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Autor: Blochini, Davide / Paolini, Paolo

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Guest Editors' Introduction

DAVIDE BOLCHINI* & PAOLO PAOLINI**

DESIGNING INTERACTIVE COMMUNICATION:
INSIGHTS FROM THE CULTURAL-HERITAGE DOMAIN

1. Introduction

The journal dedicates the thematic section of this issue to “*User-Centered Communication Design for Interactive Applications*”. Given the breadth of scope of the theme on one hand, and its apparently articulated expression, a brief remark on the key underlying concepts may be useful. Interactive applications represent today an important asset for both public and organizational communication, enabling to reach a wide audience in a rich, personalized and engaging way and providing structured content and services often not available through other channels.

By interactive applications is generally meant any digital artefact which has been designed to shape an user experience characterized by a dialogue taking place between the user and such artefact. In this perspective, CDroms, DVDs, videogames, websites, desktop software, interactive TV applications, CRM software and any kind of software providing a degree of interactivity may fall under this label. It goes without saying that such a wide definition glues artefacts so substantially different in nature, scope, communication scenarios, technology and interaction mechanisms, that coping with all these kinds of “interactive applications” in a coherent approach would be unreasonable and unfruitful. In fact, the industrial market has strongly differentiated the processes for dealing with these diverse categories of artefacts. To quote just some of the key differences, the technology, the design skills needed, and the user needs addressed in the videogame industry are little comparable to the ones in the websites industry. The research arena also specialised its interests in different sub-domains of interactive applications. Although this process

* University of Lugano, davide.bolchini@lu.unisi.ch** University of Lugano, paolo.paolini@lu.unisi.ch

is not yet mature, it is possible to identify different research communities, each addressing (regardless of the specific application content at issue) CRM applications, applications for computer-supported cooperative work, websites, interactive TV, videogames, etc.

A subset of the wide realm of “interactive applications” can be clearly identified as we move a step back along the section title, and we meet the word “communication design”. While it is clear that we are not engaged in communication with the inventor of a word processor as we are typing a letter (unless very indirectly, someone would say), the communication factor becomes crucial when the interactive application is a mean used by some stakeholders (being them within a public institution or a private organization) to convey structured content, messages and services to the user and solicit him/her to take action. Websites (especially those which are called information- or content-intensive) are a typical example of this communication paradigm, in which the user is engaged in a dialogue with the website, and this dialogue is a form of mediated communication which is part of a wider dialogue: the dialogue between the user and the stakeholders of the website, i.e. the people who conceived, designed and manage the interactive application and take care of keeping dialoguing with their online visitors. Approaches for conceiving and modelling websites as communication tools (Van Deer Geest 2001; Bolchini 2004) illustrate the communication paradigm established by a web application emphasizing four components involved in this dynamics: content and services (1) communicated by a variety of stakeholders (2) to a variety of users (3) through a set of access tools (e.g. the interface) (4). This high-level description of the website communication is very general, on one hand, but powerful, on the other hand, because it clearly distinguishes websites (where users indirectly communicate with other people through the application) from other non-communicative interactive applications (such as desktop software), where users make use of the application to accomplish operative tasks (such as compressing a file).

This thematic section aims at focussing the research contribution on communication-intensive applications in its proper sense, i.e. those application designed by some stakeholders to engage their users in a dialogue, being the themes of this dialogue the interactive content and services provided by such applications.

Other kinds of interactive applications, which were not intended as the primary focus of this thematic insight, are those whose communicative nature is much more transparent as pure cooperation tools (such as

instant messaging systems, forums, and chats). Here, the tool does not convey any content *per se* and no stakeholder is behind the application, except users dialoguing one with another.

So far, we have explained what we mean by “communication design for interactive applications”; however, why all that should be “user-centered”? The difficulties that many users encounter in retrieving the needed information while navigating in websites, the frustration emerging from disorientation, the lack of confidence in the content, and the series of non-desired user experiences are all factors which reveal that often online communication is not designed to meet user needs. The communication effort should have the user as its cornerstone, being the user the ultimate target for which content and services are designed and shaped. Communication goals are achieved through a cooperation of actors: if the user experience is damaged, this cooperation risks to fail, thus compromising the success and the reason of existence of the application itself.

