

A case study of usability evaluation: the Center for Active Ageing website

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ABSTRACT

The population is ageing and the percentage of the elderly is continuously growing. A key priority to address the demographic challenges is to implement more efficient e-services. The websites for active aging provide useful information and advice to old people, informal caregivers, and medical staff. In order to be an effective help, these websites should be evaluated for usability. The objective of this paper is to present a case study in evaluating a website aiming to promote the active aging. The evaluation results revealed several important usability problems that have to be fixed in the next version. Most of the important usability problems are related to the information architecture, navigation, compatibility with the user and task, task guidance, and support.

Keywords

Usability, usability inspection, usability heuristics, an aging population, active ageing.

INTRODUCTION

This millennium is characterized by a fast growth of the elderly in the overall population (see Figure 1). Causes explaining the phenomenon of ageing include lowering birth, medical progress, and rising living standards; these factors have increased the number of the elderly by reducing morbidity and mortality.

The population is aging and the percentage of the elderly is continuously growing. Active aging is a concept stating that the participation in various activities in the later life contributes to health and wellbeing. Several factors exist that influence a healthy and active aging [1].

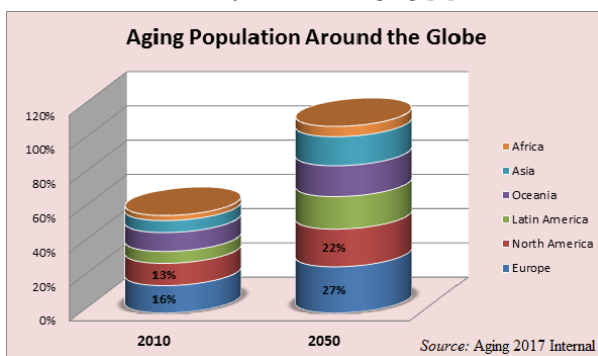


Figure 1. Projected aged population in 2050

A key priority to meet the demographic ageing challenges is to implement more efficient e-services that are able to support integrated solutions for all the actors involved in the elderly's healthcare.

This needs more investment and innovation to adapt and rethink the care systems, in particular through a better integration of services and continuity of care, so as to avoid as much as possible the institutionalization. As pointed out in the European vision, "digital innovation ... has the potential to ensure that the ageing population remain independent and active in society, can receive coordinated care and enjoy living longer in their homes" [17]

The websites for active ageing are providing useful information and advice to old people, informal caregivers, and medical staff.

Designing for web usability in the area of active aging is not easy. Despite the numerous projects at European and national levels, the research on usability in this area is too narrowly focused. It seems that in most cases there are too little resources for usability studies, therefore, few case studies exist, and, consequently, little usability data is available. Another issue is related to the diverse levels of education and web literacy of the target users. This leads to consider specific design requirements [1, 3, 9,10].

This paper presents a case study of usability evaluation of the Center for Active Ageing website that was developed during a national research project. The website provides useful information for the elderly as regards the medical services, home adaptation recommendations, and monitoring of the main physiological parameters.

CASE STUDY

The Center for Active Ageing website

PROlonging ACTIVE life for an independent and healthy Ageing (ProActive Ageing) is a project funded by the PNCDI II national research program. The partnership is composed of Clinical Hospital "Dr. Victor Babes", University of Medicine and Pharmacy "Carol Davila", "Ana Aslan" National Institute of Gerontology and Geriatrics, National Institute for R&D in Informatics and Siveco S.A.

The main outcome of the project is the ProActive Ageing integrated platform for online service, structured into three thematic modules:

- Center for Active Ageing.

- Comprehensive learning courses for specialists taking care of ageing people.
- A Toolkit to Support Medical Research Addressed to Healthy and Active Ageing.

More details about the project could be found in [6]

The Center for Active Ageing aims to support an independent life of elderly, providing a comprehensive approach to a successful ageing in place, health management, and an increased health literacy.

