‘Design for All’ versus ‘One-Size-Fits-All’: the Case of Cultural Heritage

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Abstract. This paper would like to discuss the design trade-offs that might emerge during the development of technological solutions for promoting and enhancing the fruition of cultural heritage. To this aim, the paper briefly describes the UniBSArt4All project, which employs advanced interactive technologies, such as artwork recognition and wireless sensors, to obtain engaging and accessible visitor experiences customized to different users’ profiles. By reflecting on the project development and its preliminary results, the paper finally proposes a meta-design approach to inclusive design in the CH domain.

Keywords: Cultural heritage, augmented reality, beacon, end-user development, meta-design, inclusive design, design for all

1 Introduction

In our everyday life, we often encounter trade-offs, namely situations where we need to renounce to something in order to gain something else. Problem solving usually represents such a situation, in which a solution must be designed by taking into account both the goals one would like to satisfy and the different constraints that impose choosing among those goals. Therefore, usually design “is the identification, discussion and resolution of trade-offs” [15].

Indeed, as underlined by Gerhard Fischer, a design problem does not have a correct solution or a right answer, but the solution or the answer depends on the values and interests of the involved stakeholders [6][7]. This is true also in the cultural heritage (CH) domain, where each stakeholder - from visitors to research scholars, from exhibition curators to government representatives and technology experts - possesses a specific and unique perspective on the problem. Therefore, providing suitable means for enjoying cultural heritage (CH) is often a matter of design trade-offs.

As an example, UNESCO promotes the *preservation* and *enhancement* of CH, two activities that are themselves in trade-off, since enhancing CH might imply altering it in some way. However, thanks to Information and Communication Technologies

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(ICTs), nowadays it is possible to address both needs, by fostering the enjoyment of CH in new ways and, at the same time, by sensitizing people about its importance and fragility [10]. For instance, digital audio-guides are usually available in museums and artwork expositions, through which visitors can listen to additional content describing artworks; while interactive installations or augmented reality (AR) devices are being proposed for enhancing visitors' experience [12][14][18][19]. Notwithstanding these advancements offered by new tools for enjoying CH, several trade-offs must be considered when designing ICT solutions for CH. Here are some of the design trade-offs one is usually called on to address:

- Visitors would like to enjoy personalized experiences tailored to their culture, age, interests and previous experiences; on the other hand, curators have usually limited resources to create different ways of enjoying a CH site and its artworks.
- ICT people may propose enhancing visitor's experience through novel technologies, such as wireless sensors, augmented reality devices, interactive displays, etc.; however, the cost of installation, deployment and maintenance of these technologies are usually too high for the majority of sites and museums.
- Novel technologies may offer personalized experiences, but they may also require access to the Internet and localization features that cannot be available everywhere.
- Technological interventions are often case-based, even though designers should pursue generalization and re-use in different contexts.
- Technology deployed in the CH domain is sometimes regarded more as an objective in itself (i.e., just an attraction to engage visitors), rather than as a means to reach a knowledge purpose [1].
- Last but not least, some CH places are often not physically or cognitively accessible: indeed, design for accessibility may require high costs and hard work, but it surely contributes to build an inclusive society.

The last trade-off is actually the starting point of our research in this domain. Assuming that culture is the basis of development of critical skills for democratic participation [2], access to culture becomes a right that must be guaranteed to everyone, independently from his/her age, location, language, (dis-)abilities, and preferences. Making CH accessible is a possible way of fostering access to culture: CH plays a fundamental role for understanding the present times through the knowledge of the past [1]. This issue is often neglected in existing ICT solutions for CH, which are often 'one-size-fits-all'; whilst, in the cultural sector, the content to be transmitted might not be the same for a child or for an expert, just like the communication media used for blind and deaf people might be different [1].

In this position paper, we briefly recall the preliminary results of the UniBSArt4All project, aimed to promote a new use and development of advanced interactive technologies for accessible CH [11]; then, we propose a meta-design approach to inclusive design in the CH domain, based on design trade-offs and specific issues emerged during the project development.

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2 The UniBSArt4All Project

The UnibsArt4All project includes: 1) a cross-platform (Android and iOS) mobile application, aimed to support users in enjoying museum content in a tailored and accessible way, and 2) an end-user development (EUD) [3][4] tool, to be used by museum curators to organize the app pages according to the museum structure (floors, rooms and artworks available in each room) and create all contents suitable to the different user profiles, which will be used to instantiate the app.

The app is composed of four sections (see bottom bar in Fig. 1(a)):

- *Homepage*, which shows a brief description of the museum, including opening hours, and the last news.
- *Museum*, which, according to a step-by-step interaction, allows the user to access museum floors, rooms, artworks and artwork details (Fig. 1).
- *AR screen*, which uses the photocamera and the Wikitude service (https://www.wikitude.com) to recognize the artwork, and then presents artwork details near the image captured by the photocamera (Fig. 2).
- *Bluetooth screen*, which uses Bluetooth Low Energy (BLE) technology (also "beacons" in the following) to detect the closest artwork, in order to present, similarly to the AR screen, some information related to that artwork. For example, Fig. 3 shows a pop-up that tells the user that two artworks have been found.

