DIGITAL LEARNING AND EDUCATION IN MUSEUMS

INNOVATIVE APPROACHES AND INSIGHTS

A NEMO REPORT BY LEM

THE LEARNING MUSEUM WORKING GROUP

NEMO Network of European Museum Organisations

Network of European Museum Organisations (NEMO)

The Network of European Museum Organisations (NEMO) was founded in 1992 as an independent network of national museum organisations representing the museum community of the member states of the Council of Europe. Together, NEMO's members speak for over 30.000 museums across Europe.

NEMO Working Group LEM – the Learning Museum

The working groups of NEMO (The Network of European Museum Organisations) offer their members a European perspective on different topics that are important to museums. The Learning Museum (LEM) Working Group explores topics relating to the fields of museum education, audience development, intercultural dialogue and lifelong learning.

It started out as a continuation of LEM - The Learning Museum, a network project funded by the EU and carried out between 2010 and 2013, in which NEMO was a partner. Collecting the legacy of LEM, the Working Group today supports the exchange of information and learning among museum professionals in Europe, through various study visits to different museums in Europe organised for its members, as well as through studies and reports produced by the group.

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DIGITAL LEARNING AND EDUCATION IN MUSEUMS

INNOVATIVE APPROACHES AND INSIGHTS

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GENERAL OVERVIEW

Presenting a series of digital projects developed in European museums for remote audiences in the period from the beginning of 2020 up to 2022, this report highlights various formats of digital engagement and innovative approaches to digital learning and education, as well as insights and recommendations from museum professionals and experts from the tech sector.

The impact of the coronavirus pandemic, which led to widespread museum closures starting in March 2020, on the accelerated digital transformation of the museum world has been repeatedly highlighted in studies and institutional reports ([NEMO](#), 2020; [ICOM](#), 2020; [UNESCO](#), 2020). Some of the following digital initiatives have been initiated in the wake of pandemic-driven closures, while others were conceived before it and implemented despite the aggravating circumstances of the pandemic, or have been conceived and implemented in recent post-pandemic times. These projects demonstrate how, over the past three years, public and private museums across twelve European countries have been experimenting with different digital formats and discovering different opportunities provided by digital technologies, tech solutions and Open Access policies for content mediation, education, storytelling and engagement with remote visitors.

In the fifteen case studies selected, which are based on in-depth expert interviews with museum professionals, ranging from directors to educators and staff in digital capacities, and with experts from the tech world, and which took place between April and March 2023, we review the concepts of the projects, background information, identify objectives, challenges and obstacles, learning benefits, and institutional approaches to digital learning, and present major takeaways and recommendations from the interviewed professionals. The collection of these case studies is followed by key findings drawn from interviews and desk research that will be useful for the community of museum practitioners and policymakers interested in fostering digital engagement, learning and education in the cultural heritage sector.

In this report by the NEMO Working Group LEM - the Learning Museum we look at digital learning in a broader sense, not focusing solely on formal educational projects, or on digital initiatives that are being developed from the beginning with the goal of delivering learning outcomes (formal and non-formal learning), but also projects where learning might take place unintentionally, as for example, in the process of playful interaction with museum objects in the format of a chatbot or when co-curating the digital museum collections and adding some metadata to the objects (informal learning). Although it can be complicated to track what and how remote users learn, in some cases, we were able to access the feedback of online users and look at the learning benefits from their side, but in most cases, the potential learning benefits are assessed by museum professionals. As for digital education, we mainly refer to it in the context of the formal educational initiatives which have been tailored to the school or university curriculum.

We present the selected digital initiatives within the framework of four thematic blocks.

The first chapter ties in with the [article by Lisa Peter](#) and is dedicated to the educational opportunities associated with the digitisation of museum collections and archives, as well as opening access to the museum data. [An interview](#) with one of the main advocates for the opening of museum data, curator at SMK - National Gallery of Denmark Merete Sanderhoff, allows us to dive a little deeper into the issues related to the opportunities and risks associated with opening access, assess how significant the opening of access to cultural heritage is from the point of view of education and learning, and learn more about the upcoming launch of the digital educational platform SMK Connect. In addition, this chapter presents four case studies that reveal different scenarios for creative interactions with digitised collections in the context of digital learning, including reuse of open museum data (cultural hackathon [Coding da Vinci](#)) or citizen co-curation of the digitised city heritage (platform [Collections of Ghent](#)). Two case studies demonstrate how digitised museum collections can be used to engage the most vulnerable groups, for example, children in a detention house ([Oberstown Project](#)), who cannot visit a museum physically, or children with learning difficulties who might need alternative interpretation approaches ([Art See App](#)).

In the second chapter, we will talk about learning formats related to social media and the expansion of museums into virtual environments and Extended Reality, including Augmented reality (AR), AR holograms, and Virtual reality (VR). We will see how virtual museums and online platforms created in the wake of the Covid-19 pandemic can be used as additional channels for the distribution of learning content, including audio, video and photo materials about collections. Also in this section, we will observe how museums have been practising techniques for conducting [live-streamed tours](#) on social media during the pandemic, and creating new spaces for exchange and enabling participation. The project [Ancient Olympia: Common Grounds](#) will examine the role of 3D digital cultural heritage for education. Using the example of a digital learning resource centering

around an AR hologram of a spitfire engine from the collection of the Imperial War Museum, we will see how museums in a pandemic are looking for new engaging digital formats for school education. Moreover, as an example of the AR app developed by the Anne Frank House, we will raise the topic of digital storytelling, the importance of the personal storytelling in digital learning, and the possibilities of digital education for countering prejudice and discrimination. In addition, several projects illustrate which opportunities for digital learning can be provided by the relatively new space for the cultural heritage of the so-called Metaverse. The Finnish National Gallery's Finnish Metagallery project illustrates how a historic architectural building can be recreated using the example of the Finnish Pavilion at the 1900 World Fair in Paris in Decentraland. This chapter concludes with an interview with the Head of Digital at the National Gallery in London Lawrence Chiles, who shares his experience of bringing the National Gallery to the "different spaces" through the digital game "Keeper of Council" and his thoughts on how the Covid-19 pandemic has pushed museums to reevaluate the role of these spaces for engagement with audiences and learning.

The next section will revolve around digital communication and chatbots. It will explore two different conversational formats aimed at mediation of museums narratives and collections: Facebook messenger with first-hand stories about the Berlin wall and AI chatbot carrying on a conversation with online guests of the Musée des Augustines on behalf of Dame Tholose (a bronze sculpture from the Toulouse Renaissance). In addition, in this section we explore the possibilities of the Artificial Intelligence chatbot ChatGPT.

The final chapter will focus on digital games and playful learning. Mobile or web games can be a great tool for interactive learning not just for kids but also for adults. The game Prisme7, created in the Pompidou Center, illustrates how the Pompidou collection and the history of contemporary art can be explored in a playful manner. Using the twiddle game created for the eight Leibniz research museums, we will see how the complexity of the world, nature and technology can be explored in a playful way by solving quests, by collecting and creating our own digital objects. The final case study focuses on mobile Hellenic IT Museum's VR adventure for children 7+, where they are encouraged to learn about computers by completing several challenges, whilst learning the basics of engineering and developing a deeper understanding of the history of computing as a result.

By capturing all these diverse projects, presenting insights from inside museums, and by giving a final summary based on these insights and recommendations from museum practitioners, we hope to offer ideas and inspiration to stakeholders at all levels, current and future museum professionals, educators and policymakers. Some insights will also be useful to the community of tech experts working on the development of innovative technology solutions for the cultural heritage sector.

We believe in the importance of sustainable digital mediation in museums and hope that some recommendations provided by the museum4punkt0 network will be useful to museum professionals looking for sustainable ways to profit from digital innovations in visitor engagement, mediation and education.

This report also demonstrates the significance of opening up access to digitised museum collections and other digital assets for the promotion of the educational role of museums. In particular, the article by Lisa Peter, using Europeana's educational activities as an example, demonstrates how Open Access collections can help support cultural heritage institutions in the development of online resources and learning scenarios. Europeana, as a portal providing online access to a vast store of cultural heritage material from across Europe, plays a prominent role in bridging museums and digital education.

This publication will be useful to those looking for new ideas and formats for meaningful digital engagement with virtual visitors and reaching out to new audiences. We believe that learning from each other and sharing insights is vital for the post-pandemic museum world. We are sincerely grateful to all the contributing professionals, museum practitioners, digital experts and policymakers who found time to share their thoughts, expertise and experiences.

DIGITISED MUSEUM COLLECTIONS AND ARCHIVES FOR EDUCATION, LEARNING AND CREATIVE ENGAGEMENT

OPEN ACCESS FOR LEARNING

INTRODUCTION

Digitised collections and archives for research and learning

Europe's cultural heritage institutions and museums have been digitising their collections for decades. The digitised and born-digital collections and archives have become a valuable knowledge resource for the self-guided exploration by the general public and for researchers, and also made it possible for remote visitors to access materials that are not available in the physical museum venues due to conservation conditions or limited exhibition hall space. It has also significantly simplified access to museum heritage for those who cannot physically visit museums for various reasons, whether limited mobility or being detained. Undeniably, during the museum closures caused by the pandemic and lockdown restrictions, the value of digitised collections for remote visitors has been proved more than ever.

Technology solutions applied to create online interfaces with digital collections either on the museum websites or on external platforms allow remote visitors to use a wide range of search, filter and exploring options. Visitors can view details in high resolution, access factual metadata and curatorial texts, explore digital collections by the same artist, subject, period, geography or similar motifs. Advanced collection management solutions, as for example provided by the platform Navigating Art, enable automatic recognition of texts and full text search possibilities with the help of AI, thus making large digitised archives more accessible.

Citizen curation

Along with exploring and researching, remote visitors in some cases are provided with an opportunity to co-create and co-curate digital collections and archives, add their own items or metadata, and be involved in decision-making processes with museum and cultural institutions, thus becoming "citizen curators". Thanks to SPICE, a project supported by the European Commission Horizon 2020 Programme, minority groups underrepresented in museums can share their own interpretations of museum objects on digital interfaces designed within the framework of the project and reflect on interpretations contributed by others both onsite and remotely. One of the SPICE projects presented in this section will show how a group of teenagers in a detention campus in Dublin, co-curated an onsite exhibition using a digital interface with the digitised collection of the Irish Museum of Modern Art , interpreting art works and getting acquainted with the art, museums and exhibitions.

Digital collections and remote teaching

During the pandemic, digitisation of collections has led to a greater move towards using online collection resources for remote teaching in schools and higher education. Europeana, which provides a rich variety of educational resources related to European cultural heritage and serves as a platform for knowledge exchange between museum educators, is one of the catalysts behind this process. Digitised museum collections provided school and university educators with excellent opportunities for development of learning resources for the classroom or home-based study programmes. On external digital platforms such as, for example, ArtCentrica, educators can use a variety of tools (e.g. annotation tools, compare buttons, search by timeline) either to create new lessons, or to customise the pre-existing ones.

There are a number of projects that investigate the potential of digitised cultural heritage for education and learning. One of such projects was launched by the University Museums in Scotland (UMIS). During the Covid-19 pandemic in 2020, members of the group of nine university museums met regularly to share information and different approaches to collections-based teaching and learning. Building on this exchange about teaching and learning online with collections during the pandemic, they have initiated a research project that is based on existing research and case studies and that investigates "the opportunities, capacity and barriers for digital engagement with collections, interoperability between institutions, and evaluating the impact of collections-based university teaching that has been pushed to online online and digital delivery." The interim results of this study are available on the project website.

