Article

Strategic Development and Internationalization of Cultural Industry with Virtual Reality and Augmented Reality Technologies

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Abstract: Internationalization and alternative ways for strategic management have been an objective for stakeholders in cultural industry, especially after COVID-19 pandemic crisis. During the past years "internationalization" has been almost exclusively related with promoting creation or content to larger audiences. Such a strategy seemed sufficient, even if empirical data did not always support such a belief. Technological progress and costs reduction in developing Virtual Reality (VR) and Augmented Reality (AR) applications, provides to cultural industry the opportunity to reach global audiences and to enrich their experience. Current research provides evidence about developing VR and AR tools that can act as internationalization facilitators when it comes to cultural industry. Research conducted during "VARSOCUL" project funded by the European Regional Development Fund (ERDF) as part of the Greek National Scope Action entitled "RESEARCH-CREATE-INNOVATE". The project's main result, alongside with VR and AR tools developed are presented.

Keywords: Strategic Development; Business Internationalization; Cultural Industry; Virtual Reality; Augmented Reality

1. Introduction

Internationalization and alternative ways for strategic management have been an objective for stakeholders in cultural industry, especially after COVID-19 pandemic crisis. During the past years "internationalization" has been almost exclusively related with promoting creation or content to larger audiences. Such a strategy seemed sufficient, even if empirical data did not always support such a belief. Technological progress and costs reduction in developing Virtual Reality (VR) and Augmented Reality (AR) applications, provides to cultural industry the opportunity to reach global audiences and to enrich their experience (Karafotias et al., 2022; Kargas, Loumos, & Varoutas, 2019).

As far as strategic management is concerned, there exist three distinct elements that seem to play a primitive role in developing strategy, namely (a) content, (b) context and finally (c) processes (Andrew M. Pettigrew, 1987; Wit & Meyer, 2010). These elements seem capable not only to develop a strategy but moreover to predict an implemented strategy's performance (Ketchen, Thomas, & Reuben R. McDaniel, 1996), especially when the relationship between strategy and organizational performance is examined over time (A. Pettigrew & Whipp, 1993). Technological elements are involved in all three elements, changing perceptions, values and practices. Such an approach leads on rethinking strategic management in cultural industry, when new technologies are implemented, such as Virtual Reality (VR) and Augmented Reality (AR) technologies.

Context elements include conditions and forces in each business external environment, while companies have no control on these elements, even though they can adjust their strategies in order to respond to external – environments changes. Context can include socioeconomic, political, competitive and technological conditions, alongside with elements such as market structure, organizational culture, etc. Technologies can act as a mean to reach more easily and to understand external environment and moreover to get faster aware of changes in customers, conditions and

international balance. Technology can provide to companies a competitive advantage in both external environment's divisions, the outer context (environment) and the inner context (environment) (Andrew M. Pettigrew, 1985).

Content elements involve the strategic responses to the various industry's forces, involving buyers, suppliers and competitors (Porter, 1996). Technological factors is the mean to predict and react to these forces leading to better alignment between a company and its working environment, alongside with better coherence between business's strategy and resources. Such conditions are associated with higher performance (Ketchen et al., 1996). Technology can provide content element with a larger variety of strategic directions and practices during its attempts to initially formulate and later to reach its planned objectives (Moser, 2001; Wit & Meyer, 2010).

Process element involves all means (including technological means) under which a strategy can be successfully implemented (Huff & Reger, 1987; Andrew M. Pettigrew, 1997). Technology can be associated with the management of methods and activities for such an implementation, while there exist strong evidence that a strategy process is significantly influenced by the context of a strategy (Miles, Snow, Meyer, & Coleman, 1978; A. M. Pettigrew, 1992).

Current research provides evidence about developing VR and AR tools that can act as internationalization facilitators when it comes to cultural industry. The project's objective was the development of an augmented and virtual tour guide for cultural industry stakeholders (e.g. Galleries, Museums, Libraries, Exhibitions) as a mean for business internationalization to global audience. Main technological aspects of all applications will be presented, alongside with development's results. Current paper' s objective is to provide evidence regarding how VR and AR contributes to cultural industry's internationalization by leading to its digital transformation (Kargas, Karitsioti, & Loumos, 2019; Kargas & Varoutas, 2020; Loumos, Kargas, & Varoutas, 2018).

