the Learning Network on Sustainability

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Cultural and Natural Heritage for All: Sustainable Fruition of Sites Beyond Physical Accessibility

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ABSTRACT

Heritage is defined as the set of all material, immaterial, natural and cultural assets, whose immense value is universal and belongs to all people, as a property of present and future world generations. It is therefore an asset to be preserved for future generations. However current design approaches used to implement existing Heritage's promotion strategies mainly use visual-centric design approaches, as a result of the anthropologic humans' legacy to live. Thus, people with sensorial-perceptive disabilities (i.e. blinds) are excluded from all design interventions and they rarely can enjoy of the Heritage. This paper presents the results of design researches focused on the role of Design for the inclusive and sustainable enhancement of Cultural and Natural Heritage, with an emphasis on the sensorial-perceptive fruition of sites. It combines Communication Design, Inclusive Design, Digital Modeling and Rapid Prototyping to develop a design framework useful to create sustainable and inclusive communicative solutions for the auditory-visual-haptic enhancement of Heritage.
Key Words: Cultural and Natural Heritage, Inclusive Design, Auditory-Visual-Haptic Enhancement, Sustainable Design Criteria and Design Guidelines.

1. INTRODUCTION

The 1972 UNESCO's 'Convention Concerning the Protection of the World Cultural and Natural Heritage' (UNESCO, 1972), defined the Heritage as the set of all material, immaterial, natural and cultural assets, whose immense value is universally recognized as belonging to everyone and, therefore, of property of the present and future world populations. Accordingly, the will to include future generations in the fruition of sites refers to: (a) the will to preserve the historic memory, the environmental condition and the social impacts of sites, and (b) the idea of Sustainable Development for the future enjoyment of sites in their present-day conditions. In over forty years, more than one thousand of sites, both cultural and natural, have been included in the 'UNESCO World Heritage List', which is the official list developed by UNESCO and including the names, the status and all technical-economic specifications concerning the sites composing the so-called UNESCO Cultural and Natural Heritage.
'Heritage' is an umbrella-term used to describe a large number of sites having a high collective value (Falser, 2015) and able to produce a number of horizontal effects – interdisciplinary and not only linked to the aesthetical beauty – such as: remarkable effects on local economies and wellbeing (i.e. the Great Wall in China, which is the most visited sites in the world produces income for the governmental administrators and for thousand of workers) (GHF, 2010), the lifestyle of pupations living in the surrounding areas (i.e. the Great Barrier Reef in Australia, which stimulates the development of many touristic services for tourism, diving and fishing; the site of Angkor in Cambodia, which is the main economic source for people living in the area and influence their lifestyle) (UNSCO WHC, 2013), the sense of identity (i.e. the Statue of Liberty in New York City, which is the archetype of the American sense of civilization and freedom) (Klamer, 2004; UNEP DTIE, 2005), the sense of collective protection from wars and contemporary threats (i.e. the Temple of Bel in Syria, destroyed by recent conflicts), etc.
In Design, the enhancement of Cultural and Natural Heritage has recently acquired a strategic relevance (Barcarolo, 2017). This interest is both related to the processes of conservation and sharing of artistic, historical, anthropological and cultural memories of sites and buildings, and to the new opportunities for developing enabling solutions, technologies and advanced processes to empower all end-users to visit and the enjoy the sites. A recent interesting topic concerning this new idea of sustainable-oriented enhancement is the capability of sites to be accessible and inclusive for all end-users; this idea, based on the social power of sites, switches the attention from sites to people: form technology-push approach (product centred) to socially inclusive concepts (human centred).
Recent advances in the area of Design for Social Inclusion have pointed out new positive ideas of people, evolving the paradigm of standard end-users into a more complete and holistic one described by real people, which have real needs, desires and capabilities (EIDD, 2004). The new idea considers end-users with both positive conditions (i.e. physical proportion, perceptive abilities, etc.) and negative ones (i.e. disabilities, anthropometric differences, cognitive deficits etc.); thus, even disabilities are now seriously taken into account in order to develop solutions that can meet the real needs of end-users for which, until now, only ad-hoc solutions have been produced. Even though this idea is not new within the design literature (i.e. Universal Design), the application of this concept in the domain of Heritage is new and it is able to generate new effects, radically oriented to the modern ideas of Social Inclusion and Social Sustainability, globally recognized as strategic (European Commission, 2010).
The hypothesis of this work considers the discrepancy between the real needs of people who want inclusive communicative solutions, and the ability of designers to develop them in a proper way. The design culture, which still considers the enhancement of Sites as the improvement of physical accessibility, must consider the visual enjoyment as a fundamental parameter to address the creation of new communicative solutions (Barcarolo, 2017).
The use of Design for Social Inclusion in the development of new sustainable-oriented generations of products and services allows to develop a radically new idea of Cultural and Natural Heritage 'for All', where all solutions, and in particular communicative ones – the ones able to meet both economic-touristic demands, promotion actions and socio-cultural values – are conceived to meet the socially inclusive idea of Heritage with real end-users' needs.

