Journal of Visual Languages and Computing ▮ (▮▮▮▮) ▮▮▮–▮▮▮

Contents lists available at ScienceDirect

Journal of Visual Languages and Computing

journal homepage: www.elsevier.com/locate/jvlc

Fostering participation and co-evolution in sentient multimedia systems ☆

Federico Cabitza [a], Daniela Fogli [b,*], Antonio Piccinno [c]

[a] Dip. di Informatica Università di Milano-Bicocca Milano, Italy
[b] Dip. di Ingegneria dell'Informazione Università di Brescia Brescia, Italy
[c] Dip. di Informatica Università di Bari "Aldo Moro" Bari, Italy

ARTICLE INFO

Article history:
Received 19 September 2014
Received in revised form
2 October 2014
Accepted 5 October 2014

Keywords:
End-user development
Cultures of participation
Co-evolution
Metadesigner
Maieuta designer

ABSTRACT

User diversity and co-evolution of users and systems are two important phenomena usually observed in the design and use of IT artifacts. In recent years, End-User Development (EUD) has been proposed to take into account these phenomena, by providing mechanisms that support people, who are not software professionals, to modify, adapt, and even create IT artifacts according to their specific evolving needs. This is particularly true in the case of sentient multimedia systems, in which the system is called on to interact with multiple sensors and multiple human actors. However, to motivate and sustain these people, a culture of participation is necessary, as well as proper metadesign activities that may promote and maintain it. To this aim, this article first proposes a model for describing interaction and co-evolution in sentient multimedia systems enhanced by EUD features. Then it presents four main roles involved in interaction and co-evolution, including that of maieuta designer, as the "social counterpart" of the metadesigner. Finally, it describes how the maieuta designer is in charge of carrying out all those activities that are necessary to cultivate a culture of participation, by means of proper ways that are briefly introduced in the article.

© 2014 Elsevier Ltd. All rights reserved.

1. Introduction

Sentient multimedia systems are distributed systems that actively interact with the environment through the exchange of multimedia information with many kinds of information sources, such as sensors, robots, actuators, websites and others. End users also belong to such sources of information, since they are called on to communicate and express their feelings, evolving needs and requests to this web of computational nodes. Accordingly, the overall system has to take into account this information flow coming from humans. If we take this stance, a sentient multimedia system can also be seen as a sociotechnical system, which encompasses people (rather than just users) that are bound together by social ties and personal relations of acquaintance and that are also linked with each other and with personal devices and other machines. The latter are able to perceive the environment in which people interact, also by considering the capability of people to feel a situation besides perceiving it (e.g., through the issue of a preference, "likes," and emoticons in tweets), and interpret situations to give people multimedia and multichannel means to act accordingly.

In many IT domains, IT artifacts are usually developed as commodities rather than as ad hoc projects, that is more

☆ This paper has been recommended for acceptance by Shi Kho Chang.
* Corresponding author.
E-mail addresses: cabitza@disco.unimib.it (F. Cabitza), fogli@ing.unibs.it (D. Fogli), antonio.piccinno@uniba.it (A. Piccinno).

http://dx.doi.org/10.1016/j.jvlc.2014.10.014
1045-926X/© 2014 Elsevier Ltd. All rights reserved.

Please cite this article as: F. Cabitza, et al., Fostering participation and co-evolution in sentient multimedia systems, Journal of Visual Languages and Computing (2014), http://dx.doi.org/10.1016/j.jvlc.2014.10.014

for uniform populations of consumers rather than for members of different communities that exhibit local needs and perform situated practices to achieve their goals [1]. Moreover, each end-user community is often characterized by user diversity, due to users' different physical and/or cognitive abilities, past experiences, roles, responsibilities and work contexts. To this end, in today's competitive global market, the adoption of product configuration software has recently helped to increasingly speed up the understanding of the customers' needs for a successful design and implementation of customized products [2–5]. In fact, product configuration is the activity of customizing a product, in order to better meet the needs of a particular end user more quickly. However, fulfilling the needs of end users is a "moving target" [6], since they evolve (e.g., regarding their proficiency of use, skills, expectations, needs, wishes and domain knowledge) by using software systems, and they can also change their practices (to accommodate the new artifact [7]). Acknowledging this twofold evolution (i.e., of users and their tasks) entails the requirement that IT artifacts should be designed to be very flexible, in order to be easily adapted to the specific needs of the user communities and, hopefully, to be personalized by the individual users to better fit their own evolving needs. This overall phenomenon has been called co-evolution of users and systems, to denote the variety of situations where users and their systems must co-evolve in a continuously self-adapting mutual fit [8].