Research conducted during "VARSOCUL" project was funded by the European Regional Development Fund (ERDF) as part of the Greek National Scope Action entitled "RESEARCH-CREATE-INNOVATE". The project's main result, alongside with VR and AR tools developed are presented. In the next section, the theoretical framework of the conducted research is presented, while in Section 3 the methodology used is provided. Project's results are presented in Section 4 with illustrations of what end – users can see.

2. Theoretical Framework

VR is offering a large variety of capabilities for educational purposes and skills development applications (Fowler, 2015). This potential can be used in formal educational processes as Monahan, McArdle and Bertolotto (Monahan, Mcardle, & Bertolotto, 2008) revealed, as well as in informal learning and for experimental purposes (Goodwin, Wiltshire, & Fiore, 2015). Moreover, it should be taken into account that without VR technologies, formal and informal learning are both inevitable in many cases with high risks or physical restrictions (Ott & Freina, 2015). That is why many museums and institutions have been proved more than willing to adopt VR technologies as a mean of engaging new audiences (e.g. in terms of age) when communicating historical information / content (Liaskos et al., 2022; Wang & Liu, 2019). These technologies seem most appropriate for new generations (e.g. Gen Z) which explore new means to enhance their creativity in both cultural and educational experiences (Christopoulos, Mavridis, Andreadis, & Karigiannis, 2011). Various recent projects confirm the significant relationship (Chrysanthakopoulou, Kalatzis, & Moustakas, 2021; Farazis, Thomopoulos, Bourantas, Mitsigkola, & Thomopoulos, 2019; Jung & tom Dieck, 2017; Soto-Martin, Fuentes-Porto, & Martin-Gutierrez, 2020) between Virtual Reality and 3-D modeling with education on cultural heritage for new generations.

Moreover, there is ongoing research on se of VR storytelling experiences and interactive storytelling experiences in cultural heritage and museums, according to the different forms of digital storytelling (J. F. Barber, 2016). Such forms of digital storytelling can be:

- Oral histories, being the oldest mean of communication, appearing in most media (Levinson, 1999), while digital storytelling has been directly associated with the ancient art of storytelling (Alexander, 2011).

- Podcasting, which includes combination of short videos or images, alongside with voice text and music (J. F. Barber, 2016),
- Locative / Interactive narrative, that are collected from participant of an experience so that to create new cultural content evolving (narrative experiences) constantly evolving and often connected with specific locations (J. Barber, 2013).
- Multimedia, used either in combination either separately, while multimedia digital storytelling experiences developed in the past included text and images, alongside with video, computer graphics and music (Branch, 2012), to create a deeper dimension and further immersion (Alexander, 2011) to end-user who is being transported to a simulated place (Murray, 1997),
- Transmedia, that provide the same subject / story / artefact (narrative experiences) across various media platforms in a way that differentiates from platform to platform, but still connected (J. F. Barber, 2016).

Taking all the above under consideration it is well explained why digital storytelling has been extensively used in video game industry, in several movies and in education as well (Behmer, 2005; Bromberg, Techatassanasoontorn, & Diaz Andrade, 2013; Madej Krystina, 2003), while social media's expansion to mass audience worldwide to take part in storytelling experiences (Lundby, 2009). Implementing digital storytelling to VR experiences has further helped Virtual Reality market to growth (WEARVR, 2018) and reach not only adults but moreover children aged 8 to 15 years (Yamada-Rice et al., 2017).

3. Methodology

An extensive users analysis coming from previous research works and projects was used (Kargas, Loumos, Mamakou, & Varoutas, 2022; M. Vayanou, Loumos, Kargas, & Kakaletris, 2019; M. Vayanou, Loumos, Kargas, Sidiropoulou, et al., 2019; M. Vayanou, Sidiropoulou, Loumos, Kargas, & Ioannidis, 2020; Maria Vayanou, Antoniou, Loumos, Kargas, et al., 2019; Maria Vayanou, Ioannidis, Loumos, & Kargas, 2018; Maria Vayanou, Sidiropoulou, Loumos, Kargas, & Ioannidis, 2020; Maria Vayanou, Ioannidis, Loumos, Sidiropoulou, & Kargas, 2019).