The purpose of the center is to assist and encourage people to better understand the ageing process and to facilitate the access to information about the main aspects of growing older. It is committed to providing opportunities to the elderly, their formal and informal caretakers to take advantage of using an eHealth solution in order to better monitor and manage the everyday life and activities of an ageing person.



Figure 2 Center for Active Ageing

The Center for Active Ageing provides information and awareness of the degenerative age-related processes, with an accent on lifelong learning focused on ageing persons that want to remain active, healthy and independent.

The ultimate goal of the Center for Active Ageing is to promote the independence of aging people by providing a holistic approach in order to maintain an independent life as long as possible.

The website is structured into the following components:

a. Home care

- Adjustments to the housing needs of the elderly;
- How to employ a caretaker for an elderly person;
- Types of home care services.

b. Active and independent person

- Improvement of personal knowledge about healthy ageing;
- Aspects of an active and independent ageing;
- Means of maintaining an active life;
- Self-assessment tests

c. Useful information

- Emergency (Ambulances, Hospitals Foundations, Palliative Care, Physicians, NGOs)
- Legislation concerning elderly.

The target beneficiaries of the Pro-Active Ageing Centre are the elderly that wish to preserve an active and healthy life, preferably in their own house, their caretakers, and families. Because ageing is a process that starts around 30, another type of user is any person that wants to prevent and delay the age-related health disorders.

The information and data stored can be displayed without any restriction by any user of the module.

Only authorized health specialists have the right to introduce/modify/delete information into this module's components. A user is authorized to enter data and information in this module only by following an authorization procedure supervised by the online platform administrator.

Evaluation approach

Usability evaluation aims at finding, documenting, and reporting usability problems. The goal of the evaluation is to identify usability problems, help the developers to fix the problems and, this way, improve the usability of the interactive system. A usability problem has been defined as any aspect of the user interface which might create difficulties for the user [12]. Integrating the usability evaluation in the software design cycle creates a user-centered-design attitude, ensures a good practice, and provides useful design knowledge and case studies.

Usability evaluation methods could be classified into two main categories: inspection methods (faster and cheaper) and user testing (more expensive) [4]. Usability inspection (also termed as expert evaluation) is done by experts that are testing the user interface with the goal to anticipate usability problems.

There are several inspection methods. The most widely used are the heuristic evaluation [13]. Several authors pointed out that the heuristic evaluation is oriented more towards fault finding than to goal achievement [7, 8]. Rolf Molich et al. [11] demonstrated that the usability evaluation results depend on the selected tasks, methodology and evaluators.

In this study, a set of 25 usability heuristics has been used for documenting the usability problems. The evaluation is task-oriented since the heuristics are used to explain and document each usability problem as well as to train evaluators. In this respect, the method is more similar to the heuristic walkthrough [16] than to the heuristic evaluation.

Method and procedure

Before starting the evaluation, each evaluator received the evaluation tasks, the set of usability heuristics, and two papers with examples of usability inspection.

Table 1. The evaluation tasks

No.	Task
1	Create a user account on the platform
2	Obtaining information about the monitoring of physiological parameters
3	Getting information about the home adaptation
4	Sending opinions on the medical services at home

In this study, 3 evaluators tested the website independently and reported the usability problems found for each task.

Two evaluators are usability experts and the third is an expert in the application domain. The evaluation tasks are presented in Table 1.

Then the usability problems have been consolidated per task based on the “similar changes” principle [5].

The following information has been recorded for each usability problem: context, anticipated difficulties, cause, suggestions for improvement, usability principle (heuristic) violated, and severity.

The problems have been documented and explained with a set of usability heuristics that are based on the integration of usability principles proposed by Nielsen & Molich [13] with the ergonomic criteria of Bastien & Scapin [2].

The initial set of heuristics has been used in the usability evaluations of municipal websites [14]. Later on, the set of usability heuristics has been refined in order to better address some user-centred design issues[15]. The usability heuristics are presented in Table 2.

