



PAD

Research Alert  
on Mediterranean  
Urban Spaces  
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# CULTURAL HERITAGE ALERT

# Augmented Reality Implementation in Cultural Heritage for Emotional Experiences. The Case of CHEESE

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## Keywords

Augmented Reality, Mixed Reality, Holographic Reality, Design of Experience, Cultural Heritage

## Abstract

The paper illustrates, from the Design point of view, a research project entitled CHEESE. (Cultural Heritage Emotional Experience See-through Eyewear), funded by MIUR in the context of PON projects, and its subsequent developments. The project was aimed to investigate the challenges and opportunities proposed by Augmented Reality (AR) and Mixed Reality (MR) technologies in the field of cultural heritage. The research was conducted by an interdisciplinary team, made up of engineers, computing scientists, product designers, graphic designers, experience designers, art historians and museum curators. The paper aims to define, in particular, the role of design in interpreting the potential enhancement offered to the context of the Mediterranean cultural heritage by a new technological and experiential scenario that is still being defined. Design, with its tools for trends and future scenarios prefiguration, is able to investigate users needs, attitudes and expressive languages in a hunter-gatherer perspective. Moreover, in the fields of museography its capability to control both the material and immaterial factors of innovation aims this discipline to define dense and rich exhibition experiences. Based on these cultural skills, in the CHEESE project design has been tasked with integrating the different actors and phases, keeping in balance the humanistic components with the scientific-technological ones.

## 1. Introduction

The CHEESE project was born with the intention of using Augmented Reality (Bekele et al., 2018) and Mixed Reality Technologies (Ioannides, Magnenat & Papagiannakis, 2017) with an empathic and emotional approach to improve cultural heritage in terms of audience development and enhancement through the integration of Italian design and innovative technologies. In Italy and in many Mediterranean countries such as Turkey, Greece and Spain cultural heritage is immense and has enormous potential for economic, cultural and social development. This attributes, however, does not correspond to an adequate fruition of the very numerous and precious goods located in our territories, equally distributed in relation to their cultural value. For example, in southern regions of Italy there are frequent phenomena of concentration of visitors, both tourists and locals, on a few large museum attractors, while many sites of very high cultural value tend to be neglected.

For most of the cultural sites and museums, therefore, there is a problem of audience development that needs new strategies and tools for communicating and exposing these values. Strategies that must be effective, attractive, flexible and adaptable for different categories of users, capable to use innovative expressive languages coherent with contemporary lifestyles.

Through the new technologies of Augmented and Mixed Reality, museums and cultural sites can meet the visual and communicative canons of digital, cinema, video games, comics, app and therefore the tastes of young people and of many people who do not usually visit museums.

The project deals with the emerging theme of digital fruition for Cultural Heritage, which is gaining increasing interest in the scientific community and also for cultural operators and museums.

In Italy there are several research institutions, companies and networks that specifically study and analyse the challenges and opportunities that digital innovation brings to the broad field of cultural heritage through research, formative and educational activities. Among these the *Observatory for Digital Innovation in Heritage & Culture* (SoM, Politecnico di Milano) and the *Network Digital Cultural Heritage, Arts and Humanities* (DICULTHER) emerge.

Structures like these in Italy and in the world have been founded, with the aim of building and consolidating a culture of digital technological innovation on issues related to conservation, enhancement and promotion of Cultural Heritage.

The CHEESE project referred to international case studies and research applications of AR and MR in cultural heritage with particular attention to understand the expressive and technical opportunities to use these tools to tell stories that can help to consolidate Mediterranean identity and peculiarities interpreted as cultural cohesion catalysts and as socio-economic development activators.

During the project development emerged that these technologies can help to fascinate the new generations, that are more and more difficult to attract and engage and less inclined to focus their attention and interest on cultural issues, especially if they are offered in a traditional way (Pedersen, Gale, Mirza-Babaei & Reid, 2017).

The AR experiences, and even more the MR ones, can be conceived, instead, as a kind of enchantment that allow people to travel in the time and in the space, to touch virtually, look beyond things, listen to the artifact story, feel empathy for the protagonists' emotions, even play and socialize with other users. So that they make possible things that are generally not allowed in museums and cultural sites. The feeling of freedom and the opportunity to expand the experience, sometimes even towards transgression, generates in the users, especially in the younger, intense emotions like surprise and astonishment (Dey, Billinghamurst, Lindeman & Swan 2018).

## 2. Augmented and Mixed Reality for cultural heritage narratives

Augmented Reality (AR) is a digital technology in which the user, looking at a graphic sign (target) or approaching an activating element like beacon or RFID, with an opaque device (tablet, smartphone, viewer) or transparent (glasses), can see digital content like 3D models, digital animations, drawings, texts, documents, movies, and animations overlapping the real context. AR can be integrated with sound effects and can have different forms of control, from the conventional touch, to voice control.

Research projects and commercial applications on AR applications in the field of cultural heritage are nowadays very numerous. Among the first projects in the field of archeology there is *Archeoguide*, a mobile system installed at Greece's Olympia archaeological sites that proposed, through a Head Mounted Display (HMD), a virtual reconstructions of the temples overlaid on the real ruins (Gleue & Dähne, 2001; Vlahakis et al., 2002).



Many museums worldwide are equipped with dedicated Augmented Reality apps that can be downloaded to visitors' devices such as smartphones or tablets.

The Cleveland Museum of Art's proposes the *ArtLens* app, that contains interpretive content for every work of art in its collection. Real-time updates ensure users to have access to the most accurate information available.

In some AR projects, users activate digital content by manipulating real objects that act as markers, as in the case of *AR-Cube* in which holding a cube in hand and rotating it, it is possible to view 3D models of archaeological artifacts through a screen, in high resolution, from different points of view. Each face of the cube loads a different view of the 3D model on a scale of 1:1 (Jiménez Fernández-Palacios, Nex, Rizzi& Remondino, 2015). Another examples of dedicated handheld AR device with capacitive touch-screen display is *Who Do You Think You Really Are?* developed by *IVC Media Ltd and Melford* for the *Natural History Museum* in London that combines animated 3D models of extinct creatures according to palaeontology with live video from the webcam (Debenham, Thomas, & Trout, 2011).

The term Mixed Reality (MR) was introduced by Paul Milgram and Fumio Kishino (1994) as an intermediate area of technologies that involve the merging of real and virtual worlds, when these technologies were still at a very embryonic level. Today, the devices are finally ready and performant. For Mixed Reality or Holographic Reality we mean a new

approach that differs from Augmented Reality because the visual digital contents are displayed in form of three-dimensional holograms integrating and merging with the real context, which remains perfectly visible. The MR headsets are, in fact, always transparent (see through) because they are based on the vision of natural reality.

The most performant MR device is *HoloLens*, wearable headset produced by Microsoft. Using it is possible to three-dimensionally scan the space in which the experience takes place must so that the holograms can be placed in a precise position. If the design of experience includes it, users could have also the opportunity to digitally manipulating the holograms moving, enlarging or reducing them, passing through and turning around, just as if they were real objects. The potential for interaction and involvement of MR is very high, especially when integrated with natural sounds and commands.

In Kyoto, since February 2018, is available a Mixed Reality experience to visitors of *Kennin-ji*, the oldest Zen temple in Japan, developed in partnership with the *Kyoto National Museum* and *Hakuhodo-VR*. The 10-minute experience proposes a dynamic, holographic narrative that shows to the temple visitors the Tawarayama Sotatsu's vision for his sacred artwork *The Folding Screen of Fujin and Raijin*, painted over 400 years ago.

The *HoloMuse* project, an application for the *HoloLens* developed at the *Wellesley's Human Computer Interaction Laboratory*, to make art and archeology more accessible and tangible to students, and learners in general, outside of the traditional

museum actively engaging them with artifacts from different museum collections to facilitate learning (Pollalis, Fahnbulleh, Tynes & Shaer, 2017).

A team of Delft University of Science and Technology led by Annelies Maltha, is working to use *HoloLens* experience to expand the number of *Dutch National Museum of Antiquities* exhibits they are able to show to the public.

Mixed Reality is an effective tool, not only for the narration of historical artifacts, but also for experimentations in galleries and museums of contemporary art.

In New York in 2017 was available to the public at *The Armory Show* the exhibition *The Concrete Storm*, an immersive mixed reality experience based on using *HoloLens* headsets to digitally project a virtual art catalog.

*Bitter & Sweet* is a project that opens a different area of action, defined by the authors as Mixed Reality but that does not use holographic headsets, and combines AR software with iOS handheld devices, onsite media projection, installations, old films fragments, sound traces and images, onto surfaces and objects at the Royal Cast collection of the *Copenhagen National Gallery* housed in the *West India Warehouse*. The project is aimed to use these tools integrated by design for revealing history of slavery and their legacies in Copenhagen (Engberg, Kozel & Odumosu, 2017).

Also in the field of design teaching initiatives and courses to implement the learning of AR and MR experiences are in-

creasing. At *Rensselaer Polytechnic Institute* in Troy, NY, in the *AR Design for Cultural Heritage* and *Mixed Reality Experience Design* courses held by Rebecca Rouse design students work in interdisciplinary teams to develop functioning prototype mobile Augmented Reality (AR) and Mixed Reality (MR) applications for cultural heritage collaborating with different museums as the *Museum of Science and Innovation* (MiSci) in Schenectady (Rouse & Barba, 2017; Rouse, Engberg, Jafari-Naimi & Bolter, 2015).

### 3. Design of an empathic and emotional museum experience

The CHEESE project was oriented to experimenting Augmented and Mixed Reality approaches in the cultural heritage of southern Italy, with particular attention to the possibility of using typically human Mediterranean attitudes such as empathy (Fogu, 2018) and emotional communication in fruitive experiences. The project defined new approaches and experiential models validated through a museum experience that was developed for a specific site at the museum of Capodimonte in Naples, with two different devices (*Epson Moverio* for the AR experience and *Microsoft HoloLens* for the MR experience), but was designed to be exported in different sites and platforms.

The development of Augmented and Mixed Reality experiences for cultural heritage necessarily requires an interdisciplinary research team. The participation of different discipline, including design, humanities and technologies, is the only possible way to face the complexity involved in the implementation of these advanced technologies that will generate rad-

ical revolutions in such a delicate and conservative sector as museology. So that the design of experiences could merge the museum cultural constraints, the technological opportunities as well as the users' attitudes and needs (He, Wu & Li, 2018).

The CHEESE project involved experts in history of art, design for communication, design of experience, product design, engineering, video games and digital experiences at the University of Campania "Luigi Vanvitelli" research unit and experts in informatics, human-computer interaction, applied linguistics, and optical technologies at HUB, CNR and Federico II research units. An integrated system of specialized skills, devices and methodologies around the topic of Augmented and Mixed Reality for cultural heritage was generated. The necessity to coordinate and link such distant competences required common objectives and languages and a great commitment of all the participants who, using both scientific and relational skills, managed to cooperate in a profitable and mutual way, respecting the cultural differences and specificities. The balanced integration between technological and humanistic competences was an important added value for the CHEESE project, compared to other similar projects that apply digital technologies to cultural heritage with a preferential point of view (technological or) humanistic.

In the prototype exhibit experience a human centred design approach was applied (Giacomin, 2014). The first phase of the project started with a survey on users expressed and latent needs applying ethnographic methods (contextual inquiry; users and guides interviews) which allow to both observe and

talk to people (Holtzblatt & Jones, 1993; Holtzblatt, Wendell & Wood, 2004; Sanders, 2003). For two successive Sundays, the days of greatest attendance at the museum, design researchers in collaboration with art history researchers observed and engaged users of the *Ottocento Privato* section to gather information about their permanence, typical users behaviors, activities, interpersonal relationships, questions to the guides, emotional expressions and natural interaction with the exhibition in presence of a guide or not. This phase included also an analysis of the emotional reactions to specific stories or informations related to the museum artifacts. The user observation was integrated with a context survey (Visser, Stappers, Van der Lugt & Sanders, 2005).

The results of these surveys made it possible to establish the design direction based on the choice to enhance the personal, human and private character of the artworks; the design guidelines; the different qualities of the experiences; the contents to communicate; and the hierarchy among the augmented artifacts, highlighting those that aroused more interest and curiosity in users.

The project was developed using different design tools like sketching, mockups, storyboarding, system maps, prototyping of digital contents (audio, video, pictures, texts, 3d models, digital animations).

The *Ottocento Privato* section is located on the first floor of the museum building and exposes visitors to the history of Capodimonte as a court residence. In the Nineteenth Century

the spaces occupied by the section were private apartments of the Borbone family, while subsequently with the arrival of the Savoia they became rooms destined for the cadet branch of the dukes of Aosta, until the Republic advent. The section is an integral part of the museum itinerary, but aims to tell the more intimate and private dimension aristocratic houses through paintings and sculptures from the Neapolitan and Italian school from the early Nineteenth to the early Twentieth Century and furnishings of Neapolitan production made in the same years, just for the Royal Palace of Capodimonte, restored and recomposed with philological attention (Mormone & Martino, 2012).

The attention to the private life of protagonists is the main reason why the section was chosen for the prototype experience. During the research, emerged, in fact, that AR and MR are particularly suited to narrating personal stories of the artifacts authors and subjects, to induce empathy in users towards them (Kouprie & Visser, 2009) by listening to their voices, reading their private letters, observing photographs, sketches and portraits.

The private dimension and the human aspects related to the sphere of emotions hidden behind the artworks were the key to tell the stories in the augmented experience.

The natural narrative capability, the attitude to share the private dimension, and the empathic approach are human characters typical of Neapolitan people and of Mediterranean culture in general. The prototype exhibit, therefore, was de-

signed to improve the inhabitants sense of identity and identification but also to offer foreign visitors a museum experience with a specific local flavour.

A further reason for choosing that section was the lower number of visitors, compared to the other Capodimonte sections more famous and important. Another statement emerged from the CHEESE research is that new digital devices like AR and MR technologies could be particularly effective in enhancing small museums, single sections or less visited sites, which need to be highlighted, exploiting the technological appeal that these tools have on people.

These technologies offer not only opportunities but also hints for critical evaluations. In the Digital Cultural Heritage research context, many complex problems emerge, including the questions of the authenticity of digital models related to their original counterpart on which many authors are discussing (Jones, Jeffrey, Maxwell, Hale & Jones, 2018). On the basis of this dispute in CHEESE project we avoided to reproduce historical objects 3D models, but only models and holograms evoking concepts or emotions useful to tell the real objects stories.

#### **4. *Ottocento Privato* Mixed Reality experience prototyping**

In the CHEESE research the first prototype experience was implemented in the Epson Moverio platform, waiting for Mixed Holographic Reality devices to be available.

Following the conclusion of the project, part of the research team, in collaboration with the company *Netminds*, has chosen to continue the path of experimentation implementing



part of the results, acquired in the prototype demo, using the *Microsoft HoloLens* Mixed Reality headset device, recently introduced on the market. Thus, an academic spinoff project called ARTEMA was born, which aims to propose new solutions of Mixed Reality in cultural heritage and events.

For the new demo, room number four of the *Ottocento Privato* section was chosen, large and significant enough to show the potential of tools and approach.

*HoloLens* allows to enjoy increased fruition both in visual and acoustic terms. In the demo it was chosen to interact with the headset only through the gesture tracking and eye tracking included in the device and not the voice control to prevent speech could distract or disturb other users.

At the beginning of the visit a training session was proposed in which the basic commands were illustrated, in particular how to activate and interrupt the contents play by gesture or eye tracking.

In the demo five levels of incremental experience were defined increasing in terms of intensity, complexity and emotional density of digital contents.

The first level of experience is based on the visualization of static captions that appear next to the artworks when the users approach. The captions, proposed in Italian and English, have been conceived as three-dimensional objects with luminescent white texts and white frame, with a thickness, transparent background, high-readable fonts, sized to be easily read.

