

## Chapter 20

# User Centered Technologies, Serious Games and Learning: A Critical, Speculative Perspective

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### ABSTRACT

*The widespread adoption of IT technologies by cultural heritage (CH) has transformed how cultural heritage is presented both to experts and the broad public. In the last few years a large number of multimedia applications, including virtual and augmented reality simulations, have been proposed by researchers and industry alike. However some of these technologies struggle to achieve mass diffusion, most probably due to limitations of their interfaces. Conversely, the recent widespread success of both serious games and mobile applications are laying the foundations for true extensive access to digital information on cultural heritage, creating new possibilities. This chapter illustrates this technological trend, highlighting their potential effects on the public and discussing a number of emerging scenarios of interest for the cultural heritage domain.*

### INTRODUCTION

The domain of cultural heritage has benefitted, in the last few years, of an increasing use of IT technologies. A wide range of multimedia tech-

nologies have been adopted among museums, archaeological sites and libraries to name but a few. Interactive presentations, multimedia kiosks are nowadays often found at the premises of several cultural heritage sites or institutions (Conti et al., 2006).

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Similarly, interactive virtual reconstructions are becoming an ordinary feature at museums or on the web, as dedicated graphical hardware today have become a commodity. A growing number of research works have also proposed the adoption of state of the art technologies, including among others virtual and augmented reality set-ups, within the domain of cultural heritage. The scientific literature is rich in use of cutting edge technologies within the context of cultural heritage to deliver virtual reconstructions and interactive simulations.

Nonetheless we argue that all these applications, albeit they should be prized for rising the attention towards cultural heritage of scholars, technology experts and people alike, in fact have only partially achieved mass diffusion mostly due to their limited usability and lack of user centric design.

The main reason for their limited success is that all multimedia applications in fact, despite their well-known claims, are far from achieving a true user-centric approach. The truth is that most of these technologies adopt an underlying communication metaphor which has not evolved significantly in the last few years, and it is essentially based on a linear logical sequence of events. In fact in most of these applications users' freedom is limited: the user can interact with the application along pre-sets information corridors. Whenever the application brings them to a "logical crossroad" they can only choose which logical branch they want to move next. This metaphor, essentially based on the hypertext-based access to information, provides limited degree of freedom to the user and it only partially fosters essential aspects typical of learning process such as engagement, discovery and experimentation.

On the other hand cutting edge technologies, such as virtual and augmented reality, have clearly shown their main limitation firstly in their set-up and maintenance costs and, secondly, in the true level of ergonomics ultimately delivered to the users. Usability in fact is often hindered by the need to wear stereoscopic goggles or head-mounted

displays as well as to make use of tracking and interaction devices such as virtual gloves. This not only has posed a serious limit in the overall ergonomics but it does dismay and, most importantly of all, discourages most final users to use them. This is the case of audiences traditionally not familiar with, or even frightened by, IT technologies, such as elder people. In particular, for the latter group, a special care should be taken when creating interfaces that can truly facilitate the learning process.

However in the last few years the widespread diffusion of some key technologies, namely video games and mobile IT technologies, is laying the foundations for a radical change. Since the early nineties both scientists and the industry have been paying a growing attention to educational aspects related to gaming activities and to the implementation of computer games for educational purposes. Numerous scientific studies have demonstrated unambiguously the benefits that characterize the so-called Digital Educational Games (DEG), also known as *serious games*. The scientific literature is rich in studies bringing forward different approaches to design and use of DEG for didactical applications across several domains including cultural heritage (see Figure 1). If compared to standard VR reconstructions, which allow navigation and pre-set interaction with object present within the virtual scene, game-structured environments have a tremendous added value in that the entire environment is funded upon a plot, a challenging tasks that requires a speculative attitude that goes beyond mere navigation of a reconstructed virtual scene.

This chapter will first illustrate the essential learning implications of the use of DEG by providing an historical perspective of how these can be designed to fit the different learning methodologies. The chapter will then describe the experiences of the authors, made in the context of a number of different projects, which have brought to the implementation of *serious games* for cultural heritage. We will illustrate how DEG has

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