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Reviewed Article:

Everybody Else is doing It, so Why Can't We? Low-tech and High-tech Approaches in Archaeological Open-Air Museums

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Some people believe that an open-air museum is a place where you leave your modern technique behind and go 'low tech'. Other than the museums which act like digital free zones, many others experiment with going digital. Where experience and storytelling have always been the central concepts of archaeological open-air museums, exactly these ideas are behind many digital techniques. We have to pick up the public where they are and approach

them as they are. We should use all the means at our audience hands to reach them, and not only in the open air, also in the digital world.

> There is no need to argue anymore. Both Museums and digital professionals should start from the concept, and not run into solutions straight away. The challenge is embracing the new without taking away from the huge achievements made by these museums and finding the synergies with other initiatives like Europeana to reach out to the public digitally.

Museums, Interpretation & Learning

Archaeological open-air museums are reconstructed sceneries where stories are presented mainly based on the archaeological past of a certain area. Experiencing is key, as well as touching replica objects and learning first hand from an interpreter. There are similar entities like historic or ethnographic open-air museums, historic houses & castles and historic theme parks (Paardekooper, 2012, p.66)

A museum is a place for the purposes of education, study and enjoyment (ICOM). Museum learning is not in a classroom setting and not aimed at its audience gaining a formal diploma in the information, it is instead, informal learning: "*the lifelong process in which people learn from everyday experience*" (Jeffs and Smith, 1996). Demonstrations of any kind provide the connection between text books and reality, between knowledge learned by heart and knowledge gained by experience (Colomer, 2002).

Visitors should enjoy and understand the museum they visit. Effective interpretation allows each visitor to personally connect with a resource or place and to care about the museums on their own terms. Such personal connections are crucial in gaining public support for the museums.

Archaeological open-air museums tell stories, which need to be solid and relevant to their visitors. Museums, archaeological open-air museums, are cultural hubs and seek relevance for modern society.

Their stories are very hands-on and the exhibition is not behind glass. The museums involve their visitor actively. The stories presented go in depth - visitors do not just learn how to make fire, but this is a way to teach problem solving strategies.

Storytelling, sharing stories, can refer specifically to; literally oral storytelling and in a looser sense, to techniques used in other media to unfold or disclose the narrative of a story. Think for example about gaming and films, but also drama therapy and museums presenting their message within the larger cultural story. There is a good deal of reasoning and strategies behind good stories.

Storytelling takes many shapes. The traditional forms, for example fairy tales, folktales, mythology, legends & fables, where alternative use of storytelling includes representing history, personal narrative, political commentary, computer games and 'fake news'.

Going Digital in (open-air) museums

In a promotion video in 2009, a visit to an archaeological open-air museum is described as: "*... a moving adventure of the senses that not even the most sophisticated virtual reconstruction techniques, at least not yet, have been able to rival...*" (liveARCH, 2009). By now, these museums can use the digital revolution as a means to improve quality.

Open-air museums are strong in non-formal learning methods (Winter, 2016). Digital techniques can complement this approach. However, using digital technology in a way that enhances the experience and meets the needs of both facilitators and audiences is tricky (Hansen, 2019, personal communication).

Going digital often is not an impulse from inside the museums. Often, they engage because there is funding available for this, and not something else. Also, these museums sometimes act due to the fear of missing out, and on other occasions they do so because they are told to by their superiors (Hansen, 2019, personal communication).

The lack of understanding by museum colleagues of what it means to go digital can lead to them thinking digital techniques may be good for 'special effects' only. Museum staff feel very alone, and in their experience act as pioneers without much support in their work with digital professionals. The decision takers in museums are unlikely to use VR and AR much in their daily life or cooperate with game developers.
Looking at the developers of VR techniques, their emphasis is on building as realistic a presentation as possible, a quest for better hardware and they work on good storytelling as a final, and secondary process. However, most developers are not showing a lot of imagination yet in how to integrate the technology into real-world situations, especially in an educational forum outside of tech or programming.

For now, the combination of museum and digital professionals may lead to a shallow but aesthetically pleasing wow factor, but not very useful application in the long term (Hansen, 2019, personal communication).

Virtual reality (VR)	immerses users in a fully artificial digital environment.
Augmented reality (AR)	overlays virtual objects on the real-world environment with spatial registration that enables geometric persistence concerning placement and orientation within the real world. Prior technologies that overlaid data or images not spatially registered to real-world geometries are referred to as heads-up display technologies.

Mixed reality (MR)	not just overlays, but anchors virtual objects to real-world objects and allows the user to interact with combined virtual/real objects.