Open Access to digitised collections, learning and education

Open Access to digitised collections, which makes digital images and metadata (for example, title, artist, date made, medium, dimensions) in the public domain available for unrestricted use without financial or legal barriers, significantly enhances the potential of digital heritage for education, learning, research, knowledge sharing, and creativity. Such data may be mixed with other resources, used for scientific purposes and teaching, or integrated into new digital applications, as an example of the cultural hackathon Coding da Vinci will demonstrate later in this chapter.

One of the main advocates of opening access to the digital museum heritage curator at SMK Merete Sanderhoff explains the concept of Open Access in the expert interview opening up this chapter, and she also sheds light on the opportunities Open Access has for museums in the context of education and learning, presenting the work of the SMK, and highlighting challenges involved. Moreover, an article about integrating Online Access collections into museum learning by Lisa Peter goes into a bit more detail about what kinds of learning activities and learning scenarios can be created with the help of Open Access materials, using the example of Europeana's education activities.

Europeana, as a multilingual resource providing online access to a vast store of cultural heritage material from across Europe and a hub for sharing knowledge between the cultural professionals interested in different aspects related to Open Access and the GLAM Sector, for instance Copyright, plays a prominent role in bridging museums and digital education. Through workshops, frameworks and a variety of tools, Europeana promotes Open Access Policies within the professional community of the European cultural heritage sector.

Along with Europeana there are an increasing number of projects and initiatives on the European level aimed at unlocking the potential of Open Access in the cultural heritage sector for education, learning, research, knowledge sharing, and creativity. H.E.L.P (Heritage Education New Web Formats And Free Licences Opportunities For Dissemination, Co-creation And Open Data), the initiative led by ICOM Italy, together with the other partners ICOM Czech Republic, ICOM Portugal and the ICOM Working Group on Sustainability, is one of the projects that encourages participation and active reuse of digital reproduction of museum collections, brings out advantages of free licensing and public domain for museum education, and provides museums with the fundamental guidelines for a correct legal approach.

Overall, this chapter will present four case studies, demonstrating the educational and learning potential of digitised collections and Open Access.

Screenshot of EUROPEANA website.

LEARNING THROUGH CO-CREATION AND CREATIVE REUSE OF DIGITISED COLLECTIONS

THE EDUCATIONAL VALUE OF OPEN ACCESS

OPEN MUSEUM DATA, LEARNING AND EDUCATION LEARNING PLATFORM SMK CONNECT: OPEN ACCESS AND EDUCATION AT STATENS MUSEUM FOR KUNST (DK)

INTERVIEW WITH MERETE SANDERHOFF

Merete Sanderhoff *is a curator and senior advisor in the field of digital museum practice at SMK. She is responsible for the museum's Open Access policy and works to foster active re-use of the museum's digitised collections for research, learning, knowledge sharing, and creativity. Merete is currently a member of the Europeana Foundation Advisory Board.*

Could you explain what Open Data is in the context of digital museum collections?

Museums and other cultural heritage institutions hold collections on behalf of the public. We have knowledge and information about both the artworks and the artists, and also reproductions of the artworks. Before the digital era, we would send that information out on request to publishers, researchers and educators, etc. It was a necessary transaction because we needed to get the information - the data - back as it was in physical form. Since digitisation, it's been possible to simply share copies and that has been a paradigm shift for the cultural heritage sector. Now we can open up the data and just make it available so people can take what they need. However, in order for data to be open, we need to make a conscious contribution - a choice to open this material up - and this has been slowly catching pace for 15 to 20 years in the cultural heritage sector. **More and more institutions recognise the public interest in being able to access this material for many good reasons: educational, lifelong learning, research, creative reasons, and also just for transparency reasons.** Because we're public institutions, this data should be accessible and usable because we hold it on behalf of the public. So that's open data in short.

What are the learning/educational benefits of opening up access to digital data in museums?

Educational institutions everywhere need access to trustworthy materials for education, which not only focuses on a narrow canon but opens up wider perspectives for the students, so that both individuals and communities can form more informed, complex, and inclusive outlooks on the world. I think one of the problematic legacies of museums has been the fact that very small parts of our collections are actually on display in our physical venues. When we digitise our collections, so much more comes to the surface. For instance, art by female artists and different minorities has just been invisible. **I believe there's enormous potential in opening up much more of the diversity that we hold in our collections, especially for educational purposes, because students can gain a broader horizon on what our cultural heritage is made up of.** In today's societies, where school kids have many different cultural backgrounds, it's important

Vilhelm Lundstrøm. Portrait of the Poet Emil Bønnelycke, 1921. Statens Museum for Kunst, open.smk.dk, public domain.

Constantin Hansen. A Group of Danish Artists in Rome, 1837. Statens Museum for Kunst, open.smk.dk, public domain.

that these kids can see themselves reflected in the art and culture they meet in class: diversity in cultural backgrounds, in gender backgrounds, in religious and historical baggage. Our collections often hold that kind of diversity, but it's not necessarily what you meet in the physical museum because the space there is limited. But on the internet we don't have that limitation.

What are the challenges and risks of opening up access to digital data in museums?

A challenge is definitely resources. There's so much for us to do. With collections follow many obligations – to constantly research, inquire and ask new questions, reflecting how the times are changing around us. New kinds of questions that the cultural development is demanding us to ask. For instance, here at SMK, the National Gallery of Denmark, we're starting to look into art from Greenland which is a part of the kingdom but its art was never really given much attention. The same is happening in other Scandinavian countries where the Sámi cultural heritage is for the first time really being investigated and taken into account as part of art history now. Similarly with the whole wave of female artists and artists of different genders and sexual orientations.

Then there's the conservation obligation which continuously requires massive resources. Also, staffing is a challenge because with the digital turn, we need new kinds of competencies in our staff in order to follow the development, and be able to offer what the public is starting to expect from us in terms of accessibility and responsiveness. We're expected to be in mutual dialogue with the surrounding world, not just send out our knowledge, but to step into a new role as facilitators. Digitisation is still a fairly new field for many museums so there's quite a steep learning curve, a lot of new skills to acquire. But most of all, it's very promising and exciting to work with digitisation. I think there's a lot of unnecessary concern that if you open up your data, people will do bad things with it and misuse our cultural heritage. **Here at SMK, we have more than ten years of experience with open data and we have seen example after example of fantastically creative, imaginative reuse by the public – ideas that we never got ourselves.**

A huge example is how cultural heritage data, images, and material are being reused on Wikipedia. Many cultural heritage institutions today have an educational strategy and we create a lot of educational material. But try to compare it with the educational reach of Wikipedia. For most school kids - and a lot of teachers too - Wikipedia is the place you start your research, and often it's the first hit you get when you google something. So it's super important that our source material is accessible through Wikipedia and that our trustworthy data actually inform what Wikipedia tells you about, say, an artist, a period, or a cultural phenomenon. We have been working for seven years in partnership with the Danish Wikimedia chapter to ensure that volunteer Wikipedians have access to open data from Danish cultural heritage institutions. So it's not like we write Wikipedia articles about our own material. An arm's length approach is required between the subject and the writer. Neutrality is one of the basic principles of Wikipedia. But the fact that we have open data and quality images is a great resource for the volunteers who write on Wikipedia. They search on the internet trying to find good sources and illustrations. Museums, archives and libraries have that. So it's an important bridge to build which benefits learners of all ages out there.

Could you tell us about the educational/learning benefits of opening up access to the digitised collections in the SMK?

We're working on a project called SMK Connect. The past five years, we've spent a lot of effort creating an open online collection where material is made as open as possible. It's a basic infrastructure that connects all the digitised materials we have and makes it accessible. The next step we want to take is to package material from our online collection specifically for education. Because one thing is making it universally available. Another thing is building bridges to specific stakeholders and end-user groups. And teachers and educators are notoriously super busy and tied up, fulfilling learning plans and curricula. We want to make an extra effort to reach out to them and understand their needs because for us, there's great value in creating an online collection that supports education for everyone in society.

Carl Bloch. In a Roman Osteria, 1866. Statens Museum for Kunst, open.smk.dk, public domain.

With SMK Connect, we're building those bridges. We're collaborating with schools all over the country, engaging in dialogue with the teachers to find out how we can package the material and make it easy and beneficial to bring art historical content into classrooms. The idea behind SMK Connect grew out of the Covid-19 lockdowns. For years we have noticed that usage of our online collection peaked during public school and high school exam periods. We knew that both teachers and students were looking for material for learning purposes. We have a long educational tradition at SMK with classes coming into the physical museum. **During the lockdowns, teachers were itching to get new inspiration from museum education to do something more creative and inspiring with all those school kids stuck in isolation in front of their screens.** We're developing SMK Connect also with a view to the future as an educational platform where you start by the screen, but then send the kids outside, out into their local environments to do stuff together, to go find physical locations that relate to artworks in our collection, or go search for materials that artists use to create colours or frames or whatever, just get kids away from the screen for a while to do something together.

SMK Connect is founded on SMK's education philosophy, called dialogue-based teaching. It's based on the idea that it's not about learning something static about the art. Rather the art space is a place where you can learn to develop your own thinking, where you can ask open-ended questions and learn something new by hearing what others are thinking. Instead of just having a teacher tell you "this was painted in 1895 by this artist" we would like to inspire learners to reflect on their own life and experiences through the conversations that can arise when you look at art.

What would be your recommendations for museums considering making the first moves towards opening up access to their digital data?

Trust your users. People who find their way to our open online collection express a lot of gratitude and deep interest. They share their knowledge with us. We learn from them. I truly believe that over time, this builds a user base for museums. A different mindset towards museums where people find us friendly and see us as relevant, necessary institutions. Not everybody is a museum visitor in the regular sense, and never will be, but everybody can use us for something that's relevant for them. I think it's crucial for our survival in the long term to trust our users.

CULTURAL HACKATHON CODING DA VINCI AND OPEN MUSEUM DATA FOR CREATIVE REUSE LEARNING THROUGH CO-CREATION (DE)

Concept and context

Coding da Vinci is the first German hackathon for Open Cultural Data, which aims to bring together people from the cultural world and people from the tech world in order to develop digital applications together on the basis of Open Cultural Data. Over 2,000 participants at Coding da Vinci events have developed over 210 digital applications based on almost 500 datasets shared by 362 cultural institutions.

How does a Coding da Vinci hackathon work?

Kick-Off: *presentation of the data by cultural institutions, workshops and team building. Descriptions of the datasets and links to all media files and metadata can be found on the digital portal of* Coding da Vinci.

Sprint: *the sprint phase between kick-off and award ceremony lasts six to ten weeks to give the participants and the data-providing institutions more time and space for communication and complex design. The participating hackers, coders, designers, etc. develop their projects on a voluntary basis and in their free time. That is why it is not possible for data-providing institutions at Coding da Vinci to commission applications exclusively according to their wishes. Implementation of the project idea can neither be demanded nor guaranteed.*

Award ceremony: *public presentation of all projects and award ceremony*

Here are some examples of the projects

• Wiederaufbau Ost-Berlin: A mobile webpage that combines archival material from different sources to recreate the vision the GDR government had of its capital.

• Zeitblick: An app that analyses selfies and searches for historical look-alikes in the image archive of the arts and crafts museum in Hamburg.

• Berliner MauAR: This Augmented Reality app brings back the Berlin wall. Historical photos are downloaded and positioned on your screen right where they have been taken.