2. The Application Lifecycle and Cultural-Heritage

The development of any communication-intensive interactive application is characterized by an ideal lifecycle, which describes a set of phases or activities which lead to the deployment of the final application. The lifecycle may greatly vary from one case to the other depending on the size and nature of the application, the budget available and the culture of the design team. However, some key communication aspects can be isolated in a typical lifecycle. The following questions (corresponding to traditional activities in the development) try to raise issues relevant from a communication perspective:

- a) How can stakeholder’s visions & communication goals be elicited and analyzed? What are the user motivations and the typical scenario of use to be supported? (*requirements elicitation*)
- b) What are the requirements the application should possess according to a)? (*requirements analysis*)
- c) What are the design solutions needed for an effective user experience? (*design*)
- d) Can users actually exploit the application at its utmost potential? Is the dialogue between the user and the stakeholders (through the application) effective and satisfactory? (*usability evaluation*)

The specific focus of the thematic section is articulated in two main topics, which capture important phases of the interactive application lifecycle: design and usability evaluation.

Design activity is crucial for giving a shape to the user experience. It entails the decisions about how to structure the content, to organize the navigation architecture, to define the interaction capabilities available to the user and to present content and functionality in a proper way through a visual (or aural) interface. In this phase, design models and methodologies can support designers to take the right decisions, not to forget important aspects of the user experience and to document, share and communicate effectively the results of these decisions among the design team and to the developers.

Usability evaluation ensures that the design decisions meet the needs of the end users, i.e. enabling them to accomplish their goals. The results of the usability evaluation take the form of recommendation that can be exploited to improve the application (in its final or prototype release) in such a way that it can be more effectively and efficiently used by the intended users and, eventually, accepted by them.

Instead of emphasizing general-purpose methods for design and usability, this thematic section particularly favoured contributions focussing on a specific domain: *cultural-heritage communication*. The intention was to promote best-practices and success stories of interactive application design, soliciting scholars to share experience from the trenches and then inductively elicit lessons-learned useful for other's practices. The use of interactive applications to promote the communication and the valorization of the cultural heritage is an interesting and growing sector for a number of reasons, including the following:

- The potential target audience is the wide public (from children, to tourists, to specialists, to students);
- Both the private and public sectors are demonstrating strong interest in deploying application to valorize the cultural heritage potential;
- Cultural-heritage is rich in multimedia content (audio, video, images, stories, etc.) and such content lends itself to be highly structured and interactive;
- Important parts of the cultural heritage content has already been digitized (even if not properly communicated);
- User goals and tasks are often open-ended and ill-defined (e.g. users delegate to the application the responsibility of raising interest and curios-

- ity), thus allowing for the communication strategies of the stakeholders to break in the user experience;
- Accessibility and usability become necessary concern (especially when such applications are the results of a public effort) for appreciating and communicating the cultural heritage;
 - The need for ubiquitous and multichannel access is more and more needed (e.g. using the application *in situ* while visiting a cultural place) and the technology is mature to support these scenarios.

With this potential in mind, the guest editors of the thematic section called for contributions which could inspire both practitioners and scholars in understanding the communication issues behind the design, deployment and evaluation of cultural heritage interactive applications. The accepted contributions are briefly presented in the next paragraph, trying to offer to the reader a possible reading guide to appreciate their distinctive features. The topics covered by the articles span from research advances and best practices in design and usability, to field studies, and to elaboration of novel methodologies and principles.

3. The articles of the thematic section

Peter Samis, Associate Curator and Co-Acting Director of Education at the Interactive Educational Technologies Department of the San Francisco Museum of Modern Art (MoMA), illustrates cutting-edge sensory-rich applications developed at MoMA (Making Sense of Modern Art program) thanks to a state-of-the-art production suite, called Pachyderm. This application generator is specifically designed to allow efficient and high-quality online publishing of interactive applications dedicated to museums exhibitions. Samis' experience demonstrates how it is possible to capitalize on designer's experience to reuse proven solutions (design patterns) in a specific domain (interactive online exhibitions) and to offer them encoded in a design tool, which can dramatically improve the efficiency and the quality of the production process.

Simeon Retalis and his colleagues from the universities of Piraeus and Cyprus present the results of an experiment conducted on 24 museum websites with the aim of assessing the relationships between the user perception of the website features (in terms of navigation, content, layout, etc) and their satisfaction/dissatisfaction level when completing given

tasks (exploring the exhibitions, finding opening hours, booking a tour, etc). Focussing on resulting levels of satisfaction or dissatisfaction of the user experience, the study tries to reveal user's emotional responses associated to web design features. In this way, indications are provided to designers about interrelationships between given design features and the potential for user's emotions to arise. The relevance of affective aspects in usability studies is a growing trend in human-computer interaction in general. One of the gems of this work is that, embracing this trend, it offers concrete insights which can be useful for the studies of the communication impact of museum websites.

