

Exploring Digital Service Concepts for Healthy Lifestyles

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Abstract. In this paper, we report our findings charting the user interfaces (UI) design trends of current mobile phone wellness applications (n = 39), and report e.g. that whereas features related to sharing are already quite common, conversational UIs and gamification still play a minor role. In addition, we present the service design based development of future concepts for ubiquitous wellness services and UIs, and evaluate the concepts in an online survey based user study with 89 participants. The salient findings show that concepts that were embedded into everyday life routines and which contained clearly presented interpretation of the data were the most appreciated.

Keywords: Digital health services · Wellness · Service design · Mobile applications · Ubiquitous computing · User studies

1 Introduction

The health and wellness sector is constantly growing in importance in the field of public digital services. Whereas conventional health services, e.g. hospitals and occupational healthcare, are transferring information and services online, also commercial wellness and lifestyle related digital services are rapidly expanding. The digital age provides enormous possibilities for new, ubiquitous consumer services. Data related to individuals is no longer collected only through centralized services, but as a byproduct of the numerous interactions we have through, e.g. smart phones, Internet use and credit cards. All this creates a digital footprint of our everyday life. Our digital footprint consists of a vast amount of data from different sectors of our lives, and contains much lifestyle information that could be utilized by health and wellness related digital services.

Amongst mobile and ubiquitous computing research, the design of wellness applications has been quite intensively addressed. Examples of research in the area include persuasive and playful UI design [1, 2], user experiences with outdoor sport tracking [3], and enhancing sports experiences with social cues [4]. In this paper, we approach the area by presenting design reflections on current commercial mobile UI design trends, and present our approach to the design of a service concept which goes beyond the scope of currently available services.

We first introduce our background study on mobile UI designs with current wellness applications. Then we describe our concept design process in detail, introduce the five digital service concepts created, and present the results from a survey based evaluation of them. We also discuss the role of UI design in public digital services related to wellness and health, and how the availability of our digital footprint and lifestyle data can influence the future services in this domain area.

2 Related Work

According to the WHO, in 2014, globally 39 % of adults aged 18 + years were overweight, and 13 % were obese [5]. Technology has been suggested as one enabler that can motivate people to follow and improve their health and wellness. Prior research on health and wellness related application concepts and user interfaces is vast. Often the topic is investigated from the motivation point of view, as persuading people to do more physical exercise and live a more healthy lifestyle are key problems to address at both individual and societal level in urban cultures. Consolvo et al. [6] list four key design requirements for technologies that encourage physical activity, namely (1) Give users proper credit for activities; (2) Provide personal awareness of activity level; (3) Support social influence, and (4) Consider the practical constraints of users' lifestyles.

Whereas specialized equipment set-ups are used in both research and commercial sectors, mobile phone based wellness applications are very popular amongst large user groups. Research on mobile phone related wellness topics has been extensive, e.g., Ahtinen et al. [3] present a user study on tracking outdoor sports with a mobile phone application. The results report that the form factor of a mobile phone was found sometimes challenging, although its benefits include that people did carry it around anyway, easing its integration to the sports activity. Mobile phones have a strong social function, and thus their use for communicating wellness data is easy both in technical as well as in behavioral sense. Examples of these kinds of concepts are presented, e.g., in [7, 8]. Here, in [7], a game where groups were competing against each other by measuring the team's cumulative step count was designed and implemented, and in [8] Anderson et al. introduce a mobile phone application which tracks the user's activity and enables sharing it with friends. In a study on collaborative context information in social media, received as status updates via mobile phone, updates containing information about physical exercise were found interesting and motivating [9]. Also mobile wellness diaries have been reported to be well received [10], although the effort of typing in and recording the entries has been found burdensome [11]. Mobile phone applications have also been used as a tool to monitor and learn the movements or pace of an exercise, as in RunRight system for runners [12].

In addition to mobile phones and other off-the-shelf gadgets for health and wellness monitoring, such as heart rate monitors, research in the area of ubiquitous computing has provided a variety of user interfaces (UIs) for wellness applications. The concept 'jogging over a distance' makes the person jogging aware of the speed of a peer jogging in a remote location, through headphones and spatial audio [13]. In [14], a person's run is visualized in a playback with an avatar in an imaginary virtual world,

and in [15], the running distance on a treadmill is shown on a virtual 3D model of the local city, together with previous runner’s achievements.

In the following, we investigate both the user interfaces of current commercial mobile wellness applications, and after that explore user perceptions of wellness concepts utilizing ubiquitous computing technologies.