Background information

This format was initiated by the Deutsche Digitale Bibliothek, the Open Knowledge Foundation Germany, the Berlin Research and Competence Centre for Digitalisation (digiS) and Wikimedia Germany. Since 2014 Coding da Vinci has brought together technophile communities, cultural enthusiasts, institutions of cultural heritage and museums in Germany in order to unfold the creative potential of digital cultural heritage.

Digital format

In the spring of October 2020, the hackathon Coding da Vinci took place as an online event for the first time since its inception in 2014. The plan was to carry out the kick-off as a hybrid event, however, the tightening of the corona measures led to the decision to switch the event to online one week before kick-off.

Onboarding Coding da Vinci Rhein-Main 2018, CC-BY 2.0, by Mainzed.

Learning benefits

Hackathon Coding da Vinci brings learning benefits both to participants and museum professionals.

1. For the participants: learning about handling Open Cultural Data and exploration of its potential. Many of the participants come to the Coding da Vinci hackathon in order to try new digital skills that they have just learned, to practise them and to use the hackathon to improve their skills. Engagement with Open Cultural Data allows participants of the hackathon to explore, experiment and foster their creativity.

2. For museums and cultural institutions: learning about opening up data, handling open data, open licensing, metadata standards and presenting open data both in front of a physically present audience and online.

As the Head of the headquarters office of Coding da Vinci, Philippe Genêt highlights:

"Opening data is also about opening up minds because there are no legal issues to worry about – and thus no limits to your creativity. At Coding da Vinci you can remix and alter the data, put it into new contexts and tell your own story with historical and cultural data. This wouldn't be possible if the data was not open."

Feedback from museum professionals (data providers) and participants

Data providers:

"I got to know a completely new world of computer scientists, graphic designers, etc., who can do really great things with cultural data." (Coding da Vinci Nieder.Rhein.Land 2021)

"It was very enriching to talk to people who have had little contact with traditional museum work (unfortunately) so far, although they basically have a lot in common: a very democratic approach to communication or better accessibility to knowledge. Due to the Covid-19 pandemic, the exchange may not have been as intensive as it would have been analogously - in a personal conversation. In terms of communication between the hacker and culture community, I definitely took away that we need to talk to each other more and understand our (professionally) different languages." (Coding da Vinci Schleswig-Holstein 2021)

"The whole process was a new experience: the viewing of potential data sets, the presentation of the data with a view to potential technical implementations by the participants, and the close exchange with the participants during the sprint phase. We now have a good impression of how a hackathon works or can work, who the potential contacts are, and for which data sets open licensing should be considered in the near future." (Coding da Vinci Schleswig-Holstein 2021)

Participants:

"Was very inspirational. I also 'played' with the data from other cultural institutions." (Coding da Vinci Ost³ 2022)

"A very nice project. Great organisation, met interesting and nice people. I am very motivated to learn more in this area..." (Coding da Vinci Nieder.Rhein.Land 2021)

"I met great people and we created an exciting project. The integration of the cultural data enabled us to be very creative." (Coding da Vinci Schleswig-Holstein 2021)

Logo of the Coding da Vinci Hackathon in Lower Saxony 2020, public domain.

Challenges and limitations

1. Digital format. To find the right tools and methods to move the hackathon to the digital space due to the Covid-19 restrictions. Philippe Genêt mentioned that *"the atmosphere and outcomes of physical and digital events were different. It was difficult to form groups of people who did not know each other. For those who knew each other before it was easier. People are more reluctant online, whereas they are more open at onsite events."*

2. Sustainability

2.1 The source code of the developed prototypes decays over time if it is not maintained by its creators. So some of the prototypes cannot be used anymore.

2.2 Some participants do want to continue working on their prototypes after the end of the hackathon and get frustrated if the data providers are reluctant to support them.

3. Limitations of budget, time and political boundaries. Sometimes museum staff cannot overcome internal boundaries and are resistant to working with digital applications.

4. The decline in the number of participants. Philippe Genêt points out that there is a decline in participant numbers, while the number of cultural institutions involved in hackathons is rising.

5. Digital skills. The amount of people who are able to use Open Cultural Data is relatively small. *"We need to educate people to use open data and to convey the skills to as many people as possible."*

Historical children's books, public domain.

Major takeaways

Philippe Genêt:

1. Hackathons are great ways to bring people together. And they are great for sparking creativity and for producing many ideas in a very short time. They are also great for learning, including learning from each other.

2. Hackathons should be more sustainable. Just 10% of the projects from the hackathon Coding da Vinci are in use now.

3. It is necessary to be aware of how to design a hackathon. It is very important to define a goal and to be very clear about it.

CITIZEN CURATION OF DIGITISED MUSEUM COLLECTIONS AND LEARNING

'THE RIDE AWAY FROM THE STORM': CO-CURATING AN EXHIBITION WITH YOUNG PEOPLE IN CONFLICT WITH THE LAW USING WEB APP DEEP VIEWPOINTS (IE)

Institution
Irish Museum of Modern Art (IMMA)

Location
Dublin, Ireland

Description
IMMA is Ireland's National Cultural Institution for Modern and Contemporary Art. Its diverse and ambitious programme comprises exhibitions, commissions and projects by leading Irish and international artists, as well as a rich engagement and learning programme

Size
National Collection of Modern and Contemporary Art includes over 3,500 artworks by Irish and international artists

Staff members
100

Project
Web app DEEP VIEWPOINTS - a platform with the IMMA digital artworks for citizen co-curation and, as a particular project, application of this platform for engagement with young people in Oberstown Children Detention Campus.

Timeframe
2020 - 2023 ('The Ride Away from the Storm' Project November 2021 to May 2022)

Concept

IIMMA is one of the five case studies of the EU H2020-funded SPICE Project, dedicated to citizen curation of cultural heritage. The aim of the project is to foster diverse participation in the heritage domain through a process of citizen curation. SPICE is developing technologies that help communities select paintings, artefacts and other museum objects and share their perspectives with others. These processes open a way for the museum to support multiple voices around their objects, in which participants not only interpret artworks but also mediate how others understand and experience them. IMMA's case study aims to support groups who are less able to visit the museum physically, such as asylum seekers and children with serious illnesses, to access collections and share their own perspectives, both online and in the museum.

In 'The Ride Away from the Storm' project, a group of young people from Oberstown Children Detention Campus (a detention facility with high security which cannot be left by these young people) worked together with the SPICE Project Researcher at IMMA Adam Stoneman to develop an exhibition of their own paintings in dialogue with the works from the IMMA collection they had selected. They used the web app DEEP VIEWPOINTS to select and interpret digitised works from the IMMA collection. In the process of this work, they acquired knowledge about art, exhibitions and the organisation of the museum. The exhibition took place at IMMA in May 2022 and was titled 'The Ride Away from the Storm', a title taken from one of the paintings.

Oberstown Project

Oberstown Children Detention Campus

Oberstown Children Detention Campus is a detention centre for young people aged between 13 and 17 remanded in custody or sentenced by the courts for a period of detention. There were ten boys who took part in this project. SPICE Project Researcher at IMMA Adam Stoneman facilitated workshops at Oberstown with the boys every week for eight weeks. The boys also worked with an art teacher from Oberstown to develop their own paintings which were included in the exhibition.

Process of work: conversations about art and slow-looking

As Adam Stoneman noted, the starting point for the young people was to understand what an exhibition was, what kind of process this was, and what they were going to do. These young people had little experience with arts, only one of the boys out of ten had ever been to a museum before on a school trip, and he had an unhappy memory of the visit. They began by looking at their own paintings, which were more familiar, and discussed in groups interpretations of form, composition and content. Next, the young people looked at artworks from the IMMA collection. Here the group used the process of slow looking, a methodology related to Visual Thinking Strategies, in which the emotional and personal responses of the viewer are more important than domain knowledge.

Courtesy of Oberstown. Jenny Barker Photography (c).

DEEP VIEWPOINTS: interaction with digitised IMMA works in the web app

In order to structure their curation of the works, the boys used DEEP VIEWPOINTS, a web application with a data infrastructure that could efficiently manage an online collection of over 3,000 IMMA artworks. Low on technical requirements and compatible with multiple platforms (smartphone, tablet, laptop), the app was designed by Open University and IMMA as part of the SPICE Project to maximise accessibility to target groups. This app allowed them to select and arrange works from IMMA's online collection. For Adam Stoneman, it was important to use a selection of artworks representing the collection as a whole, and he found 60 artworks relevant to the project. Then the boys had to select a work from the collection that they felt resonated with them and with their own painting. Using this web app, they were able to create an interactive ''script'' or a sequence of stages in which they placed their own works and those from the IMMA collection, together with a set of questions and reflections to guide the interpretations of others.

Digital natives and creativity

Most of the boys were completely fluent in the use of a tablet and the web app to construct the narrative or curation. There was just one boy who struggled with a tablet due to the length of time he had spent in detention.

As Adam Stoneman observed, there was a particular mode of creativity using a tablet. The boys typed their responses in a vernacular way using emojis. The facilitation was important here, in supporting them to articulate their perspectives in their own words. *"This was me in the room with them, encouraging them to ask questions, encouraging them to push beyond monosyllabic single answers,"* Adam emphasised.

The final exhibition 'The Ride Away from the Storm' at IMMA. Presentation of the results

Over a process of 8 weeks, the boys fleshed out the responses to their works and developed the curation of the exhibition, discussing thematic connections between the works. Miniatures of the works were placed inside a wooden model of the gallery space, built in their woodwork room. A SketchUp 3D render of the gallery was also used to visualise the exhibition. The physical model of the wooden gallery was displayed in the exhibition at IMMA, to show the public the process that the group had gone through.

There were 13 works by the young people alongside their selection of 13 works from the IMMA collection at the exhibition. Overall, the exhibition was curated by their responses, their choices, their selections, and their interpretations. It was not possible to include all the works due to the size of the space. Here again technology was useful because IMMA created a PDF exhibition document that was available online by scanning a QR code in the gallery, which contained the selections in full.

Launch of The Ride Away from the Storm at IMMA 2022. Louis Haugh Photography (c).
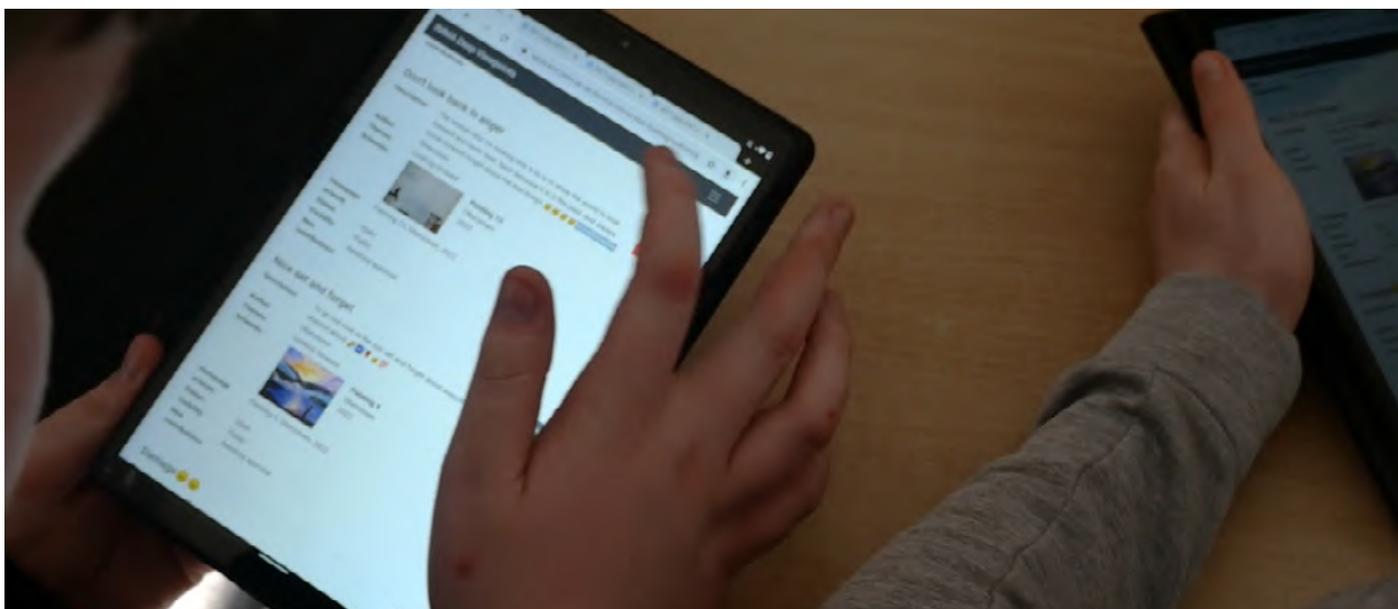
The Ride Away from the Storm documentary directed by Sorcha O'Dwyer and Don Wycherley (c).