Table 2. The set of usability heuristics

User Guidance	
1	Visibility of system status
2	Prompting
3	Immediate feedback
4	Information architecture
5	Grouping / distinction
6	Legibility
Workload	
7	Concision
8	Recognition instead of recall
9	Minimal actions
10	Information density
Adaptability and control	
11	Flexibility and efficiency of use
12	Experience of the user
13	Explicit user actions
14	User control
Error management	
15	Error prevention
16	Quality of error messages
17	Error correction
Consistency and standards	
18	Consistency
19	Compliance with standards and rules
20	Significance of codes
Compatibility	
21	Compatibility with the user
22	Task compatibility
23	Task guidance and support
24	Help and documentation
25	Esthetic design

According to the potential effect on user’s task, the severity has been assessed as severe, moderate and minor. Severe means a failure to accomplish the task goal or a significant loss of data or time. The problem is moderate if it has an important impact on task execution but the user is able to find a way. A minor problem is irritating the user but the impact on the task’s goal is not important.

A good practice requires fixing all important usability problems (severe and moderate) before the first release of the website.

Usability Evaluation Results

The number of problems detected by each evaluator varied from 15 to 28. Then the individual problems have been analyzed in order to agree on the severity. A total of 12 problems have been discarded (false problems).

The collaborative consolidation resulted in a total of 32 usability problems, of which 27 are important.

The usability evaluation results are presented in Table 3.

Table 3. Usability problems per task and severity

Task	Total	Major	Moderate	Minor
1	8	-	8	-
2	7	-	7	-
3	7	1	6	-
4	10	1	6	3
Total	32	2	27	3

The two major problems are related to the failure to open a document (requirements for a safe home) and to find the web page for sending an opinion.

Most of the moderate problems are related to:

- It is difficult to understand at a glance what is the usefulness of the center of active aging (mixed information, unclear message to the users)
- Profile page displays technical data (WordPress features) that are irrelevant to the user.
- Redundant functions and buttons, redundant web pages (having just one link).
- Indications for monitoring physiological parameters are not personalized to the elderly / caregiver and there are no downloadable forms to record the data.
- Page titles are not clear, web pages are poorly structured, with long sentences.
- The absence of a "Help" button.

The heuristics are useful to analyze the overall usability of an application according to ergonomic criteria. Most of the important usability problems are related to:

- Information architecture: unnecessary web pages, redundant information, some missing web pages;
- Compatibility with the user: long phrases, technical information, information irrelevant for the user;
- Task guidance and support: inadequate explanation, lack of forms to record the physiological parameters;
- The help and documentation: lack of a help menu/button.

The individual detection rate varied between 37.55% and 46.88%. The average detection rate was 30.95%. The agreement between any two evaluators varied between 4.17% and 21.74% (severity has not been considered). The average any two agreement was 10.15%.

The usability heuristics proved to be also useful for training the expert in the application domain. Surprisingly, the detection rate was higher and the lowest agreement was between the two usability experts.

DISCUSSION AND CONCLUSION

Usability evaluation before the website release is not a common practice. As pointed out in a previous work [15], the web is mainly designed for functionality and much less for usability. It seems that few developers are taking a

user-centered approach that requires knowing the goals a user wants to accomplish.

This case study revealed several usability problems that are important for the users. Although the major problems could be easily fixed, there are several problems that require a redesign of the website in order to improve the information architecture and navigation.

The analysis of results revealed an issue: the website has been designed having in mind three categories of user: elderly, caregivers, and medical staff. This approach is questionable and creates problems both for the developers and the evaluators since the requirements are different. For example, old people and informal caregivers need a simple navigation and content easy to read while the medical staff needs a lot of medical information which is hard to read and understand by other people.

The results are useful for the developers who have to find a solution to the aforementioned issue and to fix the usability problems. The recommendation was to split the application into two parts, one for the elderly and informal caregivers and the second for the medical staff and professional caregivers.