A two, interconnected strings platform was developed (Figure 1). From the one hand a web platform acting as a repository of digital cultural artefacts and on the other hand end-users' applications for smartphones and headsets/glasses of virtual, augmented or mixed reality. These applications were implemented for Android and IOS for mobile devices, while it included augmented reality as well as virtual reality platforms, such as: a) Oculus, b) SteamVR and c) GoogleVR.
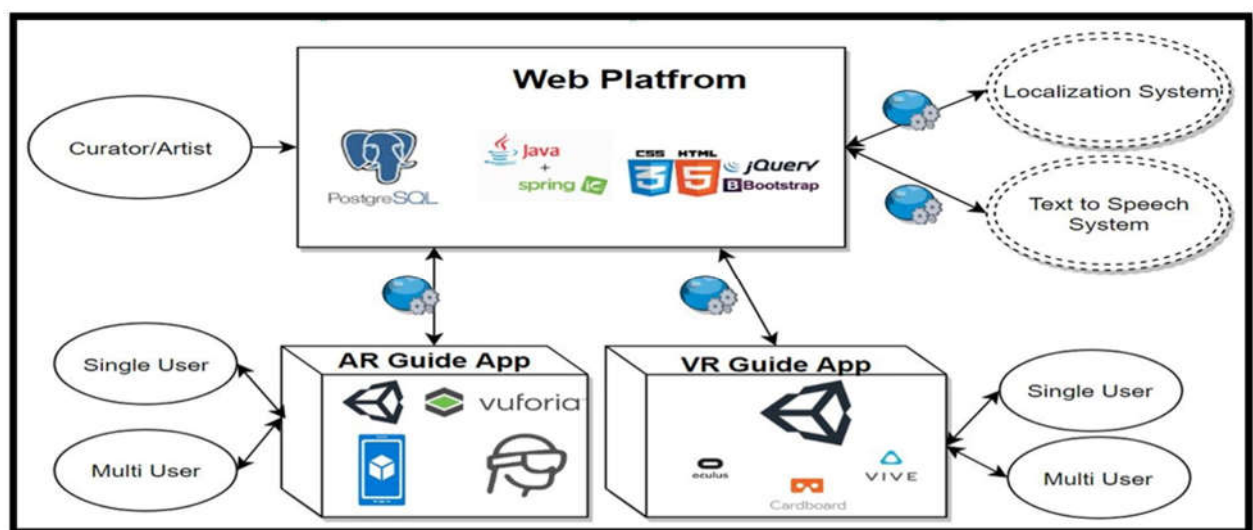

Figure 1. VARSOCUL Platform.

Unity along with Unreal are the most well-known "Game Engines" that exist now and are available for free. These two machines are designed so that they can be used by small teams to implement projects without having to build everything from scratch. We chose Unity over Unreal as the engine which has invested more in the virtual reality technologies. By using the term "invest" we mean the fact that it has a huge availability in means of developing applications when compared with Unreal. These means vary from structured libraries to automations when it comes to applications' development. Finally, it is an engine that is much easier to use and has a well-structured online forum.

4. Results

Web platform acts as a repository of digital cultural artefacts. The proposed platforms is not for end – users, but only for curators. Curators can create their unique personal profiles, alongside with their Gallery/Museum's profile. Web platform acts as a repository of cultural artefacts by permitting to upload digital artefacts and moreover to interconnect them with desired information, such as title, historical information, creator's information, materials and construction technique, curator's comments etc. These data are used in a narrative way during end – users tour.

Moreover, curators can create and recommend cultural tours (routes) by defining the order of transition from exhibit to exhibit. At the same time, it will be possible to curate the information per exhibit in order to create a narrative text that will serve the proposed route and offer a resonant and coherent tour in the form of a storytelling experience.

At the final stage, web platform make use of two (2) more subsystems: (a) a translation subsystem and (b) a synthetic voice generation and narration subsystem. Thus, for each cultural artefact, exists voice – information in different languages. Also, for each of the previous languages, narrative audio content is produced to provide end - users with more vivid guided tour in their native language, which facilitates the combination of physical contact with the exhibit alongside with its digital information.