Involved parties

The Irish Museum of Modern Art, Oberstown Children Detention Campus, Gaisce – The President's Award (a self-development programme for young people in Ireland between the ages of 14 and 25).

Objectives

1. To create opportunities for arts education and participation for a hard-to-reach group (young people in conflict with the law).

2. To support the young people to take ownership by becoming citizen curators in an exhibition of their paintings in dialogue with the selections from the IMMA collection.

Learning benefits

New knowledge about museums and art

1. The boys learned about the collection of IMMA, different aspects of museum work and a variety of museum professions. *"And one thing for me that was very beautiful is that at the end of the process, one of the boys asked if he could become a member of IMMA, and if his membership could start at the date of his release from Oberstown,"* Adam Stoneman said.

2. Gaining confidence and an ability to speak about modern and contemporary art and gaining a sense of ownership of the national collection.

Art lessons and digital skills

1. According to Adam Stoneman, the art teacher of the young men was very tech literate and very open to using technology in creative processes. The young people were actively using Photoshop and other software programmes to develop their paintings, which allowed them to enhance their digital skills.

2. Curating digitally using the DEEP VIEWPOINTS platform, where boys could slide between images, arrange things, and add text, was also about gaining new digital skills.

Obstacles and challenges

1. Institutional and social constraints on the young people's free expression. The boys in the project faced significant institutional and social (peer) pressures which limited what they felt they could openly say. This was mitigated by their selecting modern and contemporary artworks from the IMMA collection, which, in their ambiguity and openness to multiple interpretations, allowed darker emotions and themes to be present in the exhibition.

2. Low digital literacy of one participant in the group.

3. Anonymity. It is illegal in Ireland to identify any person under the age of 18 who has been convicted of a crime. The young people cannot be identified by any personal information; this complicated the process of sparking a personal connection between a young person and the public at the exhibition.

4. Emotional challenges related to prison education. Adam Stoneman: *"I found it emotionally challenging. I think it is a challenge for anyone doing prison education. You believe in the rights of everyone to an education, but then another part of your brain knows that some of these people that you're in the room with have actually committed really terrible crimes. It's a challenge to keep those two things entirely separate."*

Major takeaways

1. Citizen curation. Curating through visual art can be a very empowering form of expression for young people and young people without a voice. As highlighted by Adam Stoneman, this project emphasised how transformative citizen curation can be for young people, but also for the visitors who came to see the exhibition. Perhaps they for the first time encountered the humanity of these children in Oberstown, who are hidden from society.

2. Digital learning. The digital element in this project was an enhancement. It didn't replace the process but enhanced it. The digital allowed the group to access the image collection in a very efficient way. The digitised collection of IMMA and the DEEP VIEWPOINT app allowed the boys to explore a creative way of making, selecting and interpreting the images. The digital enhanced the process of connecting with the museum collection and the process of citizen curation.

3. Reflections on the role of the digital in museum education. Adam Stoneman suggests that in the field of museum education we think that digital is just a neutral tool. However, digital is not just a tool, but a paradigm. Digital technology constructs the world in a certain way. It emphasises certain skills and sensibilities over others. When tablets and the web app were in the hands of the boys, it was not the same as writing on a piece of paper. It represents a paradigm of expression: how you communicate, how you flit between images. It's quite a distracting but powerful mode. But you have to acknowledge that it is a different paradigm of creative expression.

4. Museum technology working group - the space for reflections. Adam Stoneman reflected that after the lockdowns he felt he had been pushed into the digital but there was not really time to consider it properly and no space for discussion of the profound implications of using technology in museum education. In response, Adam set up a museum technology working group with the support of the Irish Museums Association. This group invites speakers from the tech industry, academia, and civil society, to discuss the ethical, social, and even environmental implications of technologies such as AI, VR, Blockchain and biometrics.

Recommendations

Adam Stoneman:

1. The concept has to come first. First, you figure out what you want to do and then secondarily, you think about how you want to do it and how the digital could be a way of doing that.

2. It's important to question the role of digital technology. You should question whether using technology is the best way of doing what you want to do. I think that in museum education, increasingly now emerging technologies have a kind of cachet; they are becoming a dominant mode of doing things but we should be thinking deeply about our pedagogies and processes of engagement, and the role of technology within that, while privileging the social relationships with our communities and audiences.
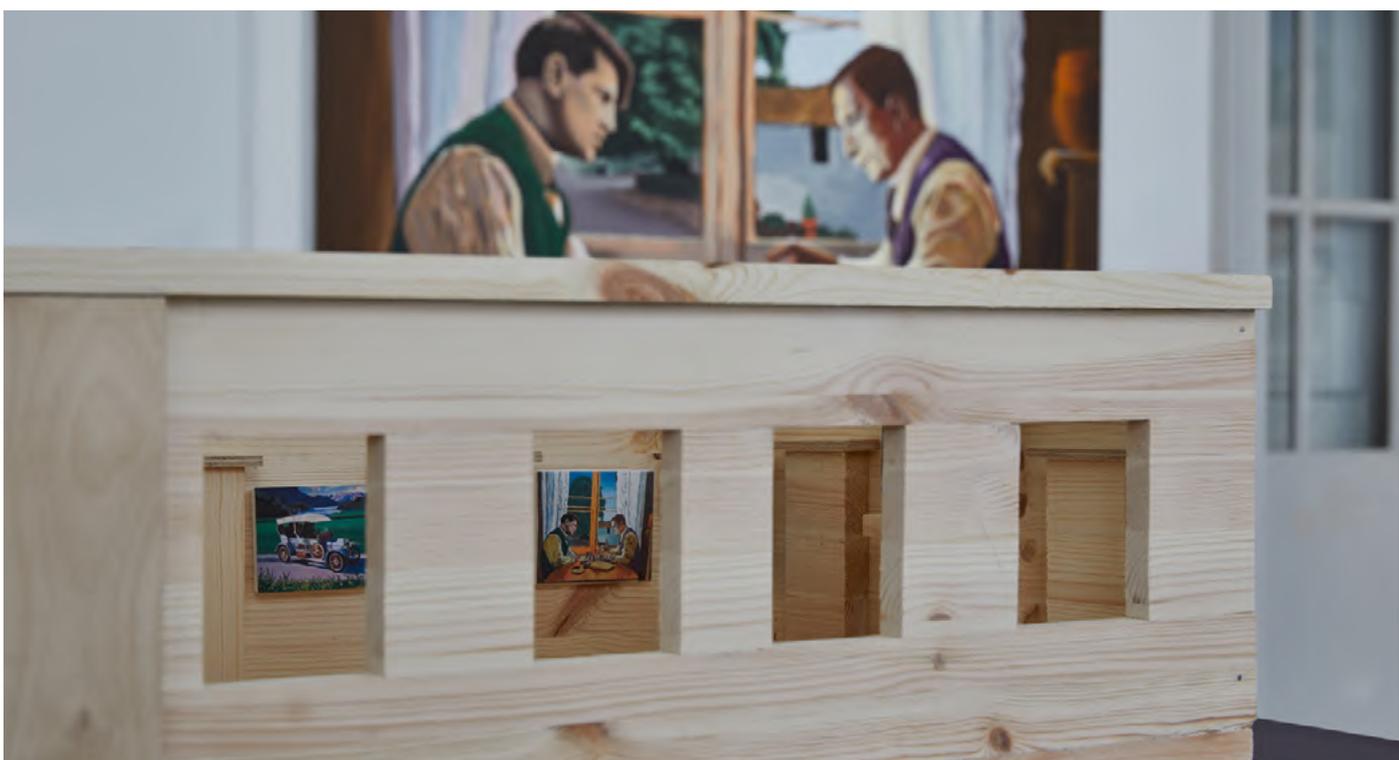
Wooden model built by the young people at Oberstown. Denis Mortell Photography (c).

OPENING UP COLLECTIONS OF GHENT: DIGITAL OUTREACH, LEARNING AND COMMUNITY ENGAGEMENT AT THE DESIGN MUSEUM GHENT (BE)

Institution
Design Museum Ghent

Location
Ghent, Belgium

Description
The Design museum Gent focuses on Belgian design within an international context and is the only museum in Belgium to collect both historical and contemporary design. The museum is currently closed and is scheduled to reopen in 2025 after renovations and the construction of a new wing

Size
The collection now holds nearly 22,000 objects

**Staff members**
34

Project
Collections of Ghent

Timeframe
June 2020 - June 2023

Concept

Collections of Ghent investigates the potential of digitised cultural heritage for the promotion of social cohesion and inclusion on an urban scale and does so on a co-creative and participative basis. Together with the citizens of Ghent and five cultural heritage institutions in the city, it creates a diverse collection consisting of archival material and museum objects but also digitised material from citizens themselves, who are invited to add new objects to the digital platform. This information gathering is carried out online, using the Linked Open Data technology.

The digital Collection of Ghent was put online in February 2022 after more than a year of collecting, scanning, researching, and digitising. At the moment more than 64,669 assets can be consulted online. The aim is to have 100,000 assets digitised and uploaded by mid-2023.

The architectural drawing of the building. Archief Gent, public domain 1.0.

Involved Parties

City of Ghent; 3 local public authorities: AGB Art and Design; AGB Heritage; District09; 1 higher education and research institution: Ghent University; 2 NGOs: VIAA; iDrops; 3 private companies: Studio Dott; Inuits; Fisheye; 1 SME: Chase Creative.

Objectives

Olivier Van D'huynslager, strategic project manager and content lead, Head of Digital, Design Museum Gent:

"By networking this material, we want to increase and ease the use of heritage and lower the museum threshold. By providing correct and descriptive metadata, we also want to ensure and encourage the FAIR use of heritage."

Approach to digital learning

Olivier Van D'huynslager:

"We see a lot of potential in digital media and technology. Whether in reaching out individually or trying to give a more multifocal perspective on things, we need interfaces that can also clearly provide a display of a pluralistic and multifaceted approach of what things are or could be. And that's what we also see as part of our digital programming in the near future. How can we, for example, work together with designers to think about these alternative interfaces?"