A general recommendation for the developers of websites is to carry on a task analysis before the design. Knowing the tasks a user wants to perform makes it possible to design the information architecture and, most important, to provide an adequate user guidance.

This case study was also useful for evaluators since it revealed some shortcomings as regards the set of usability heuristics. During the collaborative consolidation, it was sometimes difficult to agree on the explanation of usability problems. The conclusion was that it would be useful to provide a definition and several guidelines in order to detail each heuristic and help the evaluators to document each problem. In a future work the heuristics will be refined and both guidelines and examples will be given.

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REFERENCES

1. Annear, M., Keeling, S., Wilkinson, T., Cushman, G., Gidlow, B., & Hopkins, H. (2014). Environmental influences on healthy and active ageing: A systematic review. *Ageing and Society*, 34(4), 590-622.
2. Bastien, A. & Scapin, D.L. (1993). Ergonomic criteria for the evaluation of human-computer interfaces. *Technical report No. 156, INRIA, Roquencourt, France.*
3. Castilla, D., Garcia-Palacios, A., Miralles, I., Breton-Lopez, J., Parra, E., Rodriguez-Berges, S., & Botella, C. (2016). Effect of web navigation style in elderly users. *Computers in Human Behavior*, 55, 909-920.
4. Cockton, G. Lavery, D. Woolrych, A. (2003). Inspection-based evaluation, Jacko, J.A., Sears, A. (Eds.), *The Human-Computer Interaction Handbook*. LEA, 273-292
5. Hornbaek, K. & Frokjaer, E. (2008). Comparison of techniques for matching of usability problem descriptions. *Interacting with Computers* 20, 505-514.
6. Ianculescu, M., & Alexandru, A. (2016). Silver Digital Patient, a New Emerging Stakeholder in Current Healthcare. ProActiveAgeing: A Case Study. *Studies in Informatics and Control*, 25(4), 461-468.
7. Jong, M., Lentz, L. (2006). Scenario evaluation of municipal Web sites: Development and use of an expert-focused evaluation tool. *Government Information Quarterly* 23, 191-206, 2006.
8. Kamper, R. (2002). Extending the usability of heuristics for design and evaluation: Lead, follow and get out of the way. *International Journal of Human-Computer Interaction* 14(3&4), 447-462.
9. Kurniawan, S. H., & Zaphiris, P. (2003). Web health information architecture for older users. *It & Society*, 1(3), 42-63.
10. Miesenberger, K., & Petz, A. (2014). Easy to read on the web—state of the art and research directions. *Procedia Computer Science*, 27, 318-326.
11. Molich, R. Ede, M. Kaasgaard, K. Karyukin, B. (2004) Comparative usability evaluation, *Behaviour & Information Technology* 23(1), 65-74.
12. Nielsen, J. (1993). *Usability Engineering*. Academic Press, New York.
13. Nielsen, J., and Molich, R. (1990). Heuristic evaluation of user interfaces, *Proceedings of ACM CHI'90*, 249-256.
14. Pribeanu C., Marinescu R.D., Iordache D.D., Gheorghe-Moisii, M. (2010). Exploring the usability of municipal websites: A comparison based on expert evaluation results from four case studies, *Informatica Economică*, 14(4), 87-96.
15. Pribeanu, C. (2014). Extending and refining usability heuristics to better address user-centered design issues in the development and evaluation of municipal websites. *Informatica Economica* 18 (1), 83-92.
16. Sears, A. (1997). Heuristic walkthroughs: Finding the problems without the noise. *International Journal of Human-Computer Interaction*, 9(3), 213-234.
17. *** (2017). Strategic Vision Developed by Stakeholders. *Blueprint Digital Transformation of Health and Care for the Ageing Society*, 6. Available at:
https://ec.europa.eu/newsroom/document.cfm?doc_id=40787