Vassilios Vlahakis and his group at INTRACOM - Digital Media and Internet (Greece) present the ARCHEOGUIDE system, a mobile application which offers an augmented-reality experience for visitors in archaeological sites. Augmented-reality enables to learn about the archaeological remains *in situ* (of Ancient Olympia in this case) by exploring virtual reconstruction of the objects and accessing associated explanatory content. The work focuses on the evolution of the system based on the feedback from actual users and emphasizes the usability-related aspects evaluated with visitors of different cultural ages and cultural backgrounds. This paper is an example of best practice which was not only developed and deployed but also accurately evaluated and improved according to constantly emerging user requirements.

How can semiotics studies be useful to web professionals? *Luca Triacca* and *Marco Speroni* (University of Lugano), in collaboration with *Chiara Bramani* (Politecnico di Milano), illustrate the process and the results of a semiotic-based usability analysis of DICE – a online application aiming at demonstrating the possibility of integrating different information sources to create an effective working environment for professional users in the cultural-tourism industry: researchers, scientists, cultural writers, promoters of cultural events, promoters of culture-oriented tourism. The application is targeted to a variety of specific user profiles, each one characterized by typical (professional) tasks and a diverse level of knowledge in the domain. The paper shows that the analysis of interface signs from a semiotic perspective, properly integrated in proven usability techniques, allows for efficiently detecting and anticipating crucial breakdowns for the user experience (such as wrong link labels due to inadequate assumptions about user's knowledge).

Markus Jobst, Beatrix Brunner-Friedrich and Verena Radoczky (Vienna University of Technology) study a type of content which is crucial for cultural-related applications: geographical maps. The perception and use of maps for locating a specific spot in a space, for getting an overview of the area, or for accomplishing way-finding tasks are discussed. Moreover, the impact on cognition of the different types of cartographic solutions is analyzed, also presenting results from field studies (both reported in the literature and carried out by the authors). The highlights discussed on the communicative and cognitive issues involved in cartography usage pave the way for a more conscious integration of map artefacts in cultural-heritage applications.

Besides the emphasis on the cultural-heritage domain, high-quality articles have also been accepted, which concern research advances on cross-domain methodological issues, such as usability, design specification techniques and requirements analysis methods. These important aspects of the lifecycle are relevant for cultural-heritage applications, but they can as well be useful to researchers and designers active in other content-intensive domains.

Usability is an emerging concern especially when users access applications in a mobile scenario (walking, driving, and, in general, in nomadic situations). Known usability guidelines valid for interactive applications running on traditional devices (such as desktop computers) have to be adapted for coping with the new issues raised by the growing adoption of mobile devices (such as PDA or smart phones) and of the growing diffusion of the applications running on them. *Enrico Bertini, Tiziana Catarci, Stephen Kimani* ("La Sapienza" University of Rome) and *Alan Dix* (Lancaster University) elaborate on new usability principles specifically tailored for mobile computing, illustrating the limits and the potential of these technological opportunities with respect to the user experience.

There are content-intensive interactive applications particularly relevant for the everyday work of the researchers: research information systems (CRIS). These applications (both at the European and at the national/regional level) should offer to scholars the "official" resources to learn how to apply for research grants, how to find partners, how to build a project consortium, along with a full documentation support concerning the whole lifecycle for the research projects. On one hand, it is clear that usability of such applications is vital for researchers; on the other hand, the lack of usability of CRIS often make scholars refrain from drawing to the online resources,

thus not becoming autonomous in retrieving research funding. Little or no attention has been paid so far to a proper understanding of usability issues for CRIS. In this context, the article by *Benedetto Lepori* and *Davide Bolchini* (University of Lugano) define a set of usability tools specifically suitable for CRIS designers, thus offering designers and project managers effective tools to evaluate and improve the degree of usability of these applications. The methodology is used to evaluate the usability of one of the largest CRIS for european research: the CORDIS website.

During the lifecycle of complex interactive applications, the reasons behind design decisions are often overlooked and forgot as the project goes along, with the risk of having the project team and the stakeholders confused and disoriented as to the “why” the application has been designed in a given way. One of the reasons for this situation is the lack of proper traceability methods, which should enable analysts, designers and project stakeholders to keep a structured “record” of the initial goals of the projects and of the corresponding design solutions. *Giovanni Randazzo* (University of Lugano) illustrates how to fill this methodological gap with TRAMA – an innovative traceability method for highly structured and complex application designs. As case study, the methodology is applied on the demonstrating website prototype developed for the Museum of Extra-European Cultures in Lugano.

Finally, *Jacopo Armani* (University of Lugano) explores the debated field of adaptive hypermedia systems (AHS). In his insightful article, the author presents a user-centered modeling language for the design of educational adaptive websites. The language can be used by AHS designers to shape applications which are able to offer personalized content and navigation support according to the specific learning needs and knowledge of an individual user. The work is part of a larger effort that aims at diffusing adaptive technologies in the community of practice.

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