DESCRIPTIONS TAKEN FROM WIKIPEDIA, HTTPS://EN.WIKIPEDIA.ORG/WIKI/MIXED_REALITY

Examples

In 2016, **the PreHistorisch Dorp in the Netherlands** implemented a VR application. This would help the museum offer more to visitors on quiet days, when there was less staff. It was named time viewer (tijdkijker), just like a project at the same museum in 2005. The 2016 project however had some issues. Visitors in the open-air did not want to wear VR glasses, as these cut them off from the group they were visiting the museum with, as well as off from the real life experience. The film clips embedded in the application were too long to retain attention and the downloads were too heavy (Lammers, 2019, personal communcation). Two years later, the app and the VR glasses were replaced by a simpler treasure hunt which can be done as a joint exercise using smartphones. The 2018 solution, using technology that the visitors were used to, was an improvement, as visitors would stay longer.

In 2015, **the Ciutadella Iberica de Calafell near Barcelona** was a testing ground for the University of Barcelona (UB, 2015). They developed an app for smartphones and tablets which functions as an additional service for unguided visitors. The VR film clips in the app are also used during guided tours to show visitors alternatives to the real world, for example of ruins which are not reconstructed yet (Gómez Gutiérrez, 2019, personal communication).

In Northern Italy, the indoor and open-air museum at **Bostel di Rotzo** had the chance to cooperate with a university and a company in several digital solutions, paid with EU funding. There is an immersive cinema inside the museum building, an AR app used on tablets in the park and headsets during educational trips. The app on the tablets substitutes buildings which are not reconstructed yet. Visitors particularly like taking screenshots and pictures through the application. In this way, virtual reality and "real reality" are mixed. Both the cinema and app experiences are for groups of people, not necessarily for solitary use. Cooperation with the digital production company was interesting. Only at the end of the project the museum and digital colleagues spoke more or less the same language.
The digital solutions attract more visitors to the museum, and they ask a lot more questions than before. With the current experience, Bostel di Rotzo is planning a second stage (Mantoan, 2019, personal communication).

The Peale Museum in Baltimore (US) is owned by the City of Baltimore, and managed by a non-profit, The Peale Center for Baltimore History and Architecture. David London is their Director of Operations, an artist/magician/interactive performer. What people want, he says, is interaction with other human beings in real physical space in creative and intellectually stimulant ways (TV Free Baltimore 2018; the Peal Centre). He designed a two-part experience. The first part is the Escapement Time Travel Agency. This is an inverse escape room with a

puzzle to activate a time machine. It transforms a doorway into a portal back to 1818. Behind the portal is the second part of the experience, the private study of Rembrandt Peale, the museum director in 1819. This is a historical fun house from 1818, a curiosity collection. There are various ways to interact with the room. Visitors are invited to touch everything, real objects. One can also use a pair of glasses of the 1818 museum director. These are connected to a screen so visitors can 'see' what the director saw in 1818 by means of AR.

Where and how to pick up our Public?

History and archaeology museums are considered as a place where you leave your modern technique behind and go 'low tech'. On the other hand, people come with their mobile phones and experiences of modern technology, wanting to share their stories and try things out in the digital ways they are used to. Museums should address both these audiences.

VR/AR techniques are still relatively new, and the competition between the companies is high. Therefore, the producers are very proactive. It is difficult to ascertain who their main priority is. On the one hand, it could be the museums or the funding bodies, but equally their priorities may be with colleagues in their own sector, or the actual end-users.

There is little insight into what the public really wants. When game-design students in Finland (Duda, 2019b) were asked: "Would you like to play a game which will be teaching you about historical facts?", only 13% responded negatively, even if the subject was considered nerdy (cake diagram). Games are an example of the huge interest of users in history and archaeology (Reinhard, 2018). There were 3 million people who, after the fire, went sightseeing the Notre Dame model in Assassins Creed Unity. These people are an important target group (Duda, 2019a).

Cooperation between Museums and the Digital Professionals

The European Commission calls interactive technologies an "immature market with high potential" (Probst, Pedersen and Dakkak-Arnoux, 2017).

In grant-paid projects, sustainability is no priority. The app is sometimes just running for the duration of the grant period and then fizzles out. Maintenance is not planned in but vital for the long run. Maintenance is partly about keeping the hardware and software up to date and matching each other. However, there is a very high rotation in that. Staff rotation in museums is high too, leading to gaps in knowledge about the equipment and software, but also problems with developing updates of the content. Finally, an app is not something one publishes, like a book. One can compare it to a website where, in order to remain relevant for a changing public, also the structure of what is presented needs updating, without presenting more of the same.