2. AIMS

This paper aims to present the results of theoretical-experimental PhD Researches focused on the role of Design for the Inclusive and Sustainable Enhancement of Cultural and Natural Heritage (Barcarolo, 2017); as such, the paper underlines the need to combine Communication Design and Inclusive Design as sustainable-oriented elements for the Heritage promotion, with new technological advances (i.e. Rapid Prototyping). Thus, the evolution of visual-centric design approach allows to consider, with new lenses, the condition of people with visual disabilities, as well as to understand the new role of communication in the inclusive valorization of Cultural and Natural Heritage.

3. METHODOLOGY AND RESULTS

In terms of research and design methodology, two phases characterize this work:

- The first phase proposes a new design framework for the sustainable auditory-visual-haptic enhancement of Cultural and Natural Heritage, composed by six Design Criteria and fifteen Design Guidelines useful for design a wide number of communicative 'for All' solutions. This new framework considers, also, new advances in Digital Modeling (i.e. Laser Scanning) and Rapid Prototyping (i.e. 3D Printing) as additional sources for the designers' activities and industrial production.
- The second phase applies the above-mentioned new design framework for the sustainable and auditory-visual-haptic enhancement of Cultural and Natural Heritage in six[1] real cases studies of Italian Cultural Heritage. In particular, these experimentations have been used to test the data proposed and, later, to qualitatively evaluate the effectiveness of the new 'inclusive fruition' of sites. In this paper, the design experimentation presented refers to the Villa Venier Contarini in Mira (Venice, Italy).

3.1. A Comprehensive Visual Design Framework for the Inclusive Enhancement of Cultural and Natural Heritage

The design framework, useful for the design of inclusive-based and sustainable-oriented auditory-visual-haptic solution for the Cultural and Natural Heritage, is based on the analysis of four main Parameters, which have allowed to develop Design Criteria and, later, Design Guidelines:

- The haptic inclusive communication for the fruition of Heritage, which is relevant to know the processes and the design theories usable to produce solutions according to the Design for Social Inclusion theories.
- The human diversity and the understanding of potential end-users, to know the psychophysical and sensorial-perceptive conditions of real end-users that want to visit the Heritage, enjoying of its values.
- The digitalization of Heritage, including the analysis, the optimization of shapes and the parametric digital modeling of mathematical surfaces, useful to get relevant data needed for the production of effective inclusive communicative solutions, even for visually impaired end-users.
- The production of communicative solutions through prototypes made with rapid prototyping techniques (i.e. 3D Printing) for fast production, even using DIY tools.

The design framework shown in Table 1 is therefore intended as a design flow: from the analysis of contextual information – i.e. starting from the analysis of existing condition of sites – to the development of design solutions, and their production using rapid prototyping techniques and/or DIY tools. The idea to develop Design Criteria and Design Guidelines is motivated by the need to act both at the strategic level with stakeholders (Criteria) and at the design level with designers and makers (Guidelines).

[Table 1] *Design Framework for the Inclusive Enhancement of Cultural and Natural Heritage (Barcarolo, 2017)*

Design Criteria	Design Guidelines
1. Analyse the current communicative solutions (if existing).	1.1. Analyse the quality and the characteristics of the existing communicative project (if existing), showing all critical elements and negative aspects compared to the themes of Social Inclusion.
	1.2. Analyse the effectiveness, the perceived satisfaction and the efficiency of the existing communicative project (if existing) compared to the characteristics of end-users.
	1.3. Analyse the layout and the environmental relations of the existing communicative project (if existing).
2. Understand the existing communicative-environmental conditions.	2.1. Understand the social, cultural, environmental and economic conditions within which the new inclusive communicative project will work.
	2.2. Understand the dimensional, spatial, proxemic and anthropometric relations for the new inclusive communicative solution.
3. Understand the *limit* end-users using a holistic approach.	3.1. Understand real end-users' needs (i.e. primary, secondary, explicit, implicit).
	3.2. Understand the real end-users' psychophysical and cognitive-behavioural characteristic.
	3.3. Understand the end-users' residual abilities to design enabling solutions.
4. Surveying and modelling the	4.1. Surveying the items chosen to implement the new inclusive communicative

