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User-Computer Interface Design of a Family Support Web-based Portal: The Use of Scenarios and Low Fidelity Prototype

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Abstract

This paper describes the user interface design of a web-based portal for middle-aged novice internet users to receive multilingual family caregiver support. We used a scenario-based analysis technique and low fidelity prototype to create and iteratively refine 46 scenarios that characterized 4 portal functions, supporting 5 stakeholders and quality attributes. This technique has several advantages when applied to this case example: It enabled clinician participation, facilitated team communication, saved cost and time, sped up subsequent design steps, and validated assumptions in the user interface design process.

Keywords:

clinical informatics, Chinese, family caregivers, middle-aged, multilingualism,User-Computer Interface

Purpose

This paper describes the user interface (UI) design process of a web-based portal for middle-aged novice internet users who speak English as a second language to receive multilingual family caregiver support service [1]. The functions of the portal allow the caregivers to: (1) communicate with and support from health professionals online, (2) involve multiple family members in the communication process, (3) receive alerts to trigger usage of service, and (4) receive information needed to support their caregiver role. The portal consists of 4 features for use by 5 types of stakeholders.

Methods

We modified a standard requirement analysis practice to identify, specify, and validate the functions of the portal. The original version of the portal consisted of simple functions to provide information on web pages and therapist-caregiver email communication for personalized support. We collected field work data to determine the enhancement needs the original portal functions.

Enhancements of the functions were analyzed based on a stakeholder analysis (Fig. 1). Ten caregivers who had used the original version of the portal participated in in-depth interviews. They had been caring for their family member who had dementia for a range of 2 to more than 10 years. The interviews allowed us to understand the daily caregiving situation and their experiences of using the original basic portal design. The caregivers were typically female in their 40s and 50s and had other major roles in life such as being a mother, working full time.

Next, we used a scenario-based analysis technique to: 1) critically analyze the UI design, 2) bridge the design concepts to physical design, and 3) document the finalized design for implementation. Figure 1 shows how the scenario-based analysis, Step 2, is related to the other 4 UI design steps.

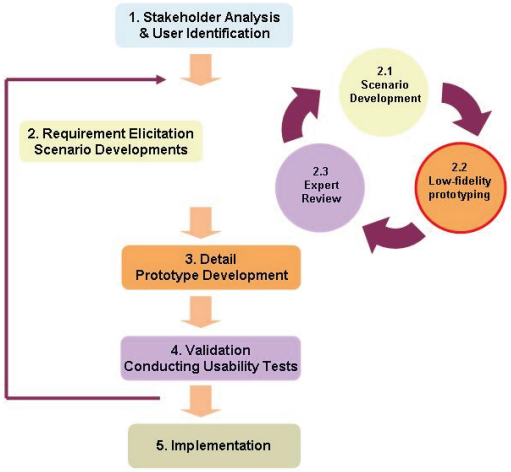

Figure 1 - Methodology for user interface design

In Step 2, we used an iterative process to (2.1) develop the scenarios, (2.2) create low fidelity prototype (LFP), and (2.3) conduct expert reviews. We created and iteratively refined 46 scenarios that elaborated the UI of all four portal features. The scenarios detailed the UI design that supported different stakeholders' needs and quality attributes such as usability, accessibility, performance, and security. The scenarios were built using LFP (Fig 2) in MS Word documents with a template and narratives. A heuristic evaluation was conducted using the LFP.

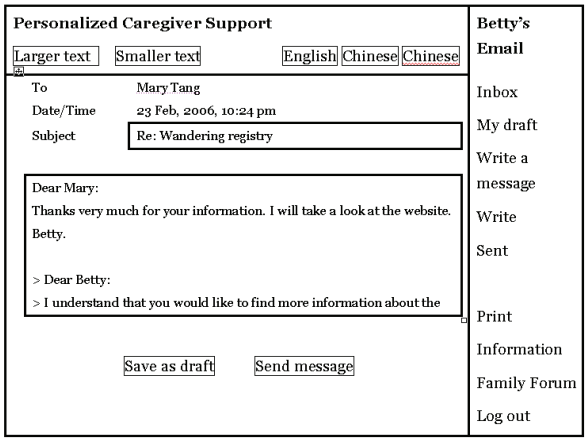

Figure 2 - Low fidelity protocol using MS word document

The scenarios were iteratively refined through these three sub-steps. The LFP facilitated the evaluation of the design against established usability standards, the validation of the design choices against functional requirements, and the identification of needs for improvements.

Results

The evaluation and analysis procedures resulted in eight important design decisions:

First, three functional enhancements to be added to the portal:

- a family message board to allow members in the same family besides the principal user to communicate with the online practitioner
- the use of narratives to describe issues in caregiving situations to increase the awareness of the caregivers to reflect on their own caregiving situations
- a tailored message to supports caregivers who do not know what to talk about to compose an email related to a specific topic more effectively and efficiently. The design would benefit caregivers who do not know medical terminologies in English (as a second language).

Second, emphasizing on analyzing stakeholders before any steps revealed crucial requirements for the system and helped to make and evaluate early design decisions.

Third, for users who are in their middle age and not technically savvy, using affordance familiar to them can improve the ease of use. For example adding buttons of "next page" and "previous page" helps with navigation like reading a book.

Fourth, buttons with only icons can be problematic for novice users. Icons with words can improve the understanding of semantic.

Fifth, users need to have control to change font size. This design decision requires special care of texts written on buttons, to resize all buttons when user changes the font size.

Sixth, to ensure security and confidentiality without compromising usability, a traditional email system design is used. The email module is used as an internal communication system; i.e., users cannot email to people not in the system.

Seventh, each family has one principal user and different collaborators and observers. The permission of each role is different. Various options of UI design was explored to examine the optimal way to present different combinations of permissions (i.e. full permission and read only). Tab sheets, toggle buttons listed in a row on the top of a window, are found useful to support this design decision.

Eighth, the portal requires supporting English, Traditional and Simplified Chinese. We chose to use language toggle buttons that allow the change of language in each page. We also have chosen a system that support Unicode encoding.

Discussion and conclusion

How to translate requirements of diverse users with competing special needs into UI design can be a challenge. Using scenarios in early design step is a well-established method in software design [2]. When applied in this case example, we have identified 5 advantages: 1) The LFP allowed team members who were clinicians and unfamiliar with advanced prototyping applications to actively take part in the process; 2) The scenarios facilitated the communication of the interdisciplinary multilingual team members; 3) The LFP allowed us to express each interaction explicitly at low cost and to quickly and easily apply the changes for expert review; 4) The iterative scenario development in Step 2 sped up the detail fidelity prototyping in Step 3; and 5) The detailed prototyping ensured the design would not use assumptions that may work in general practice but not the end users, e.g., buttons with icons preferred by experienced but not new users. The use of an inclusive, cost-effective UI design process can contribute to a sustainable ehealth practice in the long run.

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