Finances, Fitness, and Fuel: Our Experiences Designing and Evaluating Personal and Persuasive Informatics

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Abstract
In this position paper we describe our ongoing work in the area of Personal Informatics, focusing on three recent projects that span the domains of finances, fitness, and energy consumption (fuel). To date, our research has focused primarily on user requirements and the design on such tools. While we have evaluated our initial designs in the lab, we have yet to evaluate in the wild. We discuss our plans for doing so and describe the challenges we have yet to overcome.

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Personal informatics, persuasive interfaces, visualization

ACM Classification Keywords
H.5.2. Information interfaces and presentation (e.g., HCI): Evaluation/methodology

Introduction
Personal informatics can assist users in many domains such as health, managing personal finance, etc. For example, Rudolph et al. [4] proposed a tool known as Finvis for casual users, which helps them to understand and manages financial data like returns, risks and correlations and to assist users to make decisions by

visualizing the results. They found that Finvis helped users improve decision-making, improve learning, and increase confidence and perception among users through visual analytics.

Our research in the area of personal informatics has touched upon all stages of Li. et al.'s [1] five-stage model of personal informatics systems, which consists of preparation, collection, integration, reflection, and action. This model helped us to understand the kind of support that a personal informatics tool must provide to its users. Another model that has informed our work is Prochaska et al.'s [3] Transtheoretical Model of Behavior Change, which consists of five stages: pre-contemplation, contemplation, preparation, action and maintenance. It explains the changing behavior of people and their different levels of motivation. We have also been motivated by Pousman el al. [2], who proposed Casual Information Visualization as a new subdomain for Infovis research. Their research discussed design challenges for systems that are intended for casual users.

We next provide a brief overview of our research efforts to date before discussing some of the challenges of evaluation.

Finance

Our focus is on the area of personal financial analysis tools, and our initial research investigates mortgage calculators. There are a number of challenges that must be addressed as we design enhancements to mortgage calculators. Homebuyers often do not have a great deal of knowledge about the personal mortgage domain, experience with analytical concepts, or experience with data representations. We need to understand what makes a particular visualization or interface enticing, so that those with a casual interest are persuaded to interact. Furthermore, once initially engaged, we need to consider how to create persuasive interfaces that will heighten curiosity about the data and encourage interaction with the interactive visualizations and then with mortgage professionals. We are also interested in understanding how to best show risk (where are mortgage rates likely to go?) and how to better incorporate historical data (worst 5 years in last 25) and trend information (forecasts) so that users have a better basis for entering values (current calculators either have no defaults or arbitrary values provided).

In order to better understand how to elicit and sustain engagement and to ensure that our efforts are usable and understandable by a broad range of people, we are undertaking the following approach. First, we conducted an initial survey of existing on-line mortgage calculators and identified several areas where basic functionality could be enhanced. We then conducted focus groups with homebuyers to probe their experiences using mortgage calculators and to learn more details about the types of comparisons and questions that they would like mortgage calculators to be able to address. We also gain initial feedback during the focus groups on various visualization approaches to ensure that they are comprehensible. We then developed prototypes that we are in the process of evaluating through a lab study.

Fitness

In the fitness domain, we proposed a generic framework that can gather sensor and interaction data on a mobile device and use the data to annotate personally meaningful events such as motivating

landmarks or scenery encountered by a runner. Such data includes touch input, heart rate, GPS co-ordinates, and orientation sensor readings. The same framework along with business logic can be used for a wide range of running applications, and in future possibly applications in other domains such as cycling, cardio training, mountain biking and core exercises.

We developed a proof of concept iOS app called DreamFit in order to examine the requirements of such a framework to support the development of personal fitness information management applications. With the help of this app, runners can record location, time, and touch coordinates with each touch of the phone screen. We use a gesture-based language so that users can easily provide input without disturbing their run. Our framework permits users and designer to define gesture sets and to associate meanings to gestures. For example, a user could choose a tap-based approach in which a single tap means the user has encountered a good landmark, a double tap means scenic beauty, a triple tap means the user liked the route, a right to left swipe means he/she likes the music, etc. While implementing DreamFit helped us to validate and refine the framework, we have yet to validate its usefulness or usability.

Utility Bills (Fuel)

Our project "Improving Online Utility Bills for Casual Users" investigated various visual ways to represent online utility bill data. The main aim of this project was to develop an interface that consolidates the various utilities in one place (e.g., power, gas, water). Users will be able to access the information for all their utilities here, instead of managing different accounts for different utilities. Our goal was to build a new online utility bill system that will empower casual users to understand and analyze their personal utility bill information using appropriate visualization techniques.

During the research, low-fidelity and medium-fidelity prototypes were developed as we explored the desired functionality and the suitability of various visualization techniques. Informal evaluation of the prototypes was done in the form of the feedback from the supervisors and stakeholders of this project. The research outcome was a medium fidelity prototype with enhanced visualizations and features. The prototype uses simple and known visualizations techniques to allow users to determine the current status of consumption/cost for all the utilities and to review their history over the previous three years. In addition to allowing comparison with past bills, we explored how to allow users to predict the nature of upcoming bills based on their prior usage history. Persuasive techniques were used to provide guidelines for hos to reduce consumption, including providing comparisons with similar users in their neighbourhood.

Challenges of Ecological Validation

Our research focus has spanned many of the stages in Li et al's model [1]. We have explored a variety of personal informatics systems, from those that require a great deal of user input to those systems that take existing data that has been collected by the user and allow the user to gain additional insights into this data.

One of the main challenges we have found is the difficulty in conducting evaluations with a high degree of ecological validity. It is difficult to create prototypes robust enough to be used in the wild. As a result, our

evaluations to date have primarily been within the lab setting, using participants and stakeholders to validate our ideas.

We are, however, moving towards field evaluations. The DreamFit application is now robust enough to be used by the researchers and the goal is to evaluate it in the wild soon by having a local runner's group use it on their regular runs together. Our industry partner on the mortgage calculator project will soon inject our ideas into their existing interface. This will allow us to gain direct user feedback about the success of our improvements through AB tests and brief surveys after use

Conclusions and Future Work

As we move forward with this research, we would appreciate the opportunity to attend this workshop. We believe that our experiences could contribute to discussions and we hope to learn from other researchers the trials and tribulations of evaluating these systems in the wild.

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