New Studio Design and Digital Culture, informal learning and community engagement:

"We are starting Studio Design and Digital Culture, in which we will look at the impact of digital culture on different kinds of topics both within and outside of the museum, but also in terms of learning. Together with a designer, we will be codesigning new interfaces for informal learning. We're still trying to figure out what the entry points will be, whether it's materials, techniques or emotions. But it's also something we want to co-design with people from the outside. If you're talking about informal learning and digital learning, I guess it's too often the museum itself, whether being the curator or the conservator, who gets to define what the topics of this learning should be. It's important that we also go outside of the museum and ask our community or audiences, what's interesting for them."

Learning benefits

1."Collections of Ghent" presents the interconnected stories of the objects from a broader perspective. The audience can learn about the (physical) heritage sites within the city and within the broad (digitised) collections and about how these things are interconnected. As Olivier Van D'huynslager puts it: *"We want to demonstrate to our audiences that all these things can act complementary to each other. For example, there is an old architectural drawing of a demolished building in the city archive. Parts of the facade of this building (architectural elements) are now in another museum. Through the technology we are using, we are now able to put these things together again and remediate them as a whole.*

I think that's the challenge museums always have, they can only tell part of the story. And through digital interfaces, we can go beyond our own, including voices that are not necessarily situated inside of the organisation.

2. Creative approaches to collections and informal learning. By means of digital interfaces, people are presented with alternative ways of approaching the collections that differ from the traditional institutionalised narratives. And there's a lot of potential in that for informal learning and the ways in which we engage with our audiences. It helps demystify collections and present them in contexts which are closer to the people that are actually using them.

3. Knowledge graphs, linked Open Data and knowledge transfer. There lies a great potential and power in knowledge graphs (Linked Open Data), which you can only unlock if you create the right interfaces that define the right questions (query). Knowledge graphs have the possibility to make things more "clear," provide more context, which can be very impactful for learning. At the same time, the vastness of information that is stored within these graphs can easily obfuscate, endangering the learning experience. As such it is important to define the right questions (envisioning what the interface will display as a result) before moving on to designing the interface itself.

4. Informal learning through creative reuse (different approach, creative instead of history/ art and science).

Obstacles and limitations

1. Digital maturity, awareness and competencies within cultural heritage institutions remain relatively poor. Digital maturity in other departments (community workers, fieldworkers, volunteers) outside of the organisation are even harder to cope with.
2. Because of the compartmentalisation present at various levels in the city and the lack of overarching cooperation structures, working together is sometimes a laborious process.

3. As part of the project cycle, there is often too much focus on the end product, and the importance of the process and the difference in expectations threatens to remain undervalued. For example, how can we think in terms of process innovation before product innovation and focus on the difference of 'what is' to 'what can be'.

4. Different organisational cultures of the museum, fieldworkers, and developers. As Olivier Van D'huynslager has observed, *"finding a common language that is needed to co-define and co-design new digital interfaces is not an easy task."*

Challenges

1. Due to the various types of partners and the nature of their business/governance cultures (both in speed and scale), agile development proved to be challenging.

2. Copyright clearance is a big topic for "contemporary and modern collections". Copyrights on design are complicated.

3. Expectation management (hard to explain how a "small feature" can have a big impact on the development (interfaces). Olivier Van D'huynslager gives an example: *"Sometimes we had to mitigate confrontations because some people wanted to have a specific search option or filter options, but we lacked resources for that, or the software simply wasn't designed to do that. When it comes to digital interfaces, people tend to only see what is immediately visible on the surface. What appears to be a small change for them can translate into complex problems beyond the surface, both in terms of software and database design".*

4. Ideation phase. During the ideation phase, it was not always clear for everyone in the conversation what other people were talking about "How do you talk about leveraging linked data when there is no clear notion overall of what Linked Data is/can do?"

Major takeaways

1. Technologies and open data

1.1 Open source technology and open standards can be empowering.

1.2 A strong foundation is crucial (provide support at server-side / data-owner), for example, data cleaning, training, raising digital awareness, and maturity.

2. Communication and collaboration

2.1 Communication is crucial (for example, in terms of expectation management).

2.2 Strength/potential is in collaboration and summarising different viewpoints.

2.3 Importance of involvement of citizens in a professional heritage project/context, opening up heritage conversations.

3. "Content revolution" and new ways of thinking about content creation.

As Olivier Van D'huynslager points out, "it is important to understand that programming online is different and should be approached differently from designing physical experiences. It can be quite challenging for cultural institutions because this move to the digital means that they have to find new ways of thinking about content creation (that differs from analogue media) in order to leverage the true potential that lies in these new (web)technologies. Platforms such as Instagram, TikTok or Facebook demand individual approaches and offer specific ways of learning. Olivier Van D'huynslager believes that for museums it is important to be present on these different communication channels.

Recommendations

Olivier Van D'huynslager:

1. First, figure out what is really needed (analyse, speak with colleagues) - depart from existing needs and opportunities, then venture into the market to find the right solutions. This will make adoption easier as it tackles urgent/real matters.

2. If possible work with Open Source solutions and open standards. This opens up a lot of possibilities to collaborate and exchange knowledge. Opening data does not automatically mean that they will be reused. The reuse of Open Cultural Data, and the development of new interfaces and experiences require resources and time, and it might be unfair to expect that people would do that for free. For this reason, within the project Collections of Ghent, there was a co-creation fund for 13 projects aimed at data reuse.

3. Start by establishing a digital culture instead of a (centralised) digital strategy.

4. There is strength in good partnerships - not necessarily in numbers.

It's important to make sure that you have all the right people on board. So if you have a company which is doing the software development, they aren't necessarily well-versed in user interfaces and user experiences. So you need another profile for that. And that's why from my perspective, it is important to decouple the backend and the front end of what you're building, and not just put everything in one company. It's of course harder to do, but it makes the results a lot more interesting.

5. Try to partner up with academic organisations.

6. Work iteratively (process innovation before product innovation).

7. Work to make connections possible, not towards establishing certain/narrow/focused connections.

Image of the building. Archief Gent, public domain 1.0.

DIGITISED MUSEUM COLLECTIONS FOR ACCESSIBLE LEARNING AND REMOTE INCLUSION

AN ACCESSIBLE APP ARTSEE FOR CHILDREN WITH AUTISM: REMOTE INCLUSION AND DIGITAL LEARNING AT THE NATIONAL GALLERY OF BOSNIA AND HERZEGOVINA (BA)

Institution
National Gallery of Bosnia and Herzegovina

Location
Sarajevo, Bosnia and Herzegovina

Description
The National Gallery of Bosnia and Herzegovina was established on October 11, 1946, and it is the oldest art museum in Bosnia and Herzegovina. For the last 9 years the Gallery has developed educational programmes and activities for families, school-aged children, elderly people and children with learning difficulties

Size
Today the National Gallery researches and cares for over 6,000 works of modern and contemporary art. The collection is divided into several sub-collections: Bosnian-Herzegovinian art, Ferdinand Hodler's works, Icons, Yugoslav art, International works donated to the Gallery, Photographs and the archive of "NADA" (a fine arts magazine)

Staff members
13

Project
The ARTsee app
www.artseeugbih.com
Google play

Timeframe
June 2019 – March 2020: the first version of the app, which was intended to be used exclusively at the museum.
May 2020 - February 2021: the second version of the app, which integrated the museum and the home versions

Concept

The idea for an assistive form of technology at the National Gallery of Bosnia and Herzegovina was born out of the intention to give additional reasons for people with learning difficulties to visit the museum. The museum already had experience working with this group from the programme *''Blue artism'' implemented in 2018 and 2019. "Encouraged by the results of researching the visual perception of children on the Autistic spectrum during the implementation of ''Blue artism'', we came up with an idea to develop an app,"* museum educator Aida Šarac Berbić said.

Involved parties and process of work on the app

The professionals that developed the ARTsee app were from IT, the education, arts and museum sectors. The museum pedagogue of the National Gallery of Bosnia and Herzegovina was the team leader. She has imagined an interpretational assistive tool that will use three different mediums to 'explain' artworks from the collection. The duo of IT professionals were essential to developed ARTsee from the code. The special education teacher was also a part of the team. She participated in the process of selecting the paintings and alternative interpretation content, and she created the textual part of the interpretations in easy-to-read standards. The graphic designer created the visual identity of the app, which is based on pictograms and symbols. She also manipulated the reproductions of selected paintings in order to create an alternative visual interpretation of the artwork.

Approach to digital learning for children with learning difficulties

Aida Šarac Berbić: *"We have concluded that digital technologies can be a double-edged sword when working with persons with learning difficulties at the museum. For one simple reason, today's children and youngsters are so overwhelmed with digital technologies that sometimes, the presence of tablets or smartphones at the art museum can distract the attention of children/youth with learning difficulties from the original artworks.*

Fortunately, this can be overcome by persistent and meaningful direction of museum educators towards the original artworks by asking questions and showing the details of the painting. When we offered the home version of the app to our target group and their parents and caregivers, we gave instructions for use. The parent/caregiver should ask the child/youngster to link the visual content to audio, to read with the child, or to read for them. In this manner, by using the ARTsee app at home, the parents/caregivers could work on the development of communication and some cognitive and reading skills in children with learning difficulties".

An app ARTsee. Amra Mahmutović Photography (c).

Objectives

The main objective of the project was to ensure additional motivation for people with learning difficulties to visit the museum. When the Covid-19 pandemic started, the objective was to offer digital content based on the collection for the target group in the safety of their homes. Additional objectives were to explain a particular artwork to a person with different cognitive abilities via animation, sound, and text.

