

Chapter VII

A User-Centered Approach to the Retrieval of Information in an Adaptive Web Site

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ABSTRACT

This chapter describes the user-centered design approach we adopted in the development and evaluation of an adaptive Web site. The development of usable Web sites, offering easy and efficient services to heterogeneous users, is a hot topic and a challenging issue for adaptive hypermedia and human-computer interaction. User-centered design promises to facilitate this task by guiding system designers in making decisions, which take the user's needs in serious account. Within a recent project funded by the Italian Public Administration, we developed a prototype information system supporting the online search of data about water resources. As the system was targeted to different types of users, including generic citizens and specialized technicians, we adopted a user-centered approach to identify their

information needs and interaction requirements. Moreover, we applied query analysis techniques to identify further information needs and speed up the data retrieval activity. In this chapter, we describe the requirements analysis, the system design, and its evaluation.

INTRODUCTION

The development of a *Web-based information system* targeted to different types of users challenges the Web designer because heterogeneous requirements, information needs, and operation modes have to be considered. As pointed out by Nielsen (1999) and Norman and Draper (1986), the user's mental model and expectations have to be seriously taken into account to prevent her/him from being frustrated and rejecting the

services offered by a Web site. Indeed, this issue is particularly relevant to Web sites offering task-oriented services, because most target users utilize them out of their leisure time, if not at work. Being under pressure, these users demand ease of use as well as efficient support to the execution of activities.

The positive aspect of a technical Web site is, however, the fact that the users can be precisely identified and modeled; moreover, their information needs, representing strong requirements, can be elicited by means of a suitable domain analysis. Therefore, utilities, such as data search and retrieval, can be developed to comply with different goals and backgrounds. Of course, users' involvement and testing have to be carried out also in this case because they support the development of effective and usable services (see Dumas & Redish, 1999; Keppel, 1991).

In our recent work, we faced these issues in the development of ACQUA, a prototype Web-based information system for the Italian Public Administration presenting information about water resources (a demo is available at <http://acqua.di.unito.it>). During the system design phase, we put in practice traditional *usability* principles and *adaptive hypermedia* best practices and we derived general guidelines for the development of *usable Web-based systems* for technical users (see Brusilovsky, 1996, 2001; Fink, Kobsa, & Nill, 1999; Maybury & Brusilovsky, 2002). The system described in the rest of this chapter is targeted to two main classes of users:

- Generic users, such as the citizen, who want to be informed about the general health state of rivers, lakes, and underground waters.
- Technical users, such as the public administration employees, who retrieve specific pieces of information for analysis purposes.

In this chapter we describe the requirements analysis, the design, and the evaluation of ACQUA,

focusing on the *user-centered approach* adopted in the prototype design and development phases. We involved domain experts and end users since the beginning of our work in order to assess the usefulness and suitability of the functionality offered by the system, as well as of its user interface. For further information about the system, see Gena and Ardissono (2004).

The rest of this chapter is organized as follows: Section "Background" provides an overview of the relevant user-centered design research. Section "The ACQUA Project" presents our work. Specifically, Section "Application Requirements" describes the interaction and user interface requirements that emerged during the design phase; Section "Adaptive Features" presents the adaptive features we developed for our system; Section "Association Rules" describes the techniques supporting the personalized information search; Section "Evaluation of ACQUA" presents the results of an evaluation we carried out to test the system functionality with real users; and Section "Comparison with Other Solutions" compares our proposal with some related work. Finally, section "Future Trends" discusses some open technical issues and suggests how to address them, and Section "Conclusion" concludes the chapter.

BACKGROUND

Several researchers suggested to address usability issues by developing *adaptive systems*. For instance, Benyon (1993) proposed adaptivity as a solution, because a single interface cannot be designed to meet the usability requirements of all the groups of users of a system. However, it is possible to prove that adaptivity enhances the usability of a system only if it can be shown that, without the adaptive capability, the system performs less effectively. Benyon identifies five interdependent activities to be considered when designing an adaptive system:

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