3 Charting UI Design Trends

3.1 Study Procedure

In order to chart the current user interface (UI) design trends in mobile wellness apps, we investigated the most downloaded free Health and Fitness category iPhone mobile applications during September 2014. The study sample of the 20 most downloaded applications per selected country was taken on 31st of September 2014 and contained listings from 4 different sales areas; United States, United Kingdom, Australia and Singapore. Here, the sales areas were chosen as countries that provided apps in English. The download charts were taken from the AppAnnie charting service (www.appannie.com). From the initial sample size of 80 applications, duplicates that were present in more than one country were removed. Additionally, apps that were purely advertisements, selling health or fitness related products were removed from the list. Hence, the final sample consisted of 39 applications that were targeted to enhancing personal wellbeing.

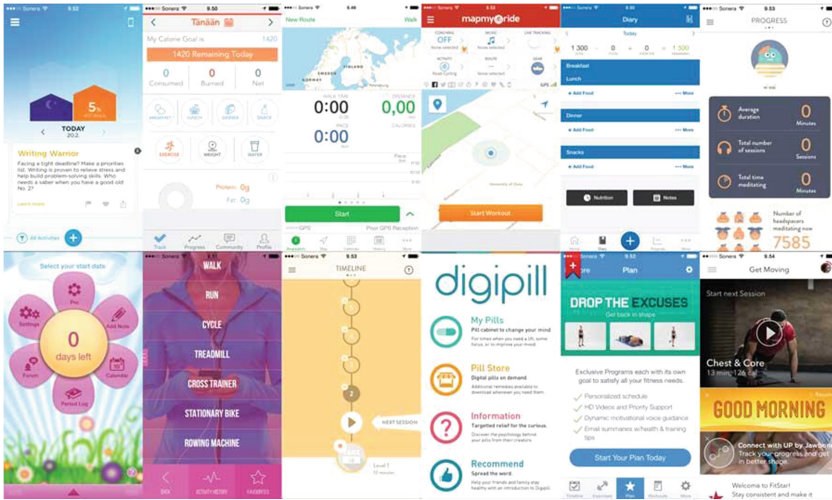


Fig. 1. Screenshots of 12 of the 39 wellness applications evaluated.

For application comparison purposes, selected applications were firstly reviewed at a general level by walking through their user interfaces and identifying their main functionality and features. Based on the initial findings a detailed question based checklist was created to make a deeper assessment of each of the 39 applications. The checklist

consisted of 31 items related to e.g. data presentation style, target setting, data sharing, gamification and accessory usage. For each application, it was identified if an item or feature in question was present or not. In all cases except one, where the application features were checked from information available in the app store, the applications were downloaded to the researcher’s device to validate the feature set. To illustrate the selection of application UIs screenshots of selected evaluated applications are presented in Fig. 1.

3.2 Results of the UI Analysis

The results of the analysis of the 39 mobile wellness applications are illustrated in Figs. 2 and 3, where different features are grouped according to common themes. These trends illustrate the current status of the commercial applications, and show that the penetration level of conversational UIs and wearable accessories is still low. These findings suggest that there is much unexplored potential in the design of such UIs. This was exploited in the service design exercise for future wellness application concepts utilizing ubiquitous computing, reported in the next section.

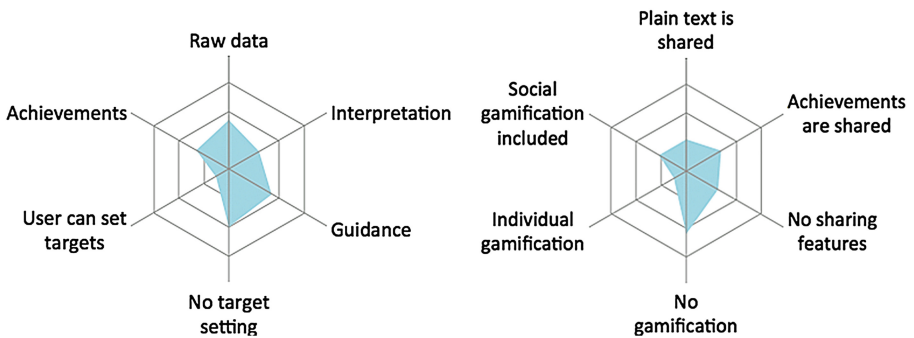


Fig. 2. Number of applications (n = 39) containing UI features related to wellness target setting (left), and sharing and gamification (right).

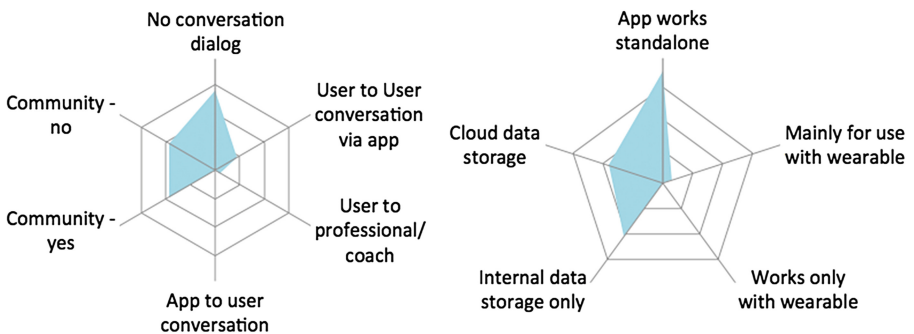


Fig. 3. Number of applications (n = 39) containing features related conversational UIs and user community (left), and data storage and accessories (right).

4 Creating Future Health Concepts via Service Design

4.1 Design Process

In order to create concepts around future wellness services and applications, we organized a design workshop, which utilized various service design methods. Seven participants (three researchers and four university students) took part in the two-day workshop.

At the beginning of the design process, we created a persona to describe our target user. A persona, a concept introduced by Alan Cooper in [16], is an (imaginary) caricature of a target user, and a well-used design tool to help the designers to look the design problem from the end-user point of view, in decision making, and as a communication tool. We then drafted a stakeholder map that described the various wellness related companies and organizations that the persona interacted with in her life, for example dentist services or workplace healthcare providers. The stakeholder map was used as a reference tool, and to focus the target of the design process. A day-in-the-life story was then created to give a comprehensive picture of the persona's activities during a typical working day, with particular focus to those that affect to the persona's health and wellbeing.

We then proceeded to brainstorm around the different scenarios in the day-in-the-life story using a bodystorming method [17], and created rapid prototypes illustrating possible UI designs for various future health services. The bodystorming method was used to rapidly ideate and test different UI design ideas. Here, two large back-projected screens showing background images of the scenario contexts were used to increase the level of immersion [18, 19], see Fig. 4. Finally, we created videos illustrating each of the digital service concepts that had produced, and evaluated them with an online survey.



Fig. 4. Two workshop participants prototyping a service using a bodystorming method in a back-projected display environment.

4.2 Persona and Concept Designs

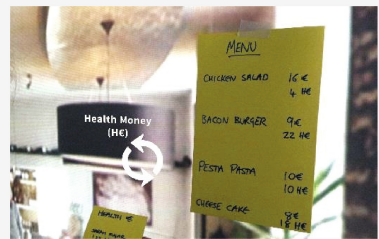
Concept 1 – Shopping Receipt Guidance

This concept aims to affect shopping habits when buying food. When you buy unhealthy groceries, suggestions of some healthier alternative products are printed on your paper shopping receipt. Hence the target is to affect your purchasing patterns next time you shop.



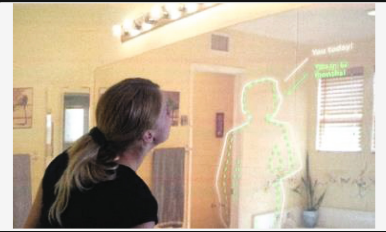
Concept 2 – Health Money

The prices of food items are displayed in ‘health money’ as well as normal currency. In health money, food is priced based on its unhealthiness. If you have signed up for the health money scheme you will have to pay the higher ‘health money’ price for unhealthy food. This concept gives a direct financial incentive to purchase healthier food.



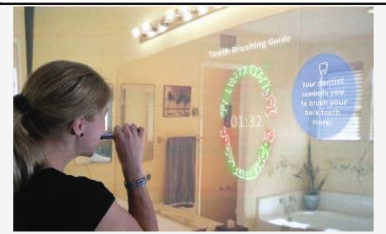
Concept 3 – Intelligent Scales & Mirror

This concept comprises of an interconnected bathroom mirror visual display and bathroom scales. The mirror display shows your weight loss or gain trend as a projected vision of how your silhouette will look, e.g. in 1 year’s time, if you continue with your current lifestyle.



Concept 4 – Feedback for tooth brushing

Here a smart toothbrush to assess the quality of your brushing and gives feedback based on your brushing performance, e.g. which areas of your teeth you are cleaning poorly. The data is presented on a bathroom mirror display with the aim used to help you brush your teeth better.



Concept 5 – Connected Dentist

Brushing data from your smart toothbrush is passed directly to your dentist, who can assess your brushing habits and guide you towards a better dental care.



Fig. 5. Created wellness application and service concepts

Persona. The target user persona created was that of “Sarah” a 29 year old professional woman, working in the business sector and living a busy career-focused life. The target persona was interested in her health, but often had trouble keeping up with it in her daily life. Sarah’s main point of contact with health care providers is through her workplace medical care facilities, which provides her with a yearly health check-up. The persona’s eating habits were rather inconsistent, often related to her busy career.

Design Concepts. Altogether five different concepts were created. These were described in the form of short, approximately 1 min long, video clips. The videos were created from photos taken during the bodystorming sessions with a voiceover added, describing each concept. The concepts are introduced in Fig. 5.

4.3 Online Survey

All five concepts were evaluated in an online survey, which was open for 28 days. Each concept was presented as a video clip with an explanatory voice over. Respondents were asked to rate, on a 7-point Likert scale, how useful, innovative, easy to use, and fun they perceived each concept. Participants were also asked if they would consider using the concept themselves. In addition, participants were asked to provide free textual feedback on their positive and negative perceptions related to each concept. At the end of the survey respondents were asked to rank the concepts from the best to the worst, and provide the reason for selecting their favorite.

Altogether, there were 110 participants in the survey, where, after dropouts, 89 proceeded to evaluate the scenarios. Of the 89, 48 were female and 41 male, representing different fields of education and occupation. The age distribution of the participants was, 18–24:6, 25–34:36, 35–44:23, 45–54:12, 55–64:10 and 65–:1. The majority of the participants (82/89) were from Finland. Figure 6 presents the mean evaluation ratings received for each concept.

Considering the ranking of the concepts, the tooth-brushing concept (concept 4) was ranked as the best concept, with 32/89 participants ranking that as their favorite one. The shopping receipt concept (concept 1) was the second most liked concept, being ranked first by 23/89 participants. Only one participant selected the connected dentist (concept 5) as the best concept.

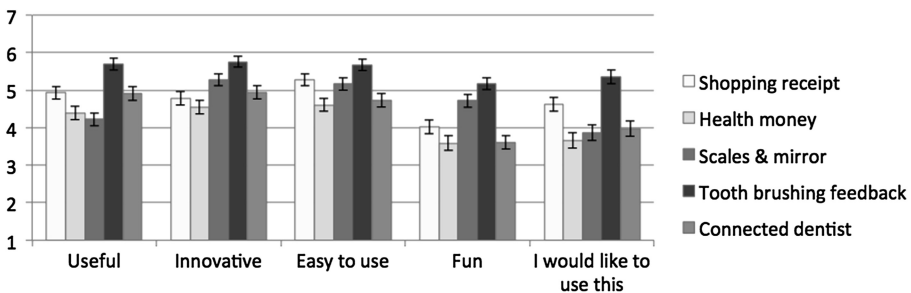


Fig. 6. Mean ranking for each concept. 7 = very much so, 1 = not at all. Error bars show standard error of the mean.

Shopping Receipt (Concept 1). The shopping receipt concept received positive free text comments from 55/87 participants. Particularly 22/87 highlighted that it was a simple and easy idea to motivate them to buy healthier food, reflected e.g. in the comment *“A really good idea and will certainly encourage everyone view their consumption habits.”* (Participant #59). Many participants felt the idea was somewhat educational and would awaken their understanding of the health consequences of the food they are buying. A typical comment in this direction being *“This is a good idea. It makes you think more about the healthiness of your purchases than you otherwise would have.”* (#84.). On the negative side, some participants (11/87) felt that they would not read the receipt and just throw it into the trash, whilst others (11/87) were concerned that it would affect their enjoyment of the food they had already bought, or not have an effect on their behavior - *“This would barely lead a change of shopping habits, everybody knows that potato chips are unhealthy”* (#8).

Health Money (Concept 2). Here, positive comments (47/87) focused mainly on the power of price to change what they buy, and how the ‘health money’ concept would guide them in an understandable way to make healthier food purchases. A typical comment in this respect was as follows: *“Could work for people who are just starting a healthier life, so they would understand how unhealthy/healthy something is.”* (#107). However, the main challenge with the health money concept was that many people couldn’t understand how it would work in practice, or felt it was unrealistic, with altogether 12/87 comments reflecting this opinion. For others (17/87) it was rather a form of economic punishment, rather than providing positive motivation to change: *“Not so funny for people who do not have that much financial resources to use. Where does the money go?”* (#2).

Intelligent Scales and Mirror (Concept 3). This was ranked as the third best concept overall, and was rated particularly highly in terms of *innovation* and *fun*. Many users (24/97) liked the very visible and concrete nature of the concept, and thus considered it could be effective in weight control, for instance *“Makes the change visible and more concrete. I would love to use this.”* (#2). Three participants were interested to see not only fat, but also muscles displayed in the mirror display. Some participants were concerned about technological issues, e.g. how to make it realistic and accurate (commented by 10/87 participants). For others (9/87) the idea was seen as frustrating and depressing, because changes in the body can be very slow. A typical comment being *“Changes in the body can be very slow to show and this might lead to frustration”* (#44).

Feedback for Tooth Brushing (Concept 4). This concept was considered as the best overall by the majority of participants, and was the highest ranked in all of the rating criteria. Altogether 45/87 participants responded that they would like to use this concept ‘much’ or ‘very much’: *“It would be nice to “see” how you’re brushing your teeth, and to do it better.”* (#16). The idea was considered good, especially for children’s tooth brushing (7/87) and visual feedback was regarded motivating and preventive. For example participants commented *“This is an excellent idea if the implementation would really work! Would help small children to learn how to brush*

their teeth and remind adults to be more precise;)" (#17). On the negative side, issues such as technology challenges (5/87) and cost (7/87) were raised. Some participants (4/87) also mentioned that a reminder to brush one's teeth should also be included as part of this concept.

Connected Dentist (Concept 5). This concept was ranked as the least liked, but still was rated relatively well in terms of its usefulness and innovativeness. Many participants (4/87) focused on the positive cooperation with the dentist this would enable, perhaps lowering the barrier to visit the dentist regularly. Here one user commenting: *"Basic idea of smoothing the path to go to the dentist and getting more information on the cost of sessions is ok..."* (#44). On the other hand, several participants (8/87) were concerned about privacy aspects, both in terms of data storage and the fact that someone was watching an intimate part of their life, for example *"I wouldn't like that my dentist would know my every brushings, although he could have time to observe me. [...] it would feel like someone is watching me all the time"* (#69).

5 Discussion

The analysis of the UI design of 39 currently popular mobile phone based wellness applications has shown, that so far conversational style UIs are little used. Whereas sharing is supported in several applications, the level of involving community and adding gamification to the UI design is still low. Moreover, the variety of standalone smartphone applications is currently far larger than those utilizing wearable accessories together with the mobile applications. By evaluating the existing user interface designs, visualization patterns and features of popular mobile applications, we anticipate that new service concepts can be better grounded.

Until now, the de facto UI design solutions for wellness applications have focused on presenting the data to the user with less interpretation and contextualization. When developing imaginary wellness service scenarios for the future, we wished to create more conversational dialogs with the user, and offer a higher level of interpretation and guidance rather than simply presenting data. Whereas in 17/39 of current apps data was mostly displayed as it is measured without further interpretation or guidance on actions to take, our futuristic scenarios sought to provide meaningful interpretations and predictions, and proactively suggest actions which would lead to a healthier lifestyle. Compared to current wellness services which still rely on collecting data from a focused source, e.g. a mobile phone or tracker device, the power in the future digital health and wellness services will be driven by the ability to combine data from broader sources.

In creating the concepts, we utilized design methods derived from the fields of service design, user centric design and participatory design. We sought to take into account both experience design [20] as well as usability aspects in our service concepts. The most favored future scenarios in our survey related to straightforward concepts, where the users could identify value for their everyday life. Here, we believe that fitting the scenarios in the context of daily routines, such as shopping and brushing teeth was valued. As a methodological note, compared to typical online survey formats, we

believe the acting out the scenarios and presenting them as video clips helped people to comprehend the futuristic wellness concepts. The rich feedback gained on the scenarios provides viewpoints that help in developing the concepts further, and to both add and prune their features.

As a limitation of our work, we acknowledge that selection of the most downloaded applications does not guarantee them to be the best in visual quality, user experience or feature content. However, analyzing a large set of popular mobile applications provides a good overview of the current design trends. We also acknowledge that an online survey is limited in its capability to capture authentic first-hand responses. However, we believe it provided our study with a tool to collect valuable feedback for further development of ubiquitous wellness interfaces.

6 Conclusion

In this paper, we have charted the UI design features of 39 popular mobile phone wellness applications against a checklist of 31 parameters. The salient findings show that although sharing aspects are present in many applications, gamification, conversational UIs and community involvement play still a minor role. To explore futuristic concepts for wellness applications and services, we created five different concepts, and created voice-over video presentations describing them. Our online survey based results indicate that people appreciated contextual feedback embedded in everyday routines and clearly presented interpretation of data.

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