Learning benefits

The artworks were selected on the basis of aesthetic, narrative, and emotional quality. Every one of the selected artworks had to have these qualities to be interpreted through visual, audio, and textual mediums. Every artwork shown in the app explains certain terms or concepts, for example, Safet Zec's «Big Treetop» explains visually, aurally, and textually to a user how the seasons change, or Gabrijel Jurkic's «Flowery Meadow» explains the terms of more and less. In this manner, children with learning difficulties, who are part of the regular inclusive school system, had additional education content based on the art museum's collection during the pandemic, when schooling switched to online formats.
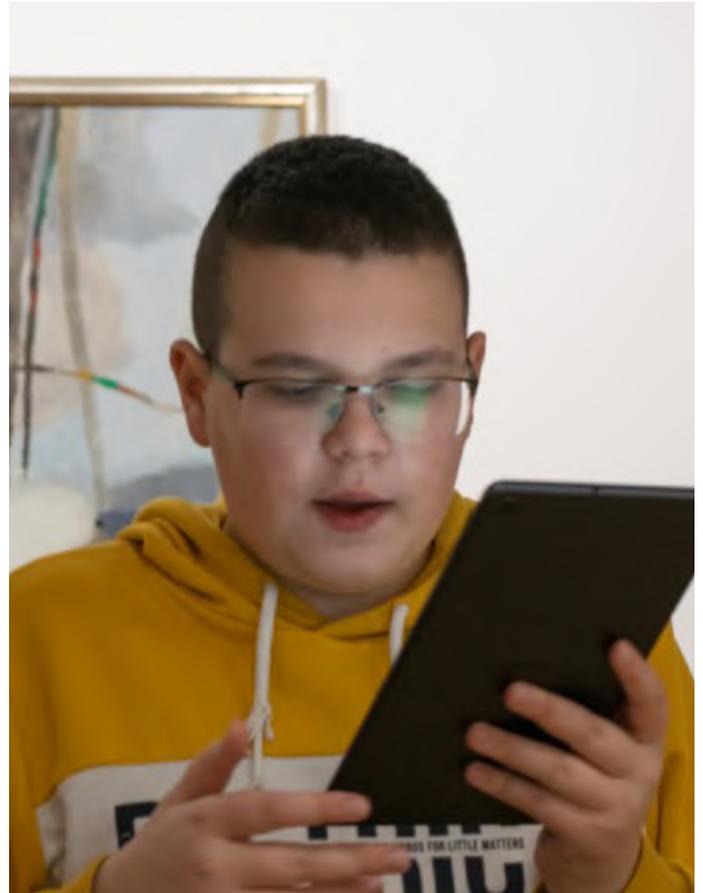
An app Artsee. Amra Mahmutović Photography (c).
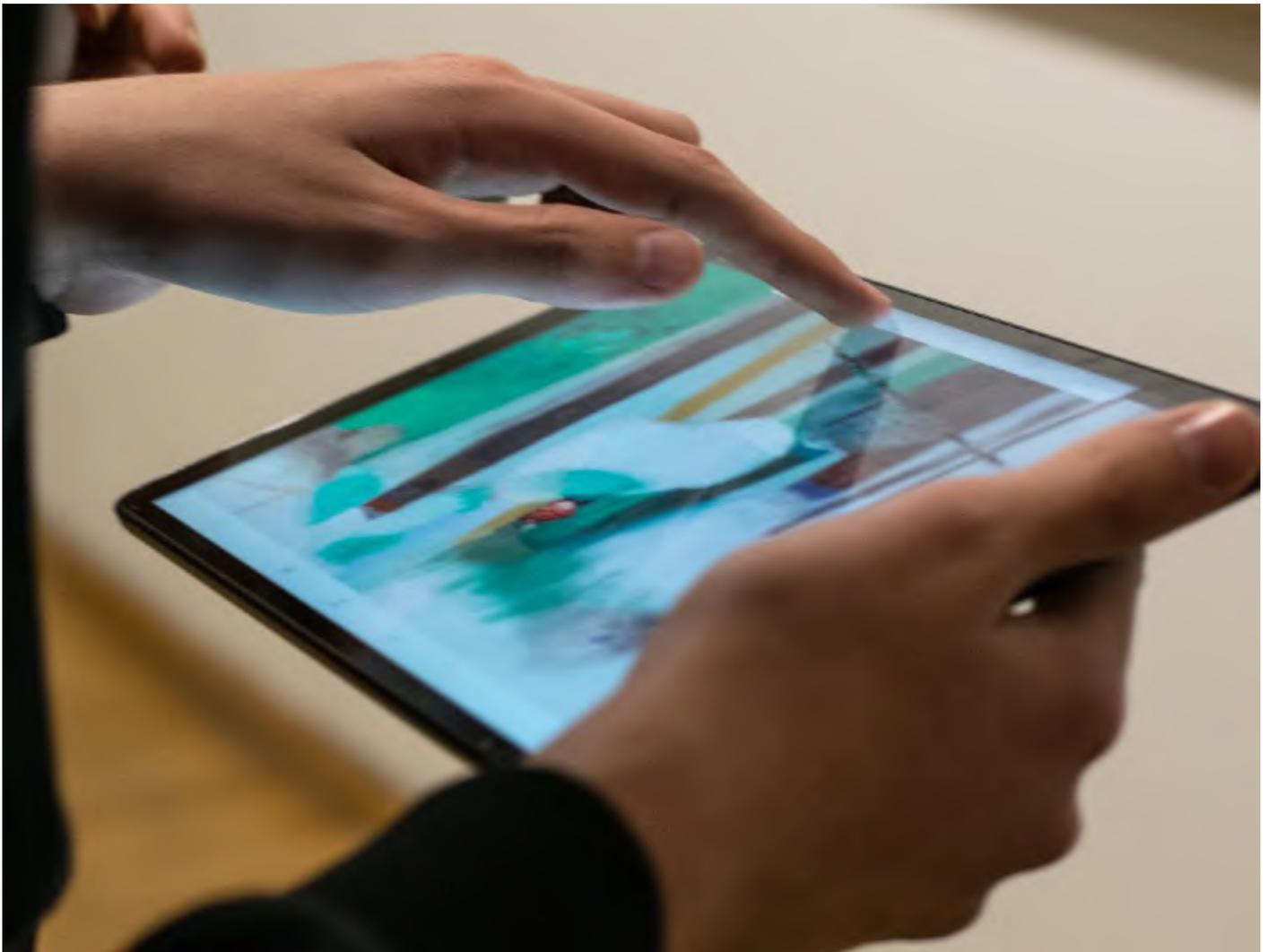
An app Artsee. Amra Mahmutović Photography (c).

An app Artsee. Amra Mahmutović Photography (c).

Obstacles

1. Outbreak of the Covid-19 pandemic (for the onsite version of the app).

The biggest obstacle to the project implementation was the global pandemic of Covid-19. At the same time, this obstacle was an opportunity to have one part of the collection available in an online format for remote access. This situation opened the door to digital educational content for the users of the museum programmes.

2. Communication with IT professionals and museum professionals.

Another obstacle was finding a common language with IT professionals. Sometimes, professionals from outside the arts have difficulties understanding artistic visions. In this case, it was necessary to have a clear and concrete visual identity in advance to ensure that the IT developers had a better idea of what was required of them.

Challenges

1. Financial sources.

Aida Šarac Berbić: *"Since we spent all the grant money from Goethe Institute for the first version of the app, we were in a situation where we needed to find other financial sources. Luckily, we found additional financial support at the Federal Ministry of Culture and Sport of Bosnia and Herzegovina".*

2.Another huge challenge was carrying out the testing of the app in March 2020 because of the Covid-19 pandemic.

"For this purpose, we created focus groups of children with learning difficulties. Also, we created observation sheets that are supposed to track the participants' understanding of the technical features of the app and their social interaction in the museum. Unfortunately, we could not continue with the tests at the museum, because we did not want to expose the children to additional health risks. Instead, we worked for another year on the app development and offered the home version to the target group and their parents and caregivers."

Recommendations

Aida Šarac Berbić:

My recommendations for other art museums that intend to use digitised collections for remote learning and inclusion are to create the content along with the target group, evaluate all of the easy-to-read textual contents with the representatives of the target group, and plan the feedback process from the users. It is important to have feedback from the target group because that way you can fix some technical or content-based issues that you could not predict when developing digital technologies for remote learning.

Also, I would recommend testing the digital content for remote learning activities directly at the museum. In that manner, you can see how the target group responds to the content and how they react to the original artworks in the museum space. In this way, you can also see how the participants from the target group relate themselves to original artworks that are the starting point for creating digital content.

LEARNING AND MEDIATION IN DIGITAL ENVIRONMENTS, SOCIAL MEDIA AND EXTENDED REALITY

INTRODUCTION

The outbreak of Covid-19 has pushed museums to explore alternative digital environments for engagement with remote visitors, designing learning experiences and delivering educational content both for adults and children. In addition to the institutional websites, social media channels, external portals and streaming platforms, over the last three years, museums have been increasingly discovering the opportunities of Extended Reality, encompassing Augmented Reality, Virtual Reality, Mixed Reality and the Metaverse.
Below are examples of how different digital environments can be approached by museums to create interactive projects for engagement with remote users:

Digital environments and 3D

The case of the multifunctional digital platform of the Centro Hospitalar do Porto Museum, developed due to the pandemic-related closure of the museum, demonstrates how remote visitors can explore a virtual museum and collections physically located in decentralised venues.
The platform, supplied with multilingual audio descriptions, texts, images and videos, allows visitors to navigate the museums either in VR or non-VR modus.
In the 3D environment of Ancient Olympia: Common Grounds users can explore the digital replicas of the ancient monuments, complemented with educational texts, images or audio comments from curators. To create the 3D model of Ancient Olympia, Microsoft AI analysed hundreds of thousands of photographs of the location taken by drones and on-the-ground cameras. Site photos, photogrammetry scans, excavator documentation, research articles, and sketched reconstructions were used to produce 3D representations.

Social media channels

Museums actively involve social media channels for engagement with audiences. Social media can be a great platform for museums to share behind-the-scenes content and give their audience a glimpse of what goes on behind closed doors. Museums can use social media to host live events such as Q&A sessions, tours (such as one of our case studies "sofa tours" in Moderna Museet), lectures or workshops. This allows remote visitors to communicate with the museum in real time and ask questions of museum staff members. Moreover, these channels can be used as an excellent resource for sharing educational content, e.g. histories behind certain artefacts, or posts on a variety of topics related to the museum's focus.

Augmented Reality

Augmented Reality provides remote museum visitors with interactive learning experiences while combining real and virtual environments. In AR, 3D virtual objects from the physical world, for example objects from a museum, or monuments from a historical or an archeological site, are combined with an image of the real environment captured by the camera and presented as if the two are real. While VR requires the use of specialised gear like a headset for the user to be immersed in a digital world, AR can be experienced through a smartphone or an app.

So, for instance, with a mobile app, Ancient Olympia historical monuments can be experienced in AR onsite at Olympia or at any place at real-world scale. This experience gives users a unique opportunity to explore ancient monuments in close proximity, which are recreated in lifelike detail.

Through an AR app, remote visitors of the Anne Frank House can step inside the carefully designed 3D rooms of four protagonists of the project "The Bookcase for Tolerance", exploring personal objects and the meaning behind them.

Moreover, Augmented Reality can provide an alternative space for game-based learning experiences. With the game app "Snapture! Get the sculptures moving", lab.Bode, Bode Museum expands its educational programmes into the digital realm and invites children to playfully interact with the sculpture collection of the Bode Museum, regardless of location.
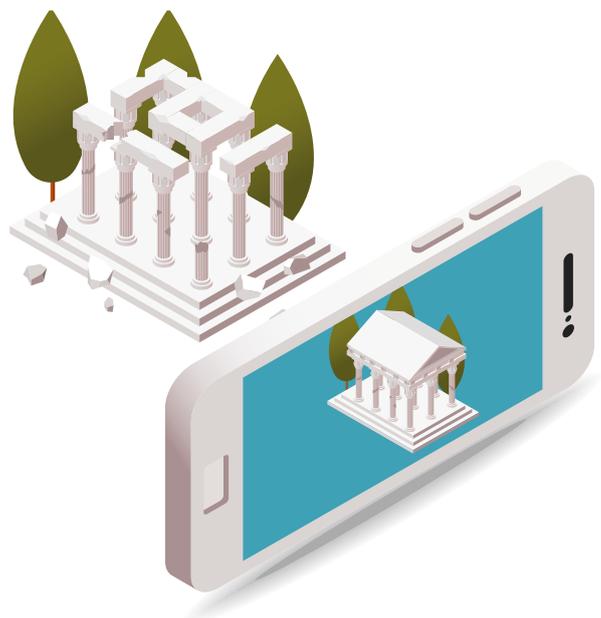
Virtual Reality, learning and social interaction

Although VR experiences onsite, for example, VR corners or VR rooms, are still a more common practice, the rise of affordable headsets enables access to Virtual Reality from the comfort of home. VR can be used to create immersive museum tours, make exhibits interactive, or to immerse visitors into gaming experience. Haptic devices, including gloves, vests and suits, enable a more lifelike interaction with these virtual environments.

VR makes it possible to interact with other people and participate in group learning experiences. Social VR brings people together from all around the world into one space where they can interact with one another or, for example, with a museum guide or university teacher. These kinds of social interactions do not necessarily require a headset. There is an increasing number of virtual environments providing cultural and learning experiences and the place for social interaction, which users can access through a desktop interface without any special headset. Some of these virtual environments are now commonly referred to as the Metaverse.