(a) (b)

Fig 1. Child' view of artwork description (a) vs 'blind' view suitable to screen readers (b).

Accessibility of contents are managed through the user profile. In particular, on first access to the app, the visitor may declare to be a child, a tourist or a scholar, and the app will select automatically the contents that are most suitable to that type of user. For instance, children may enjoy a description suitable to their reading skills and have the possibility to vote the artworks they like (Fig. 1(a)).

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The app also allows tailoring content and interaction according to the possible disabilities of the user. In particular, in the user profile, one may declare a hearing or visual impairment, thus allowing the app to adapt its interaction possibilities. For instance, in the case of visual impairment, the app provides voice-over features and organizes the pages in a way suitable to screen readers and selections made by visually impaired users (Fig. 1(b)). In this case, beacons are used to detect the closest artwork and tell the user all related contents. If more than one artwork is detected, a simplified pop-up, suitable to visually impaired users, is shown (and told) to allow artwork selection. In case the user declares to have a hearing impairment, suitable videos are proposed, including subtitles or descriptions through sign language.

Fig. 2. AR screen of UniBSArt4All app.

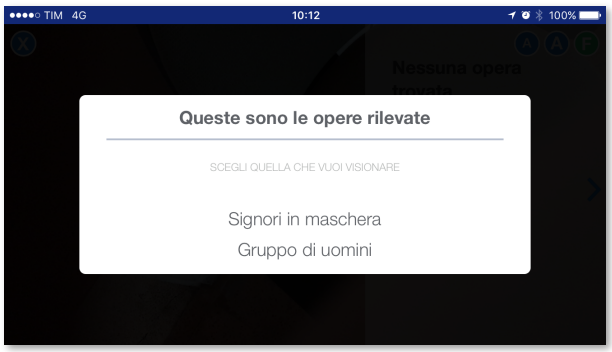

Fig. 3. Automatic detection of artworks through BLE technology.

Museum curators may use a web-based EUD tool to manage the structure and contents of the app (Fig. 4). In this way, it allows an easy adaptation of the project to any type of museum. This tool allows curators to create the museum floors and their related rooms, as well as all data associated to the artwork objects available in the museum, with the specific contents related to the different user profiles. Moreover, they may easily assign beacons and photos to artwork IDs for easy retrieval at run time. Through the EUD tool, the curators can also manage user accesses and monitor visit trends.

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The whole system has been preliminarily experimented in a monumental complex belonging to the University of Brescia, in Italy.

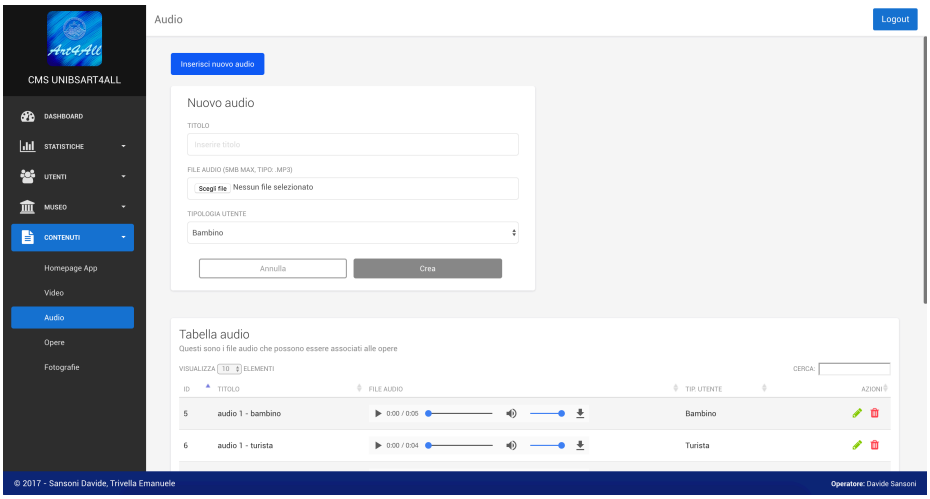

Fig. 4. Insertion of audio-descriptions in the EUD tool.

3 A Meta-Design Approach to Inclusive Design

The mobile app and the EUD tool are the result of an iterative activity carried out by an interdisciplinary team including software designers, architects and civil engineers, who are experts in ICT, CH preservation and promotion, and urban universal design, respectively. The development process started with the software designers that would like to demonstrate to the other members of the team how low-cost AR and Bluetooth technology could be used to enhance CH experience. Interestingly enough, experts in CH and universal design were worried that these technologies were not considered as an aesthetic experience in itself, but that were regarded as a new medium of communication with CH. Therefore, software designers first created some scenarios and mock-ups, and then started developing interactive prototypes of the mobile app by taking visitors and their needs, backgrounds and physical characteristics at the center of the design activity. The other members of team were constantly involved in the evaluation of the different stages of the project.