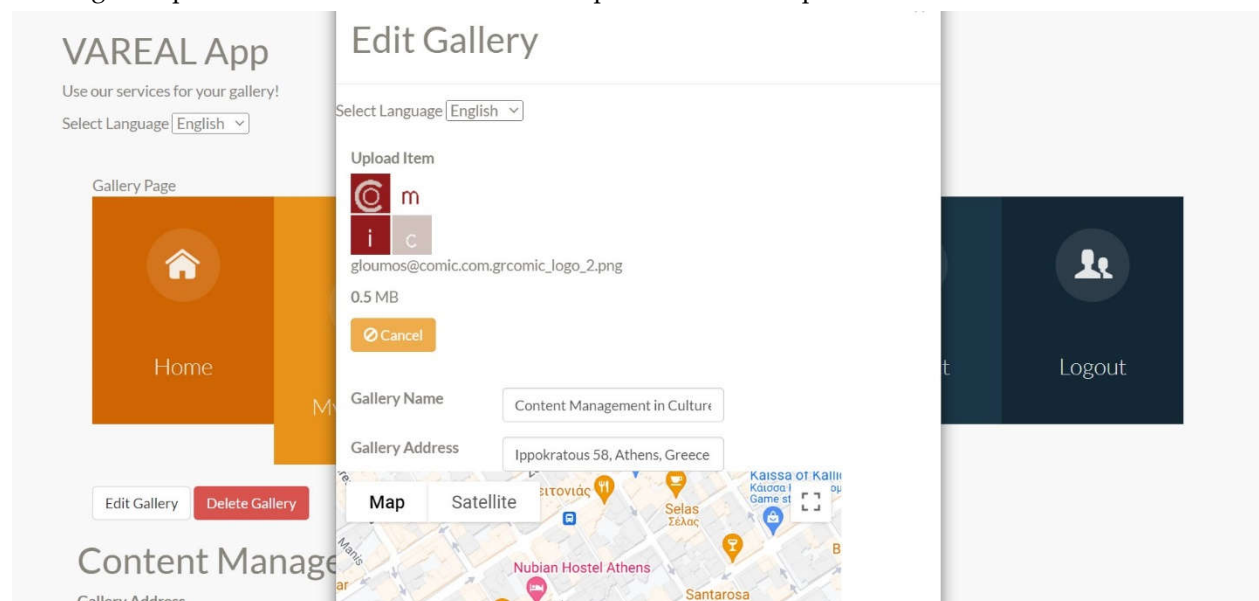Figure 2 provides a short illustration of web platform's development.

Figure 2. Web Platform's view.

The **Virtual Reality (VR) application** serves as tour to an "imaginary" gallery or museum, existing or non – existing. A VR mask is required in order the end – user to have access to the VR exhibition. As far as VR application is concerned, both curators and users/visitors can reach the desired content. The former to set up exhibits and to check how their virtual exhibition is formed and the latter to reach an experience. Curators can create various exhibitions, with distinct thematic, by using parts from their total number of exhibits. All this procedure is taking place in VR environment.

Curators can then chose the number of places / rooms of their VR gallery / museum and moving from room to room he sets up the digital exhibits (Figure 3). The application offers the following opportunities:

- moving the exhibits from room to room,
- choosing frames for each exhibit,
- choosing the color and texture on the walls and
- choosing the accompanying music.

The whole procedure resembles to what would take place in a physical gallery when an exhibition is to be set up (Figure 4). By finalizing this procedure, curator can release the VR exhibition to the world audience in order to take a tour, to reach digital artefact and to receive information (in text or oral format) regarding the exhibits.


Figure 3. Choosing different Varsocul Galleries.

End users should create an account in the virtual exhibition, while they can have access to every VR exhibition available, free of charge or after paying according to gallery's museum's policy. When an exhibition is chosen he could reach digital artefacts in rooms, either by his own, or accompanied with other users. Such an alternative can develop VR exhibitions into social "multi-spaces" of culture, with interactions among users. Subsequently, end – user will be able to navigate through the virtual exhibition and receive informative information either visually or audibly.
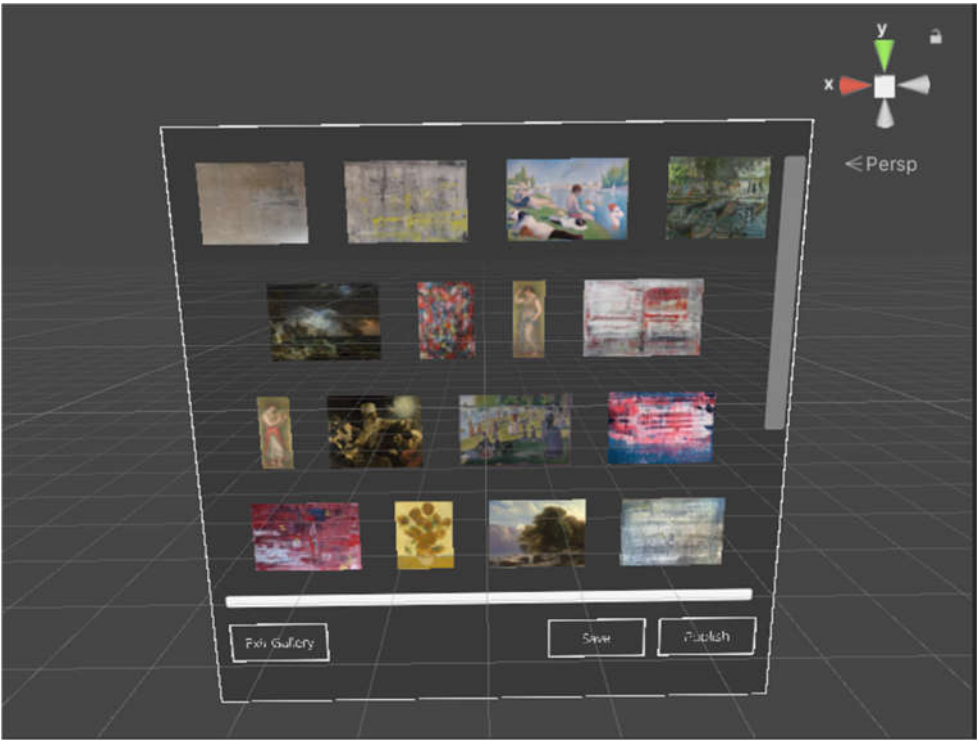
Figure 4. Curator's Camvas of Digital Exhibits.

Furthermore, end – user can choose a guided tour suggested by the curator (predetermined choice) or alternatively to freely browse according to his wishes. Depending on the controllers and the capabilities of end – user's virtual reality mask, he will be able to navigate with his hands or by giving predetermined commands with his mouth, thus making the experience more alive (Figure 5).
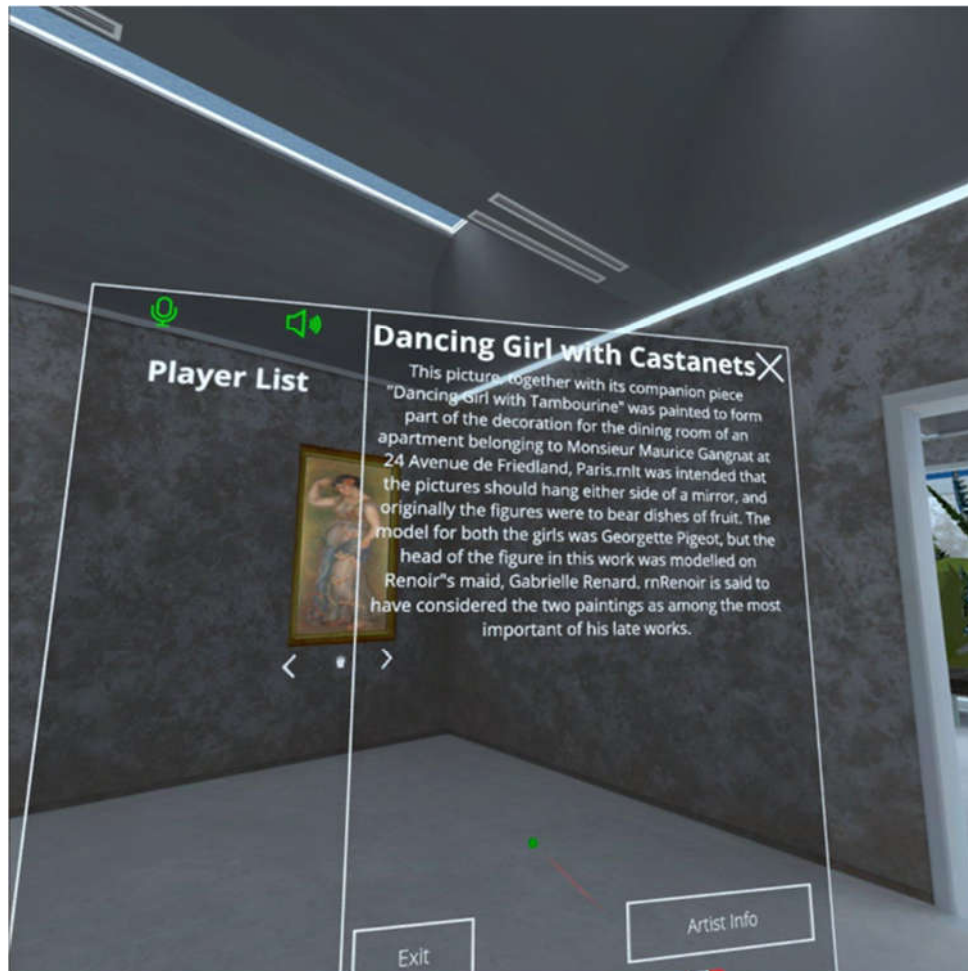
Figure 5. Reaching Digital Artefact and its Information.

When multi-visitors exist, e.g. school classes, the application supports group visits, simulating real-world conditions. The application supports audio chat between users (voice chat) and the display of directional messages as well as emoticons to express emotions between end – users. Moreover, avatars have been developed to enrich end – users experience, with an as much as possible realistic movements with zero response delay to the choices of the users who control them (Figure 6).

Emphasis was put on developing mechanisms to collect and analyze the behavior of virtual users during their presence in the space, both in relation to the exhibits and to the rest of the users. Such mechanisms serve as feedback generators to curators and to decision makers, regarding their digital presence and success or failure of an VR exhibition / tour, as perceived by end – users. Metrics (indicatively) can be delivered, regarding the (mean) time of "engagement" between each exhibit and end - user(s), the overall evaluation of the exhibition, the use of emoticons for user communication, the quality of voice chat as well as the effectiveness of messages for organized group visits (e.g. . by young school students or groups of tourists).

Figure 6. Series of Avatars.

A series of reports can be provided for curators use only, regarding each distinct exhibition. Data can provide insights about the optimal design of exhibitions and experiences, while technical comments can be collected for future improvements in the next version of the application.

The **Augmented Reality (AR) application** serves to guide the visitor or visitors through the physical space of an exhibition of a gallery or museum. The application works a) through mobile devices (mobile phones, tablets) or b) through augmented reality glasses (Figure 7). These glasses are still in an experimental stage of use, but they show a rapid technological growth, and it is soon expected to be used for specific purposes such as the experience of a guided tour in cultural places.

Figure 7. Hololens2 Unity.

Users can log into the application, and according to their geographical location, they can have access to exhibitions available for a tour that are nearby. The user can reach useful information for nearby cultural places available (such as guide languages per exhibition, information about some of the exhibits, opening hours, ticket price, available infrastructure, etc.).

When visiting an exhibition, the visitor can chose between tours designed from curators or to freely explore the exhibition. In both cases his mobile device (smartphone of AR glasses) scan exhibits and provide information upon request. End – user simply has to point the device towards the exhibit he wants to see and then the application recognizes it and can offer him visual and/or audio information about each object in any chosen language (Figure 8).
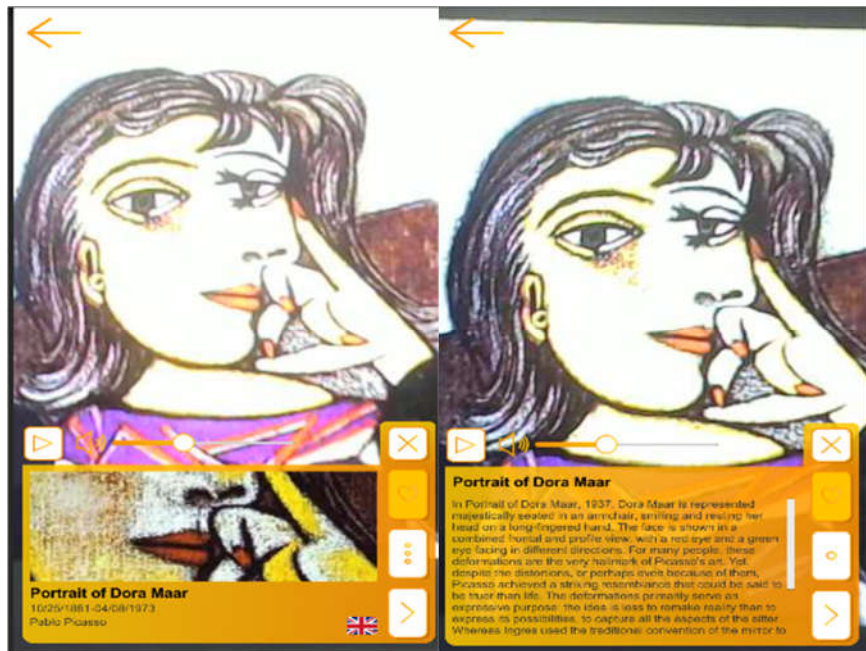
Figure 8. Exhibit recognition and information delivered.

When it comes to the case of AR glasses, the application can receive specific audio commands from the visitor and to provide answers related to the exhibition, the objects or the creators of the artefacts, while following the visitor's movement is the space.

In the case of mass visits and users in the application, special functions are provided to organize the visitors but also to arouse their interest in specific exhibits. Through a gamification mechanism, the application prompts users/visitors to participate in short collaborative activities (e.g. mini games) focusing on the exhibits and exhibition spaces.

As well as in VR application, AR application has its own mechanisms for metrics, in order to analyze the interaction of visitors with physical exhibits and also with other visitors, when it comes to organized visits. All data are given as reports to the curators of each exhibition, while technical comments are collected by the technical team for future improvements in the next version of the application.

Finally, the application supports multilanguage content (Figure 9), permitting end – users to change the language preferred at any stage of their tour.

Figure 9. Multilanguage Content.

5. Discussion

Presented applications give evidence provide an insight on how cultural content can be implemented in VR and AR applications, while moreover it provides an insight on how digital transformation in cultural industry can reshape existing strategies and business models. Discussion of results starts by taking as granted that a firm's strategy can be reached be studying its activities (Richardson, 2008), explaining why digital transformation and strategy transformation is interesting era of scientific research (Demil & Lecocq, 2010).

Changes taking place in organizations external environment make digital transformation a necessity, followed by a repositioning of current strategy (Pearce & Robbins, 2008). Cultural industry can not be unaffected. COVID-19 led to a strategy's repositioning regarding technological implementation and adoption of mixed reality technologies. Even though external treats and opportunities is not something new in business strategy theory, little knowledge still exists on how such conditions affect business models (Saebi, Lien, & Foss, 2014). Digital transformation and technological adaptation is part of business model because the latter consists of what an organization "is and does" (Mason & Spring, 2011) alongside with developing mechanism of value creation (Foss & Saebi, 2017).

Technological factors, such as VR and AR applications can differentiate any organizations from its competitors, providing a new competitive strategy or a competitive advantage as a whole (Chesbrough, 2007; Teece, 2010). Implementing such technologies open new era of business development for cultural industry while creates the prospects for a broader strategic transformation. Such a repositioning can take place as a result of a more aggressive ability to manage change and to reach higher level of competitiveness (Chesbrough, 2007; Giesen, Berman, Bell, & Blitz, 2007), alongside with better understanding business environment and potentials of collaborative activities (Neu & Brown, 2008)

Proposed research contributes to a higher understanding on how immersive technologies can be used as a mean for digital transformation and strategic transformation as well. Such a framework creates the need for a change, an a-priori delicate subject when competitive strategies are involved (Kindström, 2010). By implementing such technologies to a non – high – tech oriented industry, with extended digital content (or under digitization content), can lead as future research a research question regarding what capabilities may facilitate the strategic repositioning and the development of a new path for strategic development.

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