The Metaverse and "metaverses"

The idea of the Metaverse was introduced by Neil Stevenson in his 1992 science fiction novel "Snow Crash", where he described a 3D computer-generated parallel universe in which users may communicate with one another through avatars.

There is no commonly accepted definition of the Metaverse yet. Overall, Metaverse refers to a continuous three-dimensional virtual environment based on Blockchain technology in which users represented by avatars can simultaneously interact with each other or with digital objects. Rather than a single shared virtual environment, the current version of the Metaverse implies a range of different types of virtual environments or "metaverses". The term "metaverse" is often used alongside the term "Web3" or "Web 3.0", which, without going into details, means a new iteration of the World Wide Web based on Blockchain technology (see Glossary).

Some Metaverse platforms can be accessed using just a desktop computer or laptop and an internet browser, however, VR or AR headset devices provide opportunities for more realistic and immersive experiences. Such platforms as, for example, Sandbox, Roblox, Decentraland and Minecraft, offer Metaverse experiences that can be accessed through browsers or in some cases through mobile devices.

The Metaverse, museums and learning

While metaverses are gaining popularity among big brands and companies as a space for marketing and advertising, these virtual environments also hold potential for the museum sector, education and learning.

Museums can bring their art collections, exhibitions and public programmes to the Metaverse. The Finnish National Gallery presents in the Museum District of the Decentraland virtual world the Finnish Metagallery which takes the virtual form of the Finnish Pavilion of the 1900 Paris World Fair. In the Finnish Metagallery, visitors get access to the virtual collection of artworks from the Finnish National Gallery and historically accurate information about the pavilion. One of the aims of the project was to delight and inspire all art lovers to explore the Metaverse.

Along with bringing collections and exhibitions to the metaverse platforms, museums also have the opportunity to design gaming experiences in virtual environments. For example, the National Gallery of London has created a gaming adventure "The Keeper Council" on the Roblox platform, in which children learn about the museum collection in an engaging way, while mentored by the Keeper of Paintings from The National Gallery.

The Metaverse, museums and NFTs

Talking about the potential of the Metaverse and Web 3.0 for museum engagement with remote visitors and education, we also suggest looking at possible scenarios for the use of NFT ('non-fungible token') in the context of learning and education in museums and cultural heritage institutions.

As Stephan Holzer, former Blockchain Expert for Europe at McKinsey and currently CEO of museum-NFT platform Patron-of-Art.com says: *"Based on Patron-of-Art.com's survey at ICOM Prague 2022, half of museum professionals expect that 50% of museums will engage with NFTs in the future (64 participants). NFT technology is already benefiting many industries and represents a natural extension of museums' digital channels. This trajectory started with the internet, then social media, and now NFTs that also act as a gateway to the Metaverse. Already today, more than 20 museums use this technology in multiple ways, e.g., for fundraising and reaching young communities. Our partners also consider NFTs to increase attractiveness of membership programs, to open metaverse galleries, and to use it for conservation of digital files or digital replicas. They realise that NFT collectors become ambassadors and private conservators of the digital object, as the NFT only has value to them if the digital file persists."*

NFTs do not just create additional opportunities for fundraising and additional income and serve as a tool to reach young communities for museums, but also in some cases can be considered in regard to museum education and learning. For example, the educational Morpheus Metaverse invites users to use NFTs as a currency for knowledge exchange, motivating learners and educators to share and acquire knowledge in the virtual environment according to the principle "earn to learn". In the Morpheus Metaverse any users that teach or share knowledge can receive Denarii (DEN) fungible tokens as an incentive for sharing their knowledge and experience, whilst any user that is a learner who discovers new knowledge and experience will receive BLOCKs for their participation.

The subject of Web3.0, including the Metaverse and NFTs, is certainly relatively new to the community of museum educators and practitioners, and we would like to emphasise that it was not our intention to deeply delve into this topic in this report. However, we believe that cultural heritage practitioners who are interested in new digital formats and innovation for engagement with remote visitors will find it useful to get acquainted with the Metaverse projects highlighted in this publication, as well as access additional resources and educational initiatives.

Among such initiatives, for example, "Future Insights: Blockchain", run by Ars Electronica in collaboration with ABC Research (Austrian Blockchain Centre), can be used as an education program. This interactive online program aims to provide a basic understanding of blockchain as well as an awareness of the relevance of this technology.

In addition, another example would be the innovation laboratory WAC Lab, organised by We Are Museums in collaboration with TZ Connect and the Blockchain Art Directory 2.0, which invites art professionals, institutes, technologists, and strategists to come together to learn, discuss, and experiment with Web3 with a special focus on the Tezos blockchain. Moreover, through a series of educational events and real-world use cases, the WAC Fellowship helps twelve institutions including the Royal College of Art in London, the Musée d'Orsay in Paris and the House of Electronic Arts, Basel (HeK) to "experiment, innovate and thrive in the web3 space".

Moreover, for museum professionals interested in the potential benefits of Web3 for their organisations, the Finnish Metagallery website may be a valuable resource. It offers well-structured information about the Decentraland and some Web 3.0-related concepts.

MEDIATION IN DIGITAL ENVIRONMENTS AND SOCIAL MEDIA

ARS ELECTRONICA HOME DELIVERY SERVICES: ONLINE AND HYBRID LEARNING ABOUT DIGITAL TRANSFORMATION (AU)

Institution
Ars Electronica Linz GmbH & Co KG

Location
Linz, Austria

Description
Ars Electronica was founded in 1979 to explore the intersection of art, science, technology and society. While the portfolio of projects, initiatives and programmes has evolved through the years, Ars Electronica's philosophy has remained the same. Its activities are always guided by the question of what new technologies mean for our lives. Together with artists, scientists, developers, designers, entrepreneurs and activists, Ars Electronica sheds light on current developments in our digital society and speculates about their manifestations in the future. Key here is the focus on humans in the centre of technological development. Thus, Ars Electronica never asks what technology can or will be able to do, but always what it should do for us

Staff members
Approx. 150-160 FTE (for the whole company, not only the museum)

Project
Home Delivery

Timeframe
Since April 2020

Concept

The overall concept of Ars Electronica Home Delivery is to increase the knowledge transfer from the cultural sector to the audiences on topics of digital transformation with dedicated online or hybrid programmes through a diversity of formats such as workshops, lectures, performances or discussions.

Ars Electronica Home Delivery consists of guided tours of exhibitions, excursions to Ars Electronica Labs, visits to the Machine Learning Studio, concerts with real-time visualisations, lectures and visually stunning presentations in Deep Space 8K, workshops with engineers and talks with artists and scientists, all kinds of exciting offerings for schools, universities and companies.

Veronika Liebl, Managing Director: *"Whether you're at home in your living room or office, in the classroom or lecture hall, on the tram or subway, on the train – from anywhere, you can join Ars Electronica's programme on this artistic-scientific journey into our future, and get involved. Whenever you want, for as long as you want!"*

Objectives

From the very beginning, the core objectives of Ars Electronica Home Delivery were to develop one audience-centred public (and free of charge)

cultural programme, as well as one monetised product variation for the private sector and for clients, called Ars Electronica Home Delivery Services. Regarding the latter, the product portfolio reaches from educational offers via innovative courses to consulting and implementation for innovative, hybrid events. This is operated by the Ars Electronica Future Think School, who design and deliver innovative and interactive educational programmes for professionals from private and public sector organisations as well as academia. Its programmes bring together artists, developers, technologists, and scientists to explore topics related to technological developments, such as Artificial Intelligence, interactive technologies, sustainability and cross-sectorial innovation.

While the Home Delivery program is mostly a one-way communication channel (with some formats being open to discussion at the end, and of course social media comments), Ars Electronica Home Delivery Services was designed as an interactive and live communication programme from the very beginning.

Approach to digital learning

"Ars Electronica centres on the impact of digital technologies on our everyday lives. We look into what effects digital technologies have on the way we work, live, spend our leisure time, and on what impacts they have on our society at large. We centre our audiences in the middle of the discussions. We want to build digital literacy in order to increase digital agency in society, and allow citizens to act more informed", Veronika Liebl said.

Due to the closing of museums caused by the Covid-19 pandemic, Ars Electronica explored various opportunities to bring the experience of Ars Electronica to its audiences in a digital way. After figuring out the required technical setups, channels as well as skill sets, the team of Ars Electronica then put emphasis on adapting the content delivery – in relation to both the educational workshops as well as Home Delivery Services. Through trial and error, the team explored various options of how to best take a virtual guided tour through the Ars Electronica Centre while still providing the viewers with a unique experience. The Centre also improved targeted offers for providing content in interactive online workshops with participants joining from various locations.

According to Veronika Liebl, when Ars Electronica reopened after the lockdowns, Home Delivery (for public audiences) had to be reduced, while

Home Delivery Services (i.e. the paid programmes) remained to be in high demand and offered.

Involved Parties

All departments were involved in the conceptualisation, and all departments offer skills and courses for the program

The central coordination is implemented by the Ars Electronica Future Thinking School

Learning benefits

The main benefit is to enhance the tech-confidence of people who are not necessarily familiar with topics of innovation and technology. For example, Ars Electronica is currently working with the Public Employment Center (AMS) in Austria to help women rejoin the workforce or join new professional fields. During the two-day workshops, the participants explore the topic of AI as well as other topics connected to digitalisation and new technologies, gaining a fundamental understanding of this field, and thus building up the confidence to further explore opportunities within the field.

What makes all these educational programmes so unique, is access to interactive installations in the Ars Electronica Centre and the involvement of its renowned international network of artists. This allows participants to experience and explore emerging technologies hands-on, and keep up with exciting and innovative applications of these technologies through the lens of art.

Challenges and obstacles

1. Among the challenges encountered during the programme's launch was the lack of in-house expertise in live streaming and creating TB-show-like content. However, the programme drew on the unique network of experts who were also engaged as speakers, including Ars Electronica Centre's guides, management team members, technical teams and colleagues from various departments. Since the start of the programme, there has been an evolution in confidence with delivering digital content. Instead of hiring external experts, the organisation made a conscious choice to increase skills internally.

2. A second challenge at the beginning was the lack of specialist equipment (cameras, audio/video equipment, streaming servers, etc.) and infrastructure (such as a high quality studio, reliable software for streaming and hosting online workshops).

Festival University: «Welcome to Planet B! A Different Life is Possible. But How?». Ars Electronica (AT) and Johannes Kepler University (AT). JKU Photography (c).

Convolutional Neural Network. Ars Electronica - Robert Bauernhansl Photography (c).

Major takeaways

Veronika Liebl, Managing Director:

1. At the beginning of the conceptualization phase, we were driven by the excitement of the fantastic participatory formats and digital tools out there, ending with far too many sessions, so a focus is necessary.

2. Dropout rates differ extensively between sessions and can be very high!

3. High profile names (with world renowned artists or experts) or experimental formats worked better.

4. Also these events worked better where we involved collaboration partners with strong communities from the beginning and knew precisely which target group we were trying to reach.

5. The average online interaction time is significantly lower compared to face-to-face interactions, so adapting formats is necessary.

6. Online sessions with a shorter duration of only 30 minutes worked really well for Ars Electronica.

7. Having less time also requires focus – and helps to avoid platform hopping. Often the most experimental formats manage to use one platform only, or they embed it in a playful way.

8. Formats which worked best were those whose overall character was more focused on entertainment.

9. But when it comes to online, we saw that formats with gamified elements that bridge online and physical spaces or activities, and which could simply not happen in physical environments, worked best (such as creating avatars for a masked ball).