[1] 1. the Civic Museum in the Castle of Conegliano (Treviso, Italy); 2. the Villa Venerier Contarini in Mira (Venice, Italy); 3. the Torcello Island the Venetian Lagoon (Venice, Italy); 4. the South Theodorian Hall's mosaic floor in the Patriarchal Basilica of Aquileia (Udine, Italy); 5. the Roman statue of the Emperor Claudius at the National Archaeological Museum of Aquileia (Udine, Italy); 6. the 'Six Saints' plaster bas-relief in the Langobardic Temple of Cividale del Friuli (Udine, Italy) (Barcarolo, 2017).

	elements to be communicated.	solution.
		4.2. Modelling the subject to implement the new inclusive communicative solution considering the real end-users' characteristics.
5.	Develop the inclusive project in (systems of) enabling communicative solutions.	5.1. Conceive an integrated design strategy to develop a new integrated communication of subject(s) to be represented.
		5.2. Develop detailed enabling communicative solutions considering the collected data concerning the end-users and the environment on which they will operate.
		5.3. Verify the enabling communicative solutions using appropriate groups of stakeholders to test and add more value to the design decisions already taken into account.
6.	Implement the system of enabling communicative solutions.	6.1. Produce the system of enabling communicative solutions using sustainable industrial production systems, which allow to accurately replicate data and shapes chosen in the design stages.
		6.2. Situate the system of enabling communicative solutions in the environment considering relevant parameters, such as: visibility, accessibility, autonomy, usability and pleasantness of use.

3.2. Design Experimentation on the Villa Venier Contarini in Mira (Venice, Italy)

Villa Venier Contarini in Mira (Figure 1) is part of the UNESCO site 'City of Vicenza and the Palladian Villas of the Veneto' (UNESCO WHC, 2016), which includes twenty-four villas designed by Andrea Palladio in XVI Century. The villa complex is composed by a set of buildings and open spaces oriented along a North-South axis. The owners were housed in the main building, while the work areas were located in the 'barchesse' (outhouses) on sides of the building; in front of the main building there is an entrance garden and, on the back, a park. Two floors compose the central body of the villa: at the first floor – also known as 'noble floor' – there is a large living room with a loggia used for parties, the ground floor was intended for building's services.

[Figure 1] *Villa Venier Contarini in Mira (Venice, Italy)*

The opportunity to collaborate with reputable institutions like Veneto Region, the Regional Institute for Venetian Villas, Confartigianato Veneto and Libero Accesso, allowed to start the 2013 project 'Libero Accesso® in Villa' [in English: 'Free Access in Villa']. The aim was to create some permanent installations that would have allowed to all users in an inclusive way, respecting their visual capabilities (IRVV, 2015; Barcarolo, 2017). To be more precise:

- To propose a model for the research and the innovation, able to make easier the multidisciplinary work and to enhance the sharing of know-how of the team involved in the project; this in order to achieve real results with benefits for end-users and stakeholders.
- To promote the use of the Design for All (DfA) Approach (the 'design for human diversity, social inclusion and equality' (EIDD, 2004)), as innovative, inclusive and sustainable approach useful to create user-friendly products and services usable by all end-users interested in the fruition of the Villa, including

