Chapter 6.1
Supporting Work Practice Through End–User Development Environments

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ABSTRACT

End-user development means the active participation of end users in the software development process. In this perspective, tasks that are traditionally performed by professional software developers are transferred to end users, who need to be specifically supported in performing these tasks. We have developed a methodology that supports user work practice and metadesign, allowing experts in a domain to personalize and evolve their own software environments. In this article we illustrate how this methodology is applied to a project for the development of an interactive system in the medical domain. Physicians and their activities have been carefully analyzed through a field study that is reported in the article, in order to provide them with computer systems that may improve their work practice and determine an increase in their productivity and performance, that is, a better quality of diagnosis and medical cure, with the achievement of competitive advantage for the organization they work in.

INTRODUCTION AND MOTIVATION

The current strong technological push creates many expectations about the possibilities offered by software systems. Computer users are evolving from passive consumers of computer tools and data to a more active role of information and software artefacts producers (Fischer, 2000). This is also highlighted by Shneiderman's (2002) claim that the old computing is about what computers can do, the new computing is about what people can do. The "interaction" dimension in software systems pays much attention to the human side and forces us to go beyond the traditional Turing machine approach to computation by considering interaction as a key feature (Wegner & Goldin, 2003).

The interaction dimension also creates new challenges for system specification, design, and implementation. It is well known that "using the system changes the users, and as they change they will use the system in new ways" (Nielsen, 1993, p. 78). These new uses of the system make the working environment and organization evolve, and force the designers to adapt the system to the evolved user, organization, and environment. Current techniques for software specification and design, such as UML, are very useful for software engineers, but they are often alien to users' experience, language, and background. Software development life cycles should foresee participatory (Schuler & Namioka, 1993) and open-ended design (Hix & Hartson, 1993).

In our experience as computer scientists, we cooperate in participatory design projects to develop computer systems to support professional people in their work practices. Such people (physicians, geologists, mechanical engineers) are experts in a specific discipline (e.g., medicine, geology, etc.), not necessarily experts in computer science. Moreover, their work practices consist of "unfolding activity in actual communities that is concrete and *situated*, complexly socially

organised and technologically mediated" (Karasti, 2001, p. 16).

Developing their tasks, professional people reason and communicate with each other through documents, expressed using notations, which represent abstract or concrete concepts, prescriptions, and results of activities. Often, dialects arise in a community, because the notation is used in different practical situations and environments. For example, mechanical drawings are organized according to rules, which are different in Europe and in the U.S. These professionals need to use computer systems to perform their work tasks exploiting all the communication and operation possibilities offered by these systems, but they are not and do not want to become computer experts. Our work addresses this particular community of end users. In this article, the words *end user* denote experts in a specific discipline (e.g., medicine, geology), in general, not experts in computer science or willing to be, who use computer environments to perform their daily tasks. These end users often complain about the systems they use, and feel frustrated because of the difficulties they encounter interacting with them.

Our approach to system development starts from the observation of activities of such kinds of expert users during their daily work. The research we have developed in this field and the experience gained have brought us to develop software environments that support users in performing activities in their specific domains, but also allow them to tailor these environments for better adapting to their needs, and even to create or modify software artefacts. The latter are defined activities of end-user development (EUD), to which a lot of attention is currently devoted by various researchers in Europe and all over the world (Burnett, Cook, & Rothermel, 2004; Fischer & Giaccardi, 2006; Myers, Smith, & Horn, 2003; Sutcliffe & Mehandjiev, 2004).

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