In this way, a variety of issues emerged during the development of the app, also as a consequence of team's discussions and brainstorming: from personalization and accessibility needs of the users, to technology flexibility due to environment constraints (e.g., WiFi access), from long-term sustainability by museum curators, to the extendibility of the project to other CH contexts.

These issues led us to adopt a *meta-design* approach [8][9] and develop the EUD tool for curators, which can be used for creating and managing different app

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instances, and evolve them over time, by keeping up-to-date all the different types of content.

Following Schön's idea of "reflection-on-action" [16], we then reflected on the design activities carried out during the project, which were actually aimed at addressing the above issues and the trade-offs mentioned in Section 1. As a consequence, we suggest here that all those activities could be brought back to the "design for all" umbrella and that the emerged issues represent the dimensions to be taken into account for the inclusive design of technologies for cultural heritage.

Figure 5 illustrates these dimensions. Three of them are related to the characteristics of visitors (the human side of the *socio-technical system* under development [9]), namely their *culture*, *age* and *abilities* (or disabilities), which require the creation of different contents or interaction mechanisms. The other three dimensions have to do with technology, and they concern: i) *time*: that is, the need to support maintenance and evolution of hardware/software systems over time by museum curators; ii) *cost:* that is, the system should be affordable both for visitors and for museum organizations, for instance, through personal smartphones and low-cost wireless devices; iii) *space*: that is, the system should be cross-platform, applicable to various contexts (different museums, exhibitions and archeological sites), and robust with respect to different environmental conditions; as to the latter characteristic, it may for example occur that Internet is not available in some building or lighting is not suitable to photo capture, therefore, one must be sure that beacons can be used instead of image retrieval, as well as, in case of crowding or large sites, that BLE technology is properly deployed.

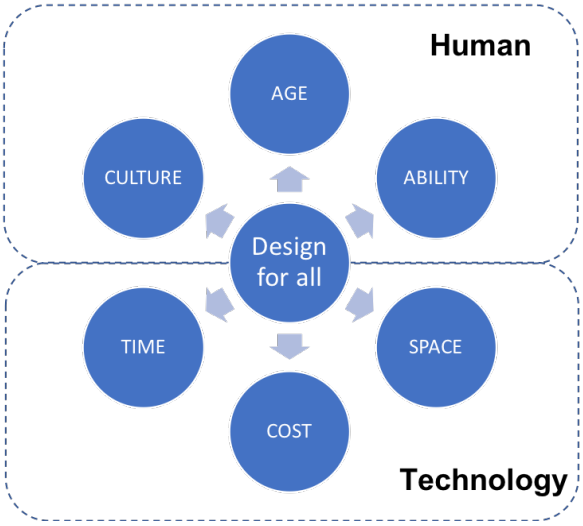

Fig. 4. Dimensions of Inclusive Design in CH.

Inclusive design for CH thus requires software designers to adopt a meta-design approach that allows them to create all the socio-technical conditions for system development, deployment, maintenance, and evolution, as well for its acceptance by

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all the involved stakeholders – visitors and curators above all. In particular, curators should be supported in the end-user development [3][4] of CH mobile apps through proper tools that transform them in *choice architects* [17] with respect to the adoption and shaping of technological solutions for CH.

4 Discussion and Conclusion

Accessibility of CH must be understood as the possibility to 'enter into a relationship', to 'establish a two-way relationship' between humankind and art and make intelligible the message that is transmitted in approaching CH. Actually, in recent years, the role of cultural heritage has been radically rethought, placing the emphasis not so much on why to protect it, but on *who* will benefit from this protection [5]. Particularly, the 2005 FARO Convention of the Council of Europe encourages people "to recognize that objects and places are not, in themselves, what is important about cultural heritage" and adds that "they are important because of the meanings and uses that people attach to them and the values they represent" [5].

In this perspective, ICT can provide a useful support for the comprehension of CH by providing different users with a 'tailor-made' tool. On the contrary, ICT cannot substitute physical accessibility because the unique way to have a real knowledge of CH passes through being there, walking through the architecture, and having a direct experience. Thus, ICT can be considered a way to foster CH enhancement, which consists, according to the Italian Code of the Cultural and Landscape Heritage, in "the exercise of the functions and in the regulation of the activities aimed at promoting awareness of cultural heritage and ensuring the best conditions for use and enjoyment of the public assets, even by persons with disabilities, in order to promote the development of culture […]" [13].

To address these issues, we propose the adoption of a meta-design framework that helps developers and domain experts take into account all the different aspects related to the inclusive design of ICT for CH enhancement. As future work, we are planning to carry out an in-depth experimentation of the developed system and possibly deploy it in different real contexts, in order to collect proper feedback for refining the meta-design framework and the system itself.

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