level, the system takes household characteristics and electricity consumption into account. Household characteristics are collected during registration with the website when the consumer is asked to create a household profile. This profile includes the type of building, the total size of the house/apartment, the number of people living in the household, the number of appliances, and the type of heating. The calculations were reviewed and validated by the partner utility.

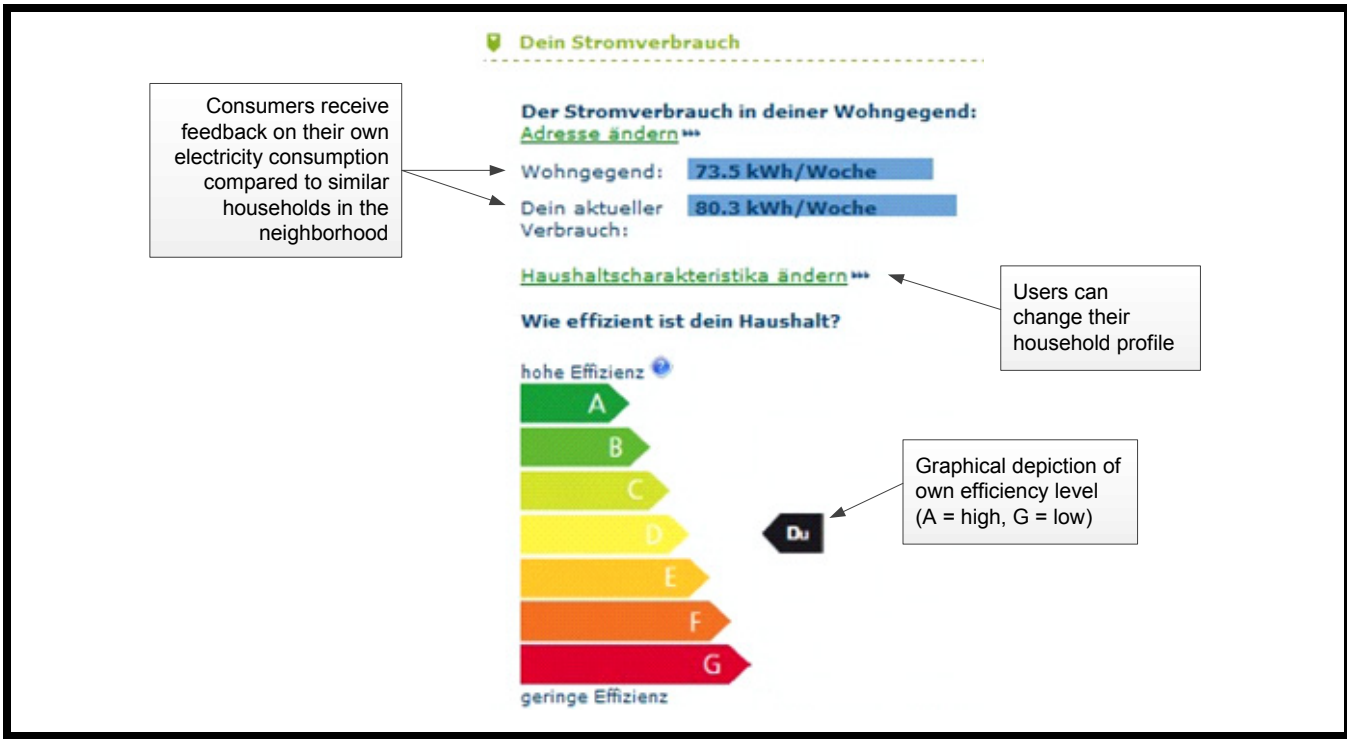

Figure B5. Feedback on Consumption Efficiency

The goal setting functionality included a bar graph of each participant's average consumption level in kilowatt hours. For the $G^{+}D^{+}$ group, we presented their default goals (0%, 15%, or 30%) next to the bar graph. The consumers could modify their conservation goals with the help of two buttons for increasing and decreasing the value. The participants had to push a button to set the goal (see Figure B6). As a result, the bar graph indicates the target consumption level. In the $G^{+}D^{-}$ group, no reference point was provided, that is, the consumer had to enter his or her conservation goal into an empty text box (see Figure B7). Regardless of the condition, the consumers could choose a conservation goal between 0 percent and 100 percent. By contrast, the $G^{-}D^{-}$ group did not have a goal-setting functionality.

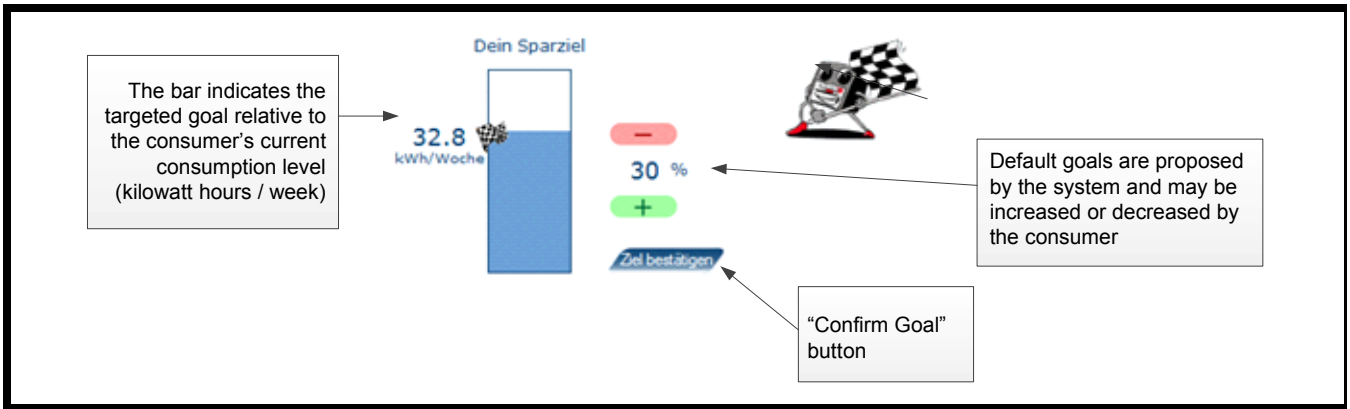

Figure B6. Goal-Setting Functionality with Default Goals

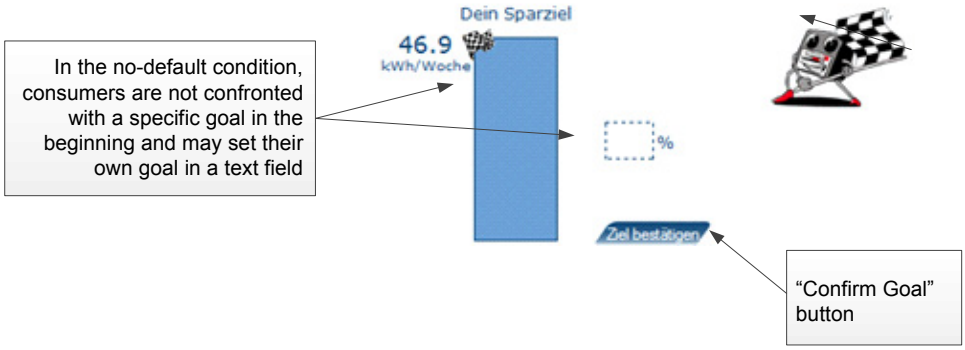

Figure B7. Goal-Setting Functionality in the No-Default Condition