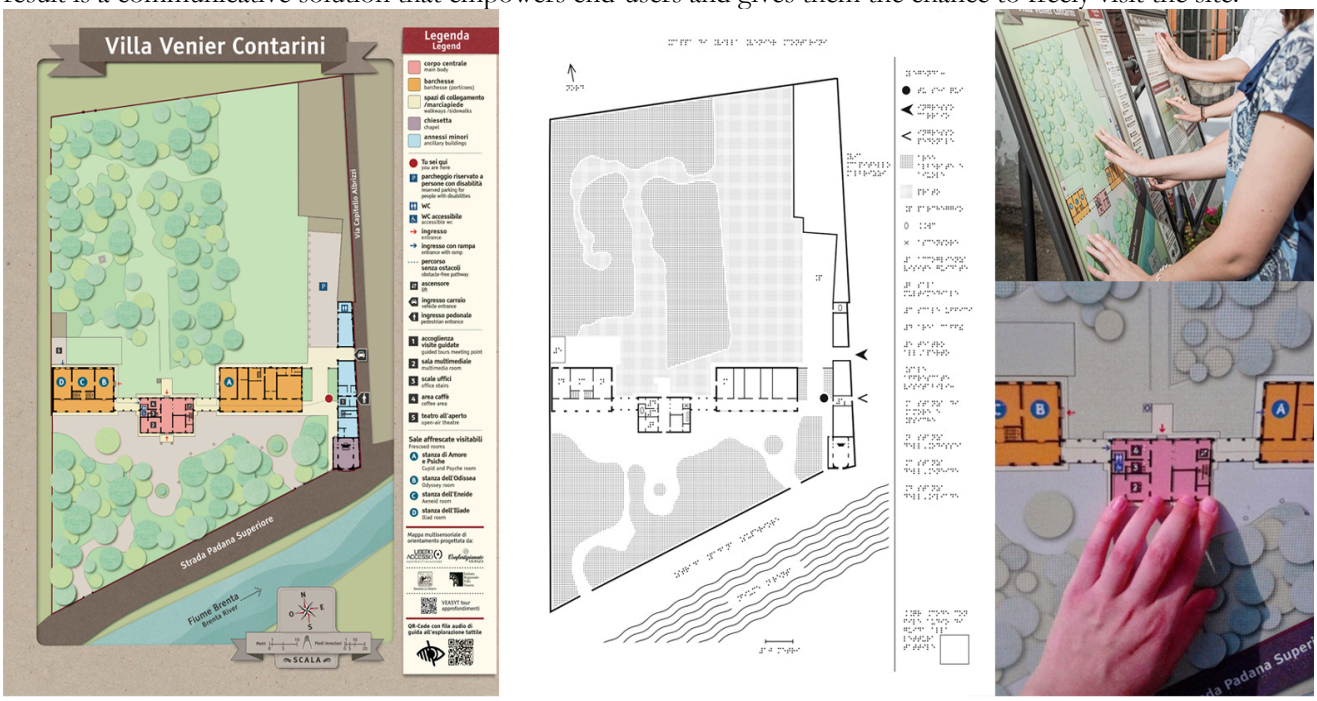
those with psychophysical or sensorial-perceptive impairments/disabilities, both temporary and/or permanent.

On the strategic point of view, the design experimentation has been addressed on the new idea to Venetian Villa as an 'open and inclusive space' able to empower all human diversities and the autonomous visit of people having different abilities. Consequently, the Head of IRVV expressed the need to have a simple and fast-replicable st of solution usable even for the others twenty-three villas composing the UNESCO site in the Vicenza area.

The use of the Design Framework for the Inclusive Enhancement of Cultural and Natural Heritage allowed to produce the early concept and, later, the specific design solutions for the inclusive fruition of the Villa (Barcarolo, 2017). The concept proposed was intended as a set of flexible and transportable visual solutions 'for All': solutions able to meet the needs both of end-users with some sensorial-perceptive and/or psychophysical disabilities and of able-bodied ones. In terms of designed solutions, a set of two visual multisensory and multimedia panels have been created to meet the project's aims. In particular, the tangible solution is both visual and haptic, and shows:

- Contents: orientation and historical-architectural information.
- Modalities of fruition (for the cognitive empowerment): visual, haptic, auditory, etc.
- Graphics: use of emotional graphics inspired by historical maps and illustrations of fairy tales.

The calibration the double-layered communication – haptic + visual – has been done using insights from Tiphlology domain. In fact, the communicative panels have been made using both braille texts and relief drawings made with transparent ink (haptic communication), and coloured visible texts and drawings (visual communication). The use of transparent ink, for braille texts and for schematic representations of plans, allowed to manage very well the information and the amount of useful data – needed, for example by blind end-users – on representations having complex graphical details (i.e. photos, plans, etc.) (Barcarolo, 2017) (Figure 2). The final result is a communicative solution that empowers end-users and gives them the chance to freely visit the site.



[Figure 2] *Double-layered visual-haptic communicative panels for the Villa Venier Contarini in Mira: visual communication (left), haptic communication (centre) and details of the fruition (right) (Barcarolo, 2017)*

Finally, an additional multimedia solution has been developed to meet the needs of deaf end-users; in this case, a video clip accessible via smartphones and QR Code reproduces all information of the Villa using the LIS Language (Figure 3); this last solution allowed to perfectly meet the DfA Approach and to give completeness to the project.

[Figure 3] *LIS video clip for the fruition of Villa Venier Contarini (deaf end-users) (Barcarolo, 2017)*

4. CONCLUSIONS

Since 80's, the international attention on the issues concerning the enhancement and the promotion of Heritage acquired a strategic relevance in terms of economic growth, local development of communities, enhancement of autochthon identity, historical preservation of human 'genius loci' – human legacy – and documentation of natural moulding effects. As it has been discussed, the protection and the enhancement of Cultural and Natural Heritage, including UNESCO one, is a priority mission for this and for the next generations; in the scenario of Sustainable Development, the issue of valorisation is important to support the sense of sustainability and inclusion linked to the fruition of the assets (i.e. protection of buildings and natural parks, valorisation of cultures, etc.).
In order to guarantee the maximum fruition, the Design community recognised the value of accessibility of sites as fundamental to give the chance to experience of buildings, monuments and natural sites; however, the traditional design approach tends to consider only able-bodied people or, in some cases, only people having physical disabilities. Today we know that these deficit conditions are only a minimum part of all potential conditions of customers interested to visit a site. In other words, people, today, are not well considered and included in the design processes and in the systems of territorial valorisation of Heritage, producing indirect limitations – exclusions – in terms of local and economic development, as well as in a lower quality of the sites' fruition.
The study here presented introduces new relevant advances for the scientific and design knowledge – i.e. literature – in the field of the enhancement of Cultural and Natural Heritage. The introduction of the Design for Social Inclusion in the strategic design actions allows to consider even people having sensorial-perceptive disabilities (i.e. blinds) who express the same will to visit a site as able-bodied people. Accordingly, this study demonstrated that it is possible to connect the need of visual enjoyment and visual fruition of Heritage with the design of communicative solutions conceived for this scope.
As shown in the case study on Villa Venier Contarini in Mira, it is possible to approach the issue of the enhancement of Cultural and Natural Heritage using innovative inclusive-based design tools (Design Criteria and Design Guidelines) useful to develop sustainable-oriented communicative solutions able to exceed the visual-centric design culture, empowering the touristic and economic offer of the Heritage both at local and at global scale.

CREDITS

This paper shows an extract of the research results achieved by Paola Barcarolo during her PhD training. The writing of various paragraphs can be attributed to Paola Barcarolo, for '2. Aims' and '3. Methodology', and to Emilio Rossi for 'Abstract', '1. Introduction' and '4. Conclusions'.

REFERENCES

[1] Barcarolo, P. (2017). *Il Design della Comunicazione Inclusiva per la valorizzazione ubiqua del Patrimonio Culturale: Criteri e Linee Guida Progettuali per lo sviluppo di soluzioni comunicative aptiche per la fruizione dei Siti UNESCO (Vol. 1-2).* PhD Dissertation in 'Civil and Environmental Engineer, Architecture', Polytechnic Department of Engineering and Architecture. University of Udine.

[2] European Commission. (2010). *Europe 2020: A Strategy for Smart, Sustainable and Inclusive Growth. COM (2010) 2020.*

[3] European Institute for Design and Disability. (2004). *The EIDD Stockholm Declaration.* Stockholm: EIDD.

[4] Falser, M. (2015). *Cultural Heritage as Civilizing Mission: From Decay to Recovery.* Heidelberg: Springer.

[5] Global Heritage Fund. (2010). *Saving Our Vanishing Heritage: Safeguarding Endangered Cultural Heritage Sites in the Developing World.* Palo Alto, CA: Global Heritage Fund.

[6] Istituto Regionale Ville Venete. (2015). *Libero Accesso in Villa.* Retrieved: http://www.irvv.net/it/post/article/libero-accesso-in-villa.html

[7] Klamer, A. (2004). Social, Cultural and Economic Values of Cultural Goods. *In:* Rao, V. and Walton, M. (eds.). *Culture and Public Action.* Stanford, CA: Stanford University Press.

[8] UNESCO. (1972). *Convention Concerning the Protection of the World Cultural and Natural Heritage.* Paris: UNESCO WHC.

[9] UNEP DTIE (2005). *Making Tourism More Sustainable: A Guide for Policy Makers.* Paris: UNEP DTIE.

[10] UNESCO WHC. (2013). *Managing Cultural World Heritage.* Paris: UNESCO WHC.

[11] UNESCO WHC (2016). *City of Vicenza and the Palladian Villas of the Veneto.* Retrieved: http://whc.unesco.org/en/list/712/