The second level of experience is based on primary audio content, including the most important information, pictures and video. When the user stops in front of the artifact, if it includes multimedia contents, a luminescent marker is activated to report the presence of an augmented information that can be activated by the user with a specific gesture or withholding himself near the artwork for more than five seconds. The basic audio was played by an actress and accompanied by images such as portraits of the author, pictures of other related artworks, historical documents, private letters or sketches. The contents appear on the side of the artifact but never overlap with it or with the captions. If the user moves, the audio is completed until the end of the first meaningful sentence, unless the user does not voluntarily interrupt the content with a gesture, to continue the visit. In any case, during the walking no visual contents are displayed. They remain positioned next to the artwork. If the user comes back, he finds the contents already explained.

The third level of experience consists of an in-depth audio and multimedia narration. If in-depth content is available, after completing the primary audio, the recorded voice warns with a message that if the user is interested he can stop and listen to further information. A luminescent white arrow pointing downwards indicates the possibility of continuing. To activate the in-depth content it is necessary to express a consensus with a gesture or with eyes. If the user moves before the recording begins the audio will not start, otherwise it will be suspended at the end of the next complete sentence, rather than to be entirely reproduced. To assure this kind of

option, the text has been elaborated in modular form, that is divided into sequential fragments, in order of deepening, of one or at most two periods.

The fourth level of experience is characterized by the presence of dynamic holograms with a particular emotional character. It concerns only some artworks related to private stories, backstory, curiosity, little-known details considered to be particularly significant both from the cultural point of view and for their involvement and empathic participation potential.

The artworks including this kind of experience are marked by a tridimensional hologram, like a white luminescent slightly pulsing sphere, larger than the markers of the basic contents, so that the user, entering the room, can be aware of the contents hierarchy and of the presence and position of the more significant and emotionally contents. Dynamic digital holograms are placed in a specific point of the space but become visible only when the user activates the pulsating marker. If an animation, an interaction or a sound content is available, it starts only when the user activates it or if he stops nearby (at a maximum distance of 1.50 m from the artwork) for more than five seconds. Holograms are also equipped with a recall sound function inviting people to approach, additional to the visual one, emitted by the device only when no other contents are active. Recognizing the active artworks is very easy and intuitive but the effect of the contents activation appears as a magical and surprising event, also thanks to the holographic visual high quality. The choice of using both visual and

acoustic markers and recalls, therefore with a redundant approach, is motivated both by the aim to make the experience simple and fluid, even to people who are not very familiar with these technologies, but also to adapt it to a large range of people categories. A gesture command that allows to repeat an already used content is provided.



**Figure 1.** *Pescatoriello* Mixed Reality experience in the *Ottocento Privato* section, Museum of Capodimonte, Naples. Photo Credits: Beniamino Guida, Laura Guarino.

Mixed Reality is also particularly suitable for implementing the contribution of contemporary arts such as cinema, music, conceptual art in the fruition of historical and ancient heritage, of which the Mediterranean territories are rich. In this direction, the emotional and holographic representation of the *Pescatoriello* statue by Vincenzo Gemito was designed. In this experience the MAD company, producer of great interna-

tional successes in animation cinema such as *L'arte della felicità* and *La gatta Cenerentola* was involved, in collaboration with *Netminds* and *Spinvector*. In developing this experience, historical information and original sources from the early twentieth century newspaper have been reversed into creative inputs, interpreted by the designer researchers and by MAD creative, who translated that through interactive holographic experience based on digital animation.

The private story narrated by experience refers to a detail of the *Pescatoriello* generation process. The bronze exhibited in the room is one of the two copies that Achille Minozzi requested of the little fisherman presented in Paris in 1878. The statue is characterized by a vivid naturalism of the boy pose, with tense muscles, ready to shoot and the careful look on the small prey. A posture that seems to have been due to a stratagem used by the sculptor who placed the boy employed as a model with his feet focused on a rock strewn with a slippery substance for laundry, a kind of soap (Lepore, 1957). In the holographic experience, while a narrating voice tells the story, holograms of soap bubbles, in which a small fish (which in the statue is held by the fisherman) is mirrored, go up starting from the stone, rising all around the statue, so that people, and in particular children, wearing the headsets can interact by the gesture tracking and make them burst by virtually touching them, just as if they were real bubbles.