End-User Development (EUD) has been proposed as one possible solution to cope with the challenges posed by user diversity and co-evolution, since it encompasses techniques that allow end users to modify and extend their own IT artifacts without necessarily delegating these modifications to software professional developers. Taking co-evolution seriously sheds light on the fact that continuously relying on professional actors for these interventions would not be feasible in the long run. Indeed, one kind of unintended consequence related to IT artifact deployment, which is reported most frequently in the specialist literature, regards the never-ending request for modifications, corrections and evolution of artifacts by the users [9]. In other words, in an EUD perspective, software systems are viewed as "continuously evolving sociotechnical systems driven by design activities of both professional software engineers and users" [10].

For the particular human-oriented extension of the traditional definition of sentient multimedia systems (see above) proposed by us, we uphold that an EUD approach is necessary also for the design and continuous evolution of this novel class of applications. In particular, through the use of EUD methods and techniques, a sentient multimedia system can resemble a living system, with some degree of intelligence, that reacts to the end-users' evolution through the consequent self-adaptation and in turn favors the adaptation of end users to the evolution of the system. In this way, the word "sentient" would also imply "alive" and "intelligent," as this kind of emergent behavior is what characterizes many complex systems, like sociotechnical systems, that do have feedback loops between perception and action.

However, this far-reaching objective also requires the "cultivation" of a culture of participation, in order to motivate and sustain end users in their contribution to system evolution. This avoids the risk of participation inequality [11] and of replicating the current gap between IT professionals and end users at the shop floor level. The metadesign framework, which aims to help "users to become co-designers at use time," has been proposed to this latter aim [12]. However, this framework seems to have neglected some important aspects that might make it more operative in real settings, like its relationship with activities promoting a culture of participation. Therefore, in this article, we would like to investigate how to extend the original proposal of metadesign with mechanisms that are more specifically aimed at cultivating a culture of participation and thus enabling a suitable environment for the sustainable co-evolution of users and their systems.

To this end, we draw on our research experience in a variety of application domains (e.g., medicine, mechanical engineering, e-government and others) and on the analysis of the existing literature about a variety of EUD projects. We first propose a model for interaction and co-evolution that aims at clarifying the dynamics occurring in EUD settings among the different professionals involved, their tasks and the systems they use. In particular, we expand the technical activities a metadesigner should perform to support system adaptation and growth over time, and then provide indications about the activities of his/her "social counterpart," namely the maieuta designer, who is in charge of activating all the necessary social mechanisms that may sustain the co-evolution phenomenon.

The article is organized as follows: Section 2 presents the related works; Section 3 describes the proposed model for interaction and co-evolution between users and systems, by clarifying in particular the role played by each different professional; Section 4 expands the role of the maieuta designer and proposes a framework for supporting his/her activities and Section 5 concludes the article.

2. Related works

Since the eighties, the human computer interaction (HCI) literature has proposed different techniques for the design of interactive systems. They start from user-centered methods [13] – including field studies, interviews, task analysis, usability testing – and move on to participatory design techniques [14], where users are directly involved in the creation of interaction scenarios [15] and/or static and semi-static prototypes [16].

However, while HCI scholars have been considering user-centered and participatory design approaches as consolidated and successful practices for interactive system development, only in recent years the need for continuous system development with the participation of end users also at use time has received adequate attention. Consequently, end-user programming (EUP) techniques have been embedded in commercial software, such as macro recording in word processors, formula composition in spread sheets or filter definition in e-mail clients. EUP is defined in [17] as "programming to achieve the result of a program primarily for personal, rather than public use." However, as highlighted in [18], the problem with end-user programming is that the programs created by end

Please cite this article as: F. Cabitza, et al., Fostering participation and co-evolution in sentient multimedia systems, Journal of Visual Languages and Computing (2014), http://dx.doi.org/10.1016/j.jvlc.2014.10.014

Download English Version:

https://daneshyari.com/en/article/10358778

Download Persian Version:

https://daneshyari.com/article/10358778

Daneshyari.com