People working with interactive technologies in museums face more problems than just maintenance. One difficulty is to serve all screens and operating systems, from mobile phones to tablets, from VR glasses to computer screens. Often, apps are too heavy and battery life of the equipment too short. In the countryside, good Wi-Fi coverage is an issue, just like the use of geolocation and Bluetooth. The *Field of View* (FOV) needs improving as well as the brightness. 3D sensing capabilities in the open air are a problem needing to be tackled too. Finally, open access is limited for the users: apps are in software app stores which can best be perceived as walled gardens (Kunz, 2019, personal communication). Museums too have an open access problem. There is no, or limited, portability of their projects from one producer to another.

Museum colleagues interested in digital interpretation should first figure out what they need, before deciding on the technology. VR or AR is not going to fix all problems or be automatically immersive. One should consider if an app is the right format for the right ideas. If one simply intends to make exhibition texts digitally available, an app or game may not be the right medium. A 3D visualisation fits better on a large screen or a tablet. If the museum is new to digital technology beyond a website or Facebook, spending some time on a need's analysis can save a lot of trouble. (Hansen, 2019, personal communication).

Digital techniques in museums should be a combination of an attractive visual experience and learning (Gómez Gutiérrez, 2019, personal communication). "Visually intensive and "unquestionable" uses of AR are problematic. We need AR-interactions that pose questions and encourage nuanced interpretations and critical thinking" (Gunnarsson, 2019).

It is both what you do and how you do it. If you make an app, make it short, simple and powerful. The user should find it worth downloading initially, and keep the app for a while longer. The application should add to the museum presentation and stay within your interpretation framework. One should best use the same protagonists in most of the interpretative channels of the museum is part of your museum branding. The future is a sand box, the user can pick up those bits he wants and change the story as he likes. There are no story lines (Duda, 2019c, personal communication).

Digital professionals work too much on their own, without the museums. It is easy for "non-digital" professionals to be intimidated by the process (Hansen, 2019, personal communication). Museum staff and digital professionals should both invest more time in cooperation, to be a single team and understand both worlds, putting the end-user in the centre. They must generate an accessible and meaningful interaction with the public. Make the visitor part of the experience (Gunnarsson, 2019, p.84). It should be participatory so that people can share feedback easily or share contents. Also, the contents itself needs to be interactive as well. Be open to the users and show what is certain and what not (Gunnarsson, 2019,p.83). Digital communication is very useful for showing alternatives.

Usually AR/VR is an individual experience. Interaction with other visitors is bad, the reflection and learning is limited. Why not for example develop a massive multiplayer online (MMO) game (Duda, 2019c, personal communication)? With social VR, multiple players can experience virtual spaces with each other. This is very exciting for outreach and education (Hansen, 2019, personal communication).

A lot of the new digital material is not re-used. The future is in cross-platform, both on site (in the museum) as in the virtual world. AR, 360 and web VR could very well supplement the museum's online presence (Hansen, 2019, personal communication). One should combine the digital with the not so digital: one should blur the borders, mix channels.

Bartle categorises game players in four categories or primary styles: achievers, explorers, socialisers and killers (Bartle, 1996). The vast majority of players, 80%, are Socializers. Socializers experience fun in their games through their interaction with other players (Kumar and Dam, nd).
We can enhance social participation if we apply multi-user experiences. One needs as few as possible controls and interfaces which hinder the experience and flow of information, thus leading to high quality experiences and a strong sense of presence (Slater and Wilbur, 1997), in short: a more effective programme.

Synchronisation and integration of different AR, MR and VR devices with motion sensing and motion capture technologies would facilitate real-time, multi-user experiences for groups of people. This way, we can serve more purposes than just learning and increase human interaction, social inclusion and countering mental health issues.

Worldwide, more than 20 million people per day used the Pokémon GO app in 2016, showing the huge potential of AR in the open-air (Wallace, 2018). Now we have "Harry Potter: Wizards Unite" coming up.

Gaming in archaeological-historical context could become a major success. There are already immersive games in existence, simulating life in the past. The scale of recreated reality is overwhelming and very realistic (Duda, 2019c, personal communication). Museum conservators and archaeologists alike can help with setting the proper storytelling and proper mechanics, the set of the rules with which a player needs to interact within a game (Champion, 2017). Many online games also play on the idea of archaeology or have it as a "mini-game" or sub-objective. In World of Warcraft, one can visit the Archaeology trainer and then survey the game world for "artefacts". This shows that game developers are already playing with the idea of archaeology, so why should heritage professionals not do the same but the other way around (Maguire, 2019, personal communication)?

Conclusion

“We are at the beginning of an exciting era in new media” (Reinhard, 2018, p.201). Museums feel they are guinea pigs in expensive experiments. They should however act more like an agent instead of a subject. Digital professionals should on the other hand aim to better understand the museums, their priorities and their public. There is no need to argue anymore. Both Museums and digital professionals should start from the concept, and not run into solutions straight away. The challenge is embracing the new without taking away from the huge achievements made by these museums and finding the synergies with other initiatives like Europeana to reach out to the public digitally.

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Gallery Image

FIG 1. ROOM WITH CHILDREN USING VR IN THE WESTFRIES MUSEUM. PHOTO: WESTFRIES MUSEUM.

FIG 2. THE MAYOR OF EINDHOVEN, MR JORRITSMA AND THE FOUNDER OF PREHISTORISCH DORP, MS BOONSTRA WITH THE TIJDKIJKER, PHOTO: PREHISTORISCH DORP.

FIG 3. APP FOR THE CIUTADELLA IBERICA IN CALAFELL (ES). PHOTO: JOAN SANTACANA. DHIGECS RESEARCH GROUP (UNIVERSITAT DE BARCELONA).

FIG 4. SCREENSHOT FROM THE APP AT BOSTEL DI ROTZO. PHOTO: RICCARDO MANTOAN, NEA ARCHEOLOGIA.

FIG 5. THE TIME MACHINE AT THE PEALE MUSEUM. PHOTO: THE PEALE MUSEUM.

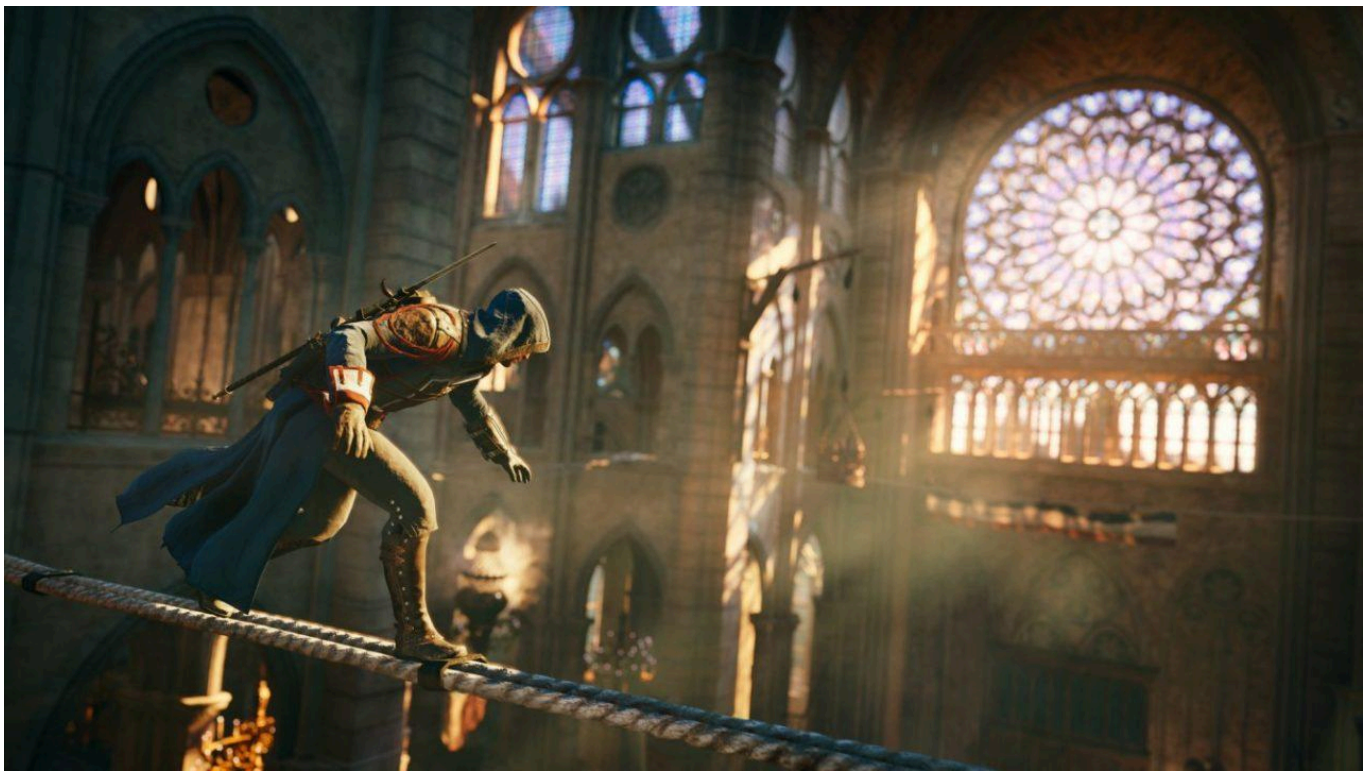

FIG 6. THE NOTRE DAME CHURCH IN ASSASIN'S CREED UNITY. PHOTO: UBISOFT.