Museums in Digital Transformation

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A digital cyber museum would be able to collect and conserve unlimited numbers of cultural assets from the whole world. This type of museum would not monopolise the industry, but share its assets with everyone in the world regardless of their location. So while the creation of a central, national museum that serves the world may not be feasible in the physical realm, in the digital world, the chances are high.

Even as museums and cultural institutions embrace digital transformation, they should view it as *plus ça change, plus c'est la même chose*, and understand the idea that *the more things change, the more they stay the same*, can be viewed positively as we acknowledge how all five senses play a part in the evaluation and appreciation of physical objects. The opposite of "digital" or "virtual" is not "real" and "original", but "physical". What is digital can also be real, and very original.

Yet in many ways, digitalised assets are similar to post-truths in the sense that the acceptance of them depends more on one's emotions and beliefs than facts. The fact that authentic physical assets matter as primary sources and preserving them is crucial is the fundamental reason museums exist—and this will continue to be the case as long as we reside in a physical, not virtual world.

This begets the question: What role can digital museums play?

Allowing research to flourish

To understand this, let's turn to some examples of 3D digital mapping. This entails a 3D shape comparison analysis method, which has been employed for cyber archaeology. It has allowed for the replication of the ancient Greek sculptor Polykleitos' creation process, which provided evidence for how a previously unidentified Amazon statue was part of his work—resolving a dispute that has lasted over 100 years. Further supporting this, 3D locational digital information has also been used to elucidate important information, like the view range of an archaeological site and its surrounding land. Work in this realm has revealed important characteristics and reinforced the historical importance of the Silk Road city, Kampyr-Tepa, in Uzbekistan, again demonstrating the role of digital technology in changing research processes.

Making immovable estates accessible

A strong point of digital museums is that they can preserve both movable and immovable assets. A good example of this is then digitalisation of

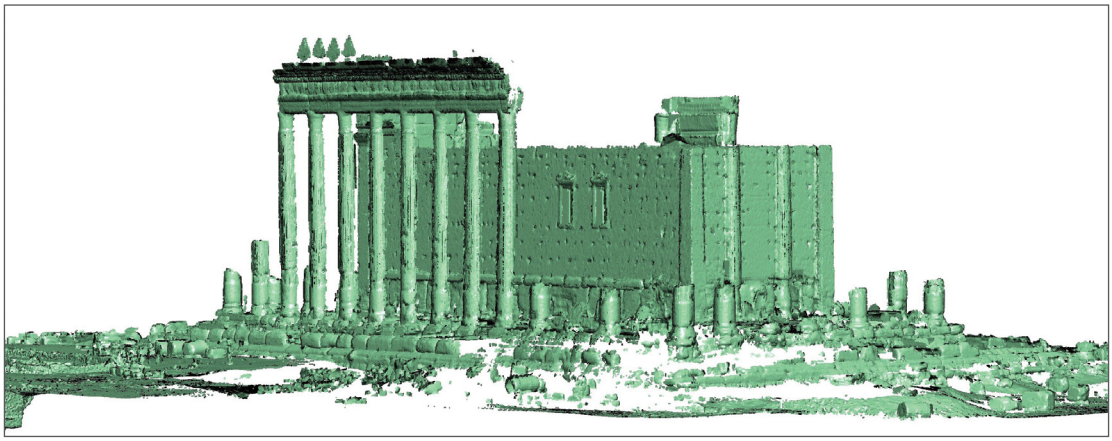

Figure 1. 3D digital data of the Temple of Bel, Palmyra, scanned in 2010. Courtesy of Prof. Kiyohide SAITO (Archaeological Institute of Kashihara, Nara, Japan) and ACCORD Co.Ltd. (Osaka, Japan).

Angkor Wat in Cambodia for the Bayon Digital Archival Project (Ikeuchi et al 2008), or the digital mapping of the Temple of Bel at Palmyra, Syria. Although the temple was destroyed in 2015, in 2010, a team of Japanese archeologists led by Professor Kiyohide Saito had already scanned both the inside and outside of the temple, allowing for a digital replica to be built. This is currently the only existing and accurate 3D digital data of the temple, which Japan will willingly provide to UNESCO when it is ready to rebuild the temple.

Education and enjoyment in digital museums

There are also plenty of examples how digitalising can help increase enjoyment and education in museums.

For example, 3D mapping was also used by Professor Kyoko Sengoku-Haga's team to scan Greek-Roman statues at European museums (Okamoto et al 2015; Sengoku-Haga et al 2015; Sengoku-Haga n.d.). The team created 3D digital statues uploaded these to a tentative digital museum, and allowed people to touch and move the statues through the hands of an avatar. Avatars of different people could also gather to discuss and jointly execute activities and plans are for the museum, making it accessible not just to scholars, but also to people across the world.

In the same vein, Japan has developed an e-Museum which consolidates images of national treasures and important cultural properties from four national museums. With its high-definition images, people can now enjoy and study museum pieces from the comfort of their homes. Also, the e-Museum contains features to enlarge details of the pieces of art, making it arguable that these visual representations in many ways exceed the experiences at physical museums.

Examples can be found across the world: The Ateneum Art Museum in Helsinki offers a platform which can enlarge digital representations of artwork, thus making it easier—especially for seniors, to enjoy the exhibitions. Noting that ancient Greek sculptures were brightly coloured (Brinkmann and Scholl, 2010), the Acropolis Museum in Athens, Greece, now allows online visitors to

repaint the once coloured Greek statues from the acropolis as they please.

Together, these projects demonstrate how museums are shifting from offering simple unilateral access to far more interactive participation. These synergistic interactions can in turn lead not just to better experiences, but also opportunities for improved education.

Are copies a problem?

One might argue that replications of artwork, whether physical or virtual, cannot be considered genuine, and as such, are also inherently inferior. Case in point, ancient Romans did order replicas of Classical Greek statues, but these duplications have been called "Roman copies of Greek originals" with the connotation that they are somehow inferior, rote reproductions.

However, anyone with this view should visit the Otsuka Museum of Art. The museum houses over a thousand full-size ceramic reproductions of major works of art from ancient to modern times, including the Sistina Chapel and Scrovegni Chapel. It receives 380,000 visitors per year and in 2011, was voted by TripAdvisor users as the best loved museum in Japan.

Also, all figures and images of Buddha and Jesus on this earth are copies of the physical, original person. Despite being earthly avatars of the real spirits in the heavens, these still come with the same sacredness and historical value attached. Why should taking these images to the virtual world change the value? The fact that a copy-likeness of Buddha was not created for centuries after achieving nirvana suggests that copies have certain real power, and the fact that people took offence to Andres Serrano's photograph, *Immersion*, only further implies that copies can have power that one can never overlook.

Open data and museum apps

An open data policy can support digital technology in making museums more interesting and attractive to the masses. This would involve making cultural assets with expired copyrights freely available for everyone to enjoy and use.

Some museums have already adopted this policy. For example, the New York Metropolitan Museum has more than 450,000 digital images available on its homepage. Yet, in other countries, like Japan, there are still arguments claiming this will allow images to be misused.

Figure 2. Gold coin (reverse) of Kanishika I, one of the earliest images of Buddha (British Museum IOC.289).

In order to allow those who are for and those who are against an open data policy to come to an agreement, perhaps there should be a distinction between the rights of ownership and the management of art held by museums, as well as the right to use art held by the people. After all, a typical issue of misuse with artworks is when they are used as parodies. But parody is also a form of culture and has been since at least the Hellenistic age; it has also proven to be an effective way to revitalise its source.

Cultural institutions also have a lot to learn from commercial companies. The American department store Macy's raised the mindshare of the brand and led consumers to frequent the stores by inviting consumers to download its store app, offering services to buy online and pick up in the store or to buy online and ship to stores—resulting in the rise of sales volume to a billion U.S. dollars.

As museums have more "stock" than department stores, they should be able to reach a wider audience by creating museum apps to draw crowds from the online into real life. Just imagine: When combined with their abundant cultural stock of open data, a museum app could be many times greater and profoundly more influential than even amazon.com!

Interfaces between the physical and the virtual worlds

Arguably, all paintings are "windows" created to lead to the virtual world and a creation of any form of art is also a creation of a virtual world. After all, the seamless continuation between the physical sphere and the virtual one has been the theme of culture and art for centuries, like in *The Butterfly Dream* (莊周夢爲胡蝶). "The Story of Kwashin Koji", a story by Lafcadio Hearn, describes how water overflows from the painting of a lake and into a room. Then, a boat glides out and the illusionist climbs in and disappears into the painting. A similar theme is found in Marguerite Yourcenar's "Comment Wang-Fô fut sauvé" from the book *Nouvelles Orientales*, 1938, where an old painter and his disciple disappear forever in a sea of blue jade. In fact, the wall paintings in the houses in Pompei were virtual representations of nature that were not available in the city.

But if every visual art is a creation of a virtual world, then what would the difference be between a traditional visual art form like a painting, statue, photo, movie, and an innovative visual art form like the virtual reality (VR) depicted in movies like Steven Spielberg's *Ready Player One*?

The answer is that paintings are reductions of the world. In these art forms, the world is trimmed down into a frame. One observes the world inside the frame objectively from the outside. One shuts oneself in a sort of "camera obscura", and from there, enjoys the framed images of the outside world, collected according to one's will.

VR is a reversal of this; one is submerged in a world of images where there is neither frame nor border. In this VR world made up of images beyond one's will and choices, one meets ideas and people that were previously unknown.

A specific example of VR that demonstrates the possibility of the digital world is the *Second Life*, a virtual world where avatars can meet and live virtual lives online. Research has also research been conducted about an online self-help chat group for autism spectrum disorder (ASD)

people (Ikegami, 2017), which allows them to gather in this virtual chat room through their avatars. Because the avatars do not have the same delicate, fine-spun human expressions and nuances as in real life—characteristics which confuse ASD people—they can talk freely and sympathise with one another, behaving in a more natural and "real" way in the virtual world.

Virtual manifestations can also help in the physical world. For example, people with severe physical disabilities, like amyotrophic lateral sclerosis (ALS) patients, can remotely control robot forms of themselves to serve coffee and chat with customers in an actual avatar cafe. Why can't technology like this be used in museums as well?

After all, there are instances where physical interfaces that connect the physical and the virtual digital worlds. A well-known example is a Chinese abacus—a tangible digital decimal system where the computing process is visible and palpable. This visible representation of information inspired the development of early computing systems, and the notion of the "black box" only came into existence after electronic digital computers were created.

In the modern-day climate, where computers are progressively becoming black boxes, Professor Hiroshi Ishii of MIT Media Lab is trying to make the intangible, tangible again. According to the MIT website, he focuses on designing seamless interfaces that connect humans, digital information, and the physical environment. The result is devices that offer new ways of communication. For example, "Bottle Music" allows users to arrange music from the violin, the cello and the piano by opening bottles and "I/O Brush" comes with a video camera, lights and touch sensors for the brush to capture colour and texture of a surface.

Inclusive Design in digital museums

To lower the barriers to acceptance of the virtual realm, especially for the digitally averse, we should demonstrate how it is not a situation of alienation through digitalisation, but a fusion of the digital and physical worlds.

The best way to do so would be to make our digitalisation process visible. For example, the final version of the Constitution of the United States may be clean and decisive, but it does not tell a very interesting story of its creation. Looking at the drafts of the constitution and understanding the trial-and-error process may be far more interesting. In the same vein, by showing the struggles digital museums face, perhaps people will be more interested and involved in the process of designing digital museums so everyone may ride the digital waves together.

The need is to integrate concepts of being barrier-free, universal design and inclusive design. The importance of being barrier-free came about in the 1950s, when wounded soldiers in America petitioned to remove physical barriers for the disabled. This allowed for reasonable accommodation for diverse people to obtain opportunities, but also resulted in some social exclusions. As such, in the 1990s, the focus shifted to universal design, a process that would ensure the disabled were taken into account even from the design phase, and that products could be equitably usable by all people despite any differences between sexes, age, capabilities, needs and aspiration.

The newest design philosophy of inclusive design has similar goals, but adopts a different approach. It invites the disabled to collaborate with non-handicapped professional designers

from the phase of product design. The idea is that the relationship between these two groups should be equal, so there is inclusion across the whole process.

This is also a concept that should be applied to advance the digital infrastructure in museums. Museums should encourage ordinary people to contribute to designing the tools and content, for example, like how Europeana[1] and the Digital Public Library of America encourage ordinary people to use the application programming interface (API) to promote the use of its contents, holding workshops for its development, so that the people can participate, intervene and develop tools freely.

The overall principles of museums

Ultimately, all physical or digital efforts are to serve two fundamental museum principles. The first is for asylum, as in a synchronic way, museums should be safe, neutral places where people can meet and share their ideas and emotions freely with a diverse group of contemporary people. The second is for inter-generational ethics: In a diachronic way, museums are time-institutions to fulfil moral obligations to the future by protecting assets from the past.

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[1] Europeana is a European initiative that seeks to empower the cultural heritage sector in its digital transformation.