Among the artworks augmented in an emotional way, the *Trionfo della Tavola* also emerges, a model of a centerpiece made of wax and wood, that was commissioned by Vincenzo

Gemito from King Umberto I in 1886, which should have been made in silver for the dining room of the Real Palace of Capodimonte.



**Figure 2.** *Trionfo della Tavola* Mixed Reality experience in the *Ottocento Privato* section, Museum of Capodimonte, Naples. Photo Credits: Beniamino Guida, Laura Guarino.

During the period when Gemito was engaged in the design of the centerpiece, never completed, the sculptor began to manifest increasingly serious nervous disorders that accompanied him until the end of his life (Savino, 1938). About these personal events there are several testimonies such as private letters, newspaper articles and numerous Gemito's sketches of parts and details made on paper. In the holographic experience these documents are proposed to the visitor through a 3D digital animation in the form of multiple apparitions, in correspondence with the parts of the work to which they refer,

floating upwards with an ever more pressing rhythm accompanied by a particularly dramatic musical track and the reading of personal letters written by Gemito interpreted in an emotional way by a Neapolitan actor. The experience is conducted in a crescendo that is a prelude to the final explosion of the state of madness of the sculptor who arouses empathy and emotion in the user.

The fifth level of experience corresponds to gamification (Papagiannakis et al., 2018), which concerns only a few artworks. In this kind of experience, the user, after having benefited from the main experiences, moving closer to an already explicated work, can activate the gamification mode. So that a graphic multiple choice test appears on the side of the artwork, the question is read and the user is invited to indicate the chosen answer by a gesture. The software is able to recognize the marked box and thus verify if the reply is correct. The gamification is activated only when the user has visualized a minimum number of augmented artifacts, as if he had acquired a minimum credit, and concerns only the artifacts enjoyed in form of holograms. In this way users have the possibility to access different game levels in function of the completed visit and the correct answers.

The different types of experience and content (text, audio, video, images, drawings, videos, photographs, 3D animations) proposed in the experiences are developed to verify the versatility and effectiveness of these tools in different contexts. The *HoloLens* implementation was realized by Netminds.

## 5. Guidelines, opportunities and reiterable methodological approach for museum AR and MR experiences

The rapid evolution of the see through AR and MR technologies (Shah & Ghazali, 2018) during the evolution of the CHEESE project, and subsequently in the holographic demo experimentation phase, led to develop new approaches, contents and interactions that could be valid also with other see through devices. The research team carried out a repertory of experience guidelines, useful for designers of museum experience or cultural heritage curators and administrators, implementable in many other contexts.

Among the most important guidelines emerges the consideration that in the applications of Augmented and Mixed Reality related to cultural heritage, the see through systems are preferable compared to opaque ones such as tablets and smartphones, more frequently used in museums, as they do not visually distract the user from the real context and interlocutors. The opaque device can be interposed as an obstacle, a barrier, between the user and the observed artifact. Transparency, on the other hand, allows to directly appreciate the real aspects of the experience, to perceive the material qualities and the details. Factors that contribute to amplify the user emotion in perceiving the privilege of being in proximity of unique, precious, unrepeatable objects, observing them in details and from different angles and distances.

An aware visitor is potentially less bored and less distracted, because he enjoys acquiring information and skills directly from the artifacts, which in many Mediterranean archeolog-



ical and historic museums are of inestimable value, survived the passing of centuries and sometimes also to the carelessness. According to this approach digital technologies can be used to reinforce the perception of the corporeity of cultural heritage, therefore of the analogical aspects, rather than to remove people from the concrete reality as nowadays often happens when digital tools are used. This is especially important for young people who will be increasingly immersed in a digital world risking to completely separate themselves from the concrete reality and from all its experiential, relational and emotional aspects.

In a not too distant future other forms of experiences, relationships and emotions will arise, but the world will always be concrete too, and it is important that concreteness continues to balance the evanescence of digital because man has an important body component, made up of pheromones, sensory perceptions, as demonstrated by the emerging studies on *embodiment* (Regenbrecht, Meng, Reepen, Beck & Langlotz, 2017). These theories, really important for design discipline, are based on interdisciplinary research that integrate studies on the phenomenology of living body with neurosciences and cognitive sciences, to understand the complex relationships existing between bodily factors, such as physical and motor perception, and cognitive processes.

With the use of commands based on natural languages and gestures, moreover, the relationship between user and device can become more spontaneous and direct (Brondi, Carrozzino, Lorenzini & Tecchia, 2016), compared to other modes

based, for example, on touch screens that require a focus on the screen that risks to distract from artifacts. In fact, more and more often, in the museums, people are busy trying to use the dedicated app following their images and effects on their devices, neglecting objects and values that will probably never be lucky enough to observe in presence.

With transparent glasses and headsets, users keep their heads stand up, instead of immersing in their screen, and remain hands-free. This allows them to conduct a more natural, continuous and spontaneous visit and also to engage in non-verbal social communications with other users. Furthermore, the possibility to position contents in specific point of space make designers able to focus user's gazes, and therefore their attention, where they strategically prefer, to favor a hierarchical, adequate and aware fruition of the artworks.

The AR and MR experiences with transparent glasses offer, finally, the advantage of making the museum reality look with different eyes, stimulating additional, alternative, unusual points of view. Visions than are not included in catalogs or audio guides and that user otherwise would not have had the chance to grasp.

Visiting cultural heritage in this way allows to acquire awareness and expertise that will make the subsequent visits more intense and appreciated. This kind of experience must not replace the conventional visit, but it is proposed as an opportunity to deepen, as a moment of opening new windows of interpretation that will improve the way in which people see and live museums and cultural heritage.

The natural experience remains the most beautiful and dense ever if, but thanks to the intermediation of digital technologies, users can acquire the adequate awareness to recognize the values and meanings of the artifacts to fully enjoy them.

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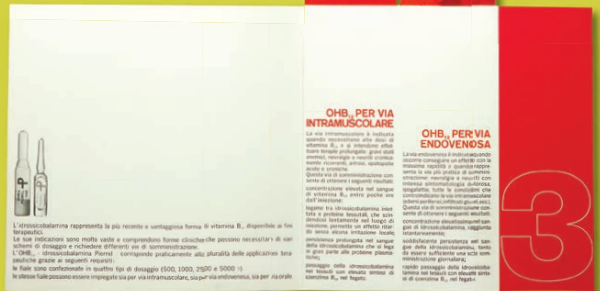
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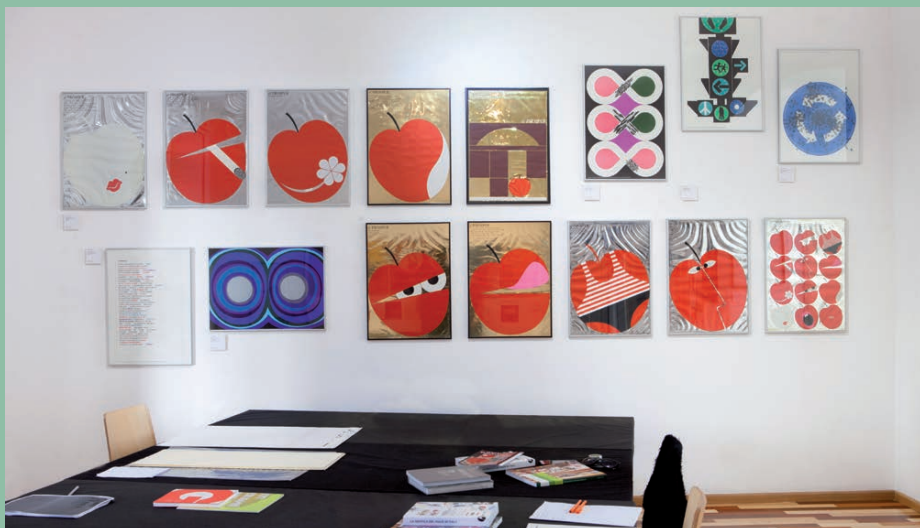
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