And as always … it all comes down to knowing your audiences!

1. You need to understand audience habits, expectations and how to meet them.

2. And even more importantly they change – so a continuous effort in understanding audiences needs to be part of the programme design and creation of online community formats.

3. And then I can only recommend:
TEST, TEST, TEST – together with your audiences!

The Mona Lisa. Vincent Delieuvin (FR), Christelle Terrier (FR), Roei Amit (FR). Ars Electronica - Robert Bauernhansl Photography (c).

Recommendations

Veronika Liebl:

My recommendation would be not to necessarily look for new tools. There are plenty already, and the appropriate selection highly depends on the use case and the overall digital strategy. What brought us forward was to invest resources during the pandemic into staff capacity building of 1) assessing which tools are relevant for our context, 2) exploring, testing (and providing a space for failing) of new tools and digital services, and 3) understanding how tools can be embedded into a wider organisational strategy (such as creating new services, or improving efficiency, or reaching new audiences).

SOFA TOURS AT MODERNA MUSEET: LIVE-STREAMED GUIDED TOURS (SE)

Institution
Moderna Museet

Location
Stockholm, Sweden

Description
The collection covers paintings, sculptures, installations, films, videos, drawings and prints by Swedish and international artists from the 20th and 21st centuries, and photography from the 1840s until today. Since 2009, the Museum has had two locations, Stockholm and Malmö

Size
>130,000 works in various media

Staff members
>100 staff members

Project
Online streamed "sofa tours"

Timeframe
Streaming began in March 2020

Concept

The sofa tours are broadcast live on Facebook (and afterwards published on the museum's website and official YouTube channel) from the exhibition halls of the Moderna Museet. The tours are guided by curators, art educators, managers or artists, and accompanied by a moderator. An important aspect of the programming of the tours was to allow different staff voices to be heard and to show a wide range of the collection and diversity. It has been important to vary the content and show contemporary artists and popular classics and consider the gender aspect[2]. Most of the screenings focused on works in the museum's collection including some of the outdoor sculptures.

The sofa tours are usually conducted in Swedish, and some of them are in English. Each tour lasts around 10 to 25 minutes. The target audience for most of them is adults, but some talks are held in a format adapted for families and children. Participants in the live tours can post questions and comments during the broadcast. All existent live broadcasts are available on Facebook and on the official YouTube channel. By the end of October 2022, more than 90 tours had been conducted overall .

The Learning and the Communication Departments launched the sofa tours in March 2020 after the museum's closure due to the pandemic. The Communications Department introduced the format and the Learning department filled it with content and knowledge of art.

Helena Åberg, curator: *"We started with the sofa tours during Covid-19, on the first day the museum closed. Now we don't want to stop, we can reach people who can't come to the museum, and work nationally and even internationally".*

Project objectives

To develop new formats for digital audiences in the period when the museum was closed because of the pandemic.

Approach to digital

"When Covid-19 started, it really affected us, we realised that we are closed but the museum is not just a building, it is also something living, that you can bring out in another way. The digital programmes came out of the need and became a possibility for us during the Covid-19", underlined Helena Åberg.

Miriam Ekwurtzel, digital communicator: *"I believe in social media as a tool to reach out with art broadly and I think the digitisation of museum activities is a democratic issue, even if the experience on a screen can never be the same as a visit to the museum. You have to adapt your activities to all kinds of visitors, not just to those who are able to be in the museum building".*

Learning benefits

Sofa tours are beneficial for lifelong learning and can also be perfect for university students. According to Helena Åberg, people enjoy listening to someone who has knowledge about art and sharing their own opinion; some of the best sofa tours are those where people share their opinion and ask questions.

Challenges and obstacles

Helena Åberg pointed out that there are so many things that can go wrong when you do a live recording. In order to get the broadcasts going quickly and not to involve more people than necessary and to create a simple and personal atmosphere, the team decided to film and broadcast with a mobile phone. In the beginning, they filmed with two mobile phones - one for Facebook and one for Instagram. The museum's technicians assembled two selfie sticks into one.

[2] Miriam Ekwurtzel, Helena Åberg Och Nina Blom. Tre röster om Soffvisningar. Et kunstmuseum i endering? Nye formedlingspraksiser i Norden red Line Engen og Boel Chrisnsen-Scheel. Museumsforlaget, p 336

However, this technology meant that in the end, the team had to choose a single channel to broadcast and fix the problems with the voice recordings, as the sound was not good enough.

"Showing art live is a challenge in itself because you don't meet the audience as you would in a regular show viewing. In a way, the person showing is more exposed. The person filming and asking questions from the viewers has an important role as moderator of the conversation, to make everyone watching feel included", mentioned Helena Åberg

Major takeaways

One of the major takeaways from the pandemic and this project has been the establishment of a digital group consisting of representatives from the different departments in the Moderna Museet, such as, for example, the Communication department, the Learning department and technicians. Helena Åberg mentioned in this regard: *"I think it's positive that we work together more in projects than we have done before".*

Future prospects

"Moderna Museet has continued to produce Sofa Tours and will work with a production company in late 2022, and we will hopefully continue developing them in 2023.

In 2023 the free admission reform will come to an end and maybe the Sofa Tours will meet needs not yet determined/ known. We have also made Studio Visits online and visited artists in Sweden and abroad. These have, and will be, broadcast on Instagram.

We are also working on a two-year project to develop our strategies for digital learning during 2022-23."

Recommendations

Helena Åberg:

Start with your strengths, for instance, the knowledge and devotion to art and people. From there ask for help from other experts, e.g. the technicians and communication department (if there is one). Together, try to find new ways to make a smaller project or case study. If you start with online programmes, make sure that the sound is good. Live broadcasting is unique, and every time there's something new, so be as prepared as possible and take heed for unexpected things to appear, in apps etc. Build trust with the audience and listen to them.

Mark Bengtsson gives a presentation of Lena Cronqvist's painting "The Madonna", from 1969. Åsa Lundén (Moderna Museet) Photography (c).

Feedback from the digital visitors (Facebook comments):

A number of Facebook comments from the viewers prove the importance of sofa tours for learning about the collection of the Moderna Museet from a distance in conditions of limited mobility. Viewers also highlighted that sofa tours created interest in learning more about the history of art and that they would visit the Moderna Museet when it is open, or when they happen to be in Stockholm.[2]

"<...> A great way for us who live in the countryside or for those for whom it's hard to get to the museum…to enjoy art and art history. Public education at a high level for us from far away Skeppsholmen [at he Swedish island where the Moderna Museet is located]".

"<...> Interesting and educational <...>! Thanks for the initiative! The next visit to Stockholm will include a visit to MM".

"It's so wonderfully educational you want to learn and look at art more than ever".

"For me, who doesn't live in Stockholm, it's absolutely wonderful to go see your favourite painting and also to get information about it".

"Now I'm curious to see the works in real life. Thanks for arousing curiosity!"

"Enjoying these virtual tours; visually stunning. I don't understand the language but I still, enjoy it. Thank you".

"Many good initiatives to enrich our everyday life with experiences and new insights".

"So nice to see [the sofa tours] when you're sitting alone. Art gives power"

"Makes me want to read art history".

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2. Comments are collected by the Moderna Museet and translated by the author from Swedish.
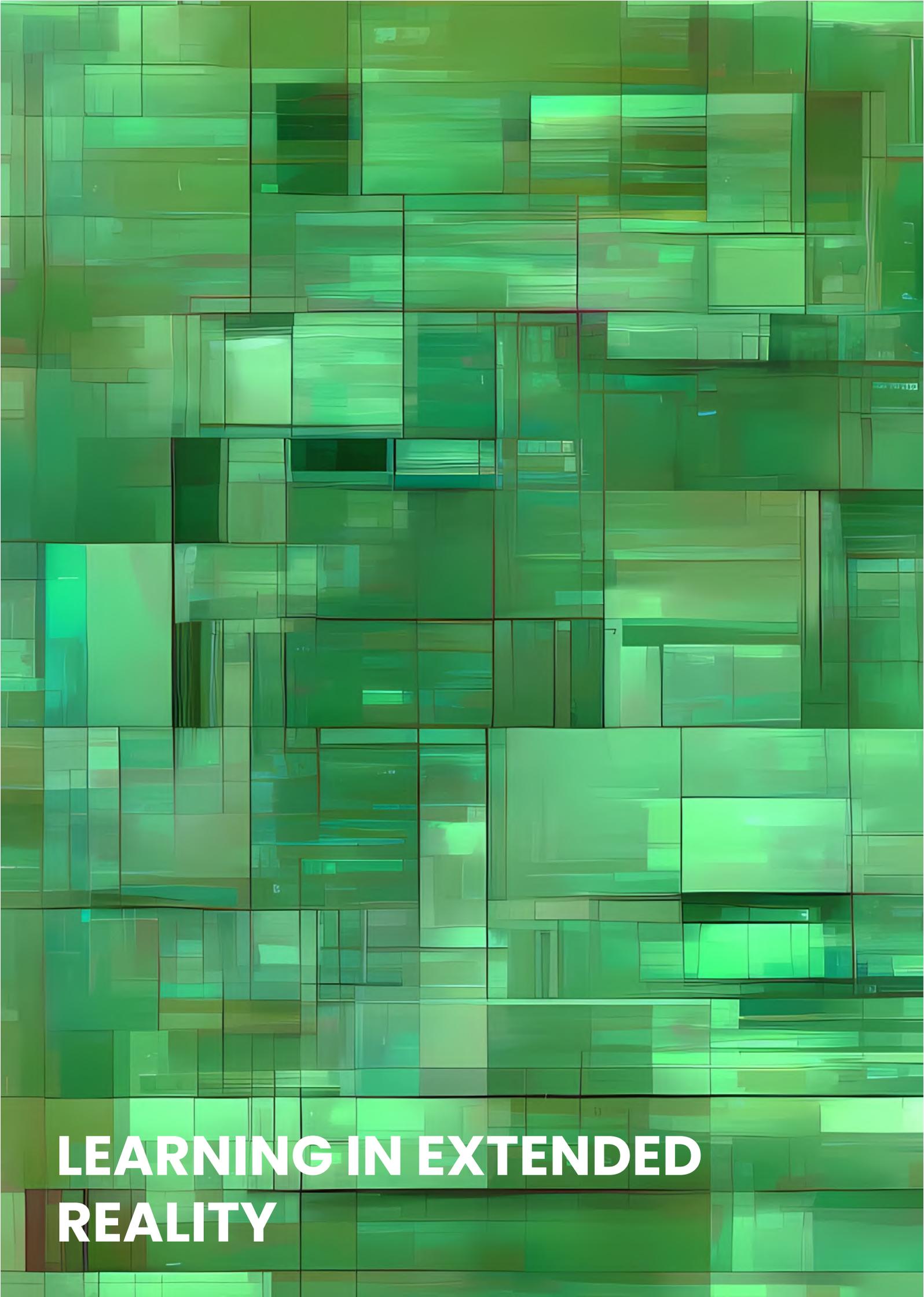
LEARNING IN EXTENDED REALITY

ANCIENT OLYMPIA: COMMON GROUNDS
DIGITAL PRESERVATION OF CULTURAL HERITAGE, EDUCATION AND ARTIFICIAL INTELLIGENCE (GR)

Concept

The project "Ancient Olympia: Common Grounds" is a collaboration between the Hellenic Ministry of Culture and Sports and Microsoft. It invites visitors to travel back to 173 A.D. to navigate around the digