

Designing and Introducing an Activity Motivating Mobile Web App Platform for Seniors

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1 Motivation and Related Work

With increasing age one's physical and mental abilities decrease gradually. Regular physical and mental activities can improve or at least preserve one's abilities [1–3]. Given a demographic shift in Germany and other developed countries, there is an increasing interest in technologies that can support the elderly population in their daily life.

In this work, we introduce a mobile health platform that encourages seniors to more daily activity. With the platform the senior can log his or her daily activities in five different categories (everyday activities, endurance, strength, mental, and special activities), review his or her activity statistics and browse through available activity encouraging opportunities in his or her local environment or residence house. Additional information is provided by the platform to make it more attractive to the elderly users (e.g., a personal calendar/organizer, news and the residence houses menu). Despite other solutions (e.g., by Stefanos et al. [5] that is primarily designed for the staff) our platform is specifically designed for a senior target group.

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Physical activity has various positive effects on older adults. Titze et al. summarize various studies showing that an increase of physical activity reduces the relative risk to die early and reduces the risk to develop various diseases [6, p. 19ff]. They recommend at least 150 min weekly training for adults and seniors with moderate to higher intensity. Warburton et al. point out that physical inactivity increases the risk for cardiovascular disease and other chronic diseases such as diabetes mellitus, some cancer types, bone, and joint diseases and depression [7]. Additionally Oerlemans et al. show that moderate physical activity (in addition to social and cognitive activities) improves the overall happiness of older adults [4].

2 Approach of a Mobile Health Device

2.1 *The VERA Project*

As the largest supporting organization for residential facilities for the elderly in Bremen the Bremer Heimstiftung is continually interested in improving their living and care facilities and adapt them to the social developments and the needs of elderly and very old people.

In addition to the desire for social participation and contact with younger generations, it is the increased use of health-promoting services as well as the increased interest in technical innovations in the field of communication and information technologies within the residents that were decisive for the project idea of VERA. Within the VERA project these interests and needs of seniors are linked together.

The VERA project comprises the development and establishment of a web-based platform that is accessible via a personal tablet computer. On the one hand the platform provides various application modules that support the seniors to foster their health and well-being and motivates them to more physical, mental, and social activity. On the other hand, the participants learn during a 3–4 month long training and monitoring phase how to use the VERA app and the handling of the new media and forms of digital communication. VERA and the tablet are used as entry to the digital world including the Internet. The seniors are supported by students, pupils, and voluntary workers. That means in every weekly session the senior is accompanied by his or her so-called tandem partner. This tandem partner supports the senior with the handling of VERA and the tablet itself. The help lessons start with basic tablet handling and continue with explaining one major function after another.

2.2 Design Workshops

To find an appropriate design for the web app, two workshops were performed in order to mockup a layout for the web app’s start screen. In preparation of the workshops six independent start screen designs were created (see Fig. 1).



Fig. 1 The six VERA start screen design drafts for the user workshop. **a** Light with many wid-gets. **b** Tiles with growing plant. **c** Colors and icons, no text. **d** High contrast text. **e** Overloaded. **f** Website-like navigation

All drafts were designed as different as possible to provoke opinions at the workshop participants. Design (a) has many (active) widgets. At a prominent central position is the calendar widget, accompanied with weather, time, and date widgets on the right. All in all it is a light design but with many widgets. Design (b) consists of squared tiles pointing to subpages. It is based on the Windows Phone's recent Metro design with its tiles. On the right are some widgets, especially the plant that virtually grows as the user earns more activity points. Design (c) is reduced to icons and colors to differentiate between the subpage icons that are also arranged as tiles as in draft (b). The bar at the bottom is the *activity bar* which shows the activity point progress of the user. Design (d) is basically the opposite of (c) and uses only black and white lines, texts, and no icons at all for navigation. On the other hand the contrast of this draft is very high which may be useful for the elderly target group. Design (e) is a provoking design with lots of texts, colors, and widgets. It is reminiscent of badly designed (news) websites of the early web. Design (f) uses a website-like navigation on the left and shows a tabular calendar on the right. With its 1/3 navigation left to 2/3 content right partition the design is based on the Android 4 design guidelines for a tablet app.

In a first step all about 25 workshop participants were provided with paper printings of the six designs. The participants then rated parts of the design which they like or do not like. We provided them with laughing and sad smiley stickers for easy rating on the paper printings. Based on the rating a final draft was created together with all participants. This final draft contains high rated elements of all drafts as one can see in Fig. 2.



Fig. 2 Final workshop draft of the VERA homescreen

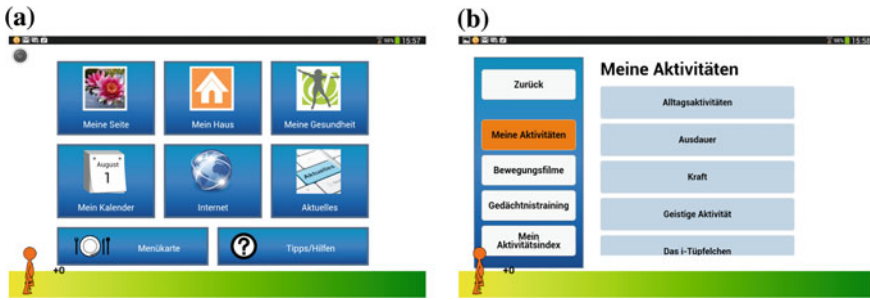


Fig. 3 VERA screenshots. **a** Homescreen of the VERA app. **b** “My Health” view of the VERA app

2.3 Platform Design Notes

The VERA platform basically consists of a client and a server component. The Samsung Galaxy Tab 3 was chosen as physical client representation due to its hardware home button. On the software side a basic Android application loads the VERA web app which presents the VERA startscreen (see Fig. 3).

The complete web app was designed with the audience in mind, every font is at least 16pt in size and the colors were carefully chosen for high contrasts. The startscreen of the web app has six large quadratic buttons which allow navigation to the subcategories *My Page*, *My House*, *My Health*, *My Calendar*, *Internet* and *News*. Additionally, the startscreen incorporates two shortcuts to the residence menu and a help document.

Most important is the *My Health* category (see Fig. 3). Within this category the user can log its activities in five different categories mentioned before. In the actual design the weather widget and the tip of the day note was removed (in comparison to the final draft) to further reduce the complexity of the design.

3 Evaluation

3.1 Method

The public rollout of the VERA system at the first residence was on the 4th February 2014. Since then various usage statistics were logged, including number of app starts and the logged activities of every user. On the beginning 18 users of a residential home (Residence 1) took part on the project. Three months later 11 additional users of an assisted living facility (Residence 2) joined the project. The statistics of both user groups are the basis of this evaluation.

In July 2014, additional logging functions were added to log every touch on the web app. Main subject of the evaluation is the usage of the activity logging functions of the app.

3.2 Results

The average logged activities per active user (see Fig. 4) shows a clear interest in the first month after the introductory month (month 2) through rising logging counts. In month 3 the average logging count is reduced nearly to the month 1 level. Up to month 3 both groups show similar behavior. After that the residential home group’s interest in activity logging is continually declining whereas the assisted living group’s activity starts to rise again. Active user means a user that has at least logged one activity in a month. This is done to effectively filter newly created but not yet used user accounts.

We also investigated the activity logging of every user in residence 1 within the 8 month period (see Table 1). We clustered the user in two groups: first group uses the logging feature only sporadic (means no activity in at least three of the 8 months), the other group shows a stable usage. With this criterion the user can be clustered in a group of sporadic usage ($N = 10$) and stable usage ($N = 8$). So we can speak of a long-term usage rate of about 45 %.

Main purpose of the VERA app is to foster activity through self-controlled activity logging. We investigated which part of the user’s clicks is within the *My Health* category which basically incorporates the activity logging features. Figure 5 shows that more than half of all clicks of the web app are within the *My Health* category, so that we can assume that the logging feature is the most used feature of the app. Additionally, it is interesting to see that second largest click group is *Internet*, so the app probably acts as a gateway to the world wide web.

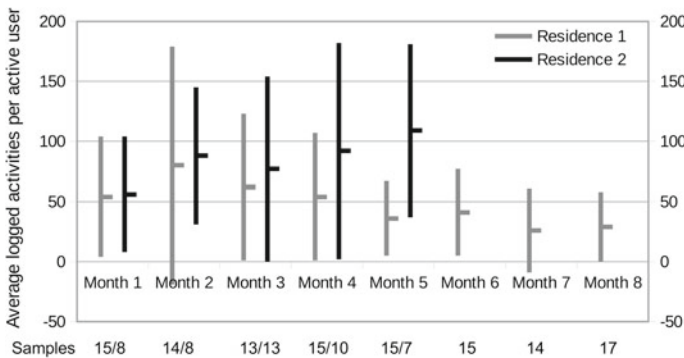


Fig. 4 Average logged activities per user per month for two residences with standard deviation

Table 1 Number of logged activities of residence house 1 users

| User ID | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | Σ |
|----------|----|---|----|----|----|-----|------|-----|----|-----|-----|----|----|-----|----|-----|-----|----|----------|
| Feb 2014 | 0 | 0 | 7 | 0 | 0 | 71 | 201 | 79 | 30 | 64 | 102 | 0 | 0 | 32 | 17 | 42 | 65 | 0 | 710 |
| Mar 2014 | 0 | 0 | 17 | 0 | 0 | 61 | 366 | 100 | 39 | 49 | 211 | 0 | 0 | 44 | 3 | 95 | 91 | 0 | 1076 |
| Apr 2014 | 0 | 0 | 12 | 0 | 0 | 83 | 238 | 70 | 12 | 74 | 93 | 0 | 0 | 31 | 15 | 57 | 73 | 0 | 758 |
| May 2014 | 0 | 0 | 10 | 0 | 0 | 92 | 193 | 71 | 2 | 61 | 103 | 0 | 0 | 38 | 14 | 54 | 83 | 0 | 721 |
| Jun 2014 | 0 | 0 | 0 | 0 | 0 | 37 | 49 | 80 | 9 | 47 | 109 | 0 | 0 | 50 | 8 | 27 | 54 | 3 | 473 |
| Jul 2014 | 0 | 0 | 0 | 0 | 0 | 13 | 125 | 85 | 0 | 34 | 89 | 0 | 54 | 40 | 0 | 51 | 14 | 0 | 505 |
| Aug 2014 | 0 | 0 | 0 | 11 | 2 | 15 | 99 | 0 | 0 | 1 | 79 | 2 | 0 | 4 | 0 | 75 | 4 | 0 | 292 |
| Sep 2014 | 10 | 8 | 0 | 87 | 11 | 12 | 89 | 10 | 0 | 17 | 90 | 0 | 35 | 24 | 0 | 25 | 23 | 0 | 441 |
| Σ | 10 | 8 | 46 | 98 | 13 | 384 | 1360 | 495 | 92 | 347 | 876 | 2 | 89 | 263 | 57 | 426 | 407 | 3 | 4976 |

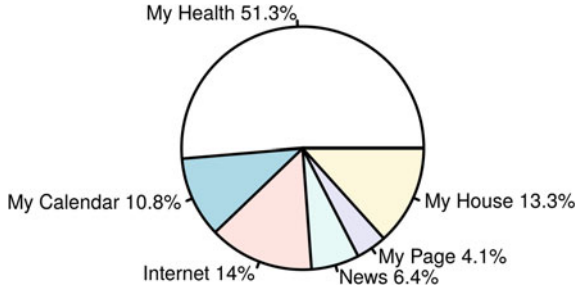


Fig. 5 Distribution of clicks on the six main categories

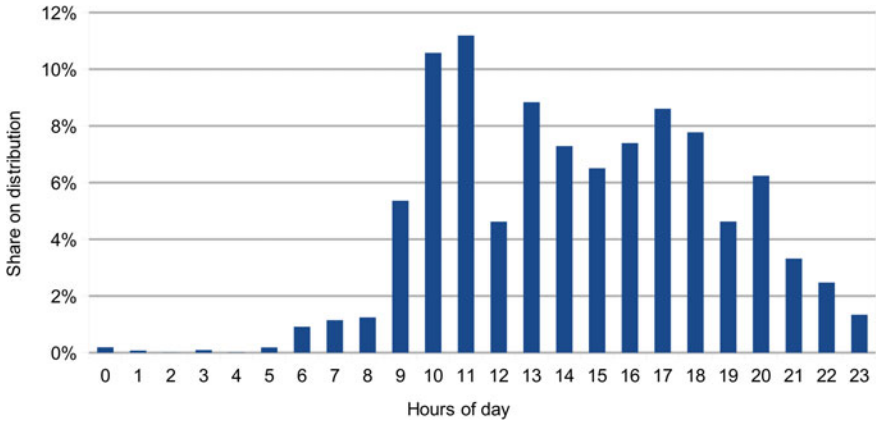


Fig. 6 Distribution of clicks on the time of day (number on x-axis is the start hour for a one hour interval)

The accompanying help lessons were from 10 to 12 am once a week, so the usage distribution throughout the day is of interest, too. Figure 6 shows at least three peaks of usage throughout the day. The first (and largest) peak is at forenoon between 10 to 12 am as the help lessons where the tablet is of course intensively used. The second peak is between 1 and 3 pm, means after lunch. And last peak of the day is between 4 and 6 pm.

4 Discussion

It is possible to design and develop a tablet based web app specifically for the elderly target group *and* it is possible to introduce it to the target group so that it is used regularly afterwards. One can see that the app is not only used throughout the lessons but basically the whole day. The activity logging feature is also used: an average user

logs at least 50 activities per month, which is one or two activities on a day level. The clicks distribution statistic (see Fig. 5) support this statement.

Currently, we can only assume that the accompanying help lessons are the most important factor of the success of such project. The usage statistics lacks a control group to support that assumption.

Another aspect is a possible seasonal shift of the app usage. In the dark and cold months of the year one's activities naturally shift toward indoor activities such as multimedia or—in this case—tablet usage. Our numbers do not cover a time span large enough to possibly see such effect.

5 Conclusion

The VERA system presented here was specifically designed for the elderly target group. If a motivated group of participants can be recruited a design workshop is an effective method to sketch out a preliminary design of a tablet app. With accompanying help lessons the tablet is gateway to the Internet and can be used by elderly to log their activities, to encourage to more activity and build a bridge for seniors to the younger generation. The evaluation shows that the tablet is not only used by seniors when they take part at a lesson but in their free time (see Fig. 6). Nearly half (45 %) of the seniors use their table with the activity logging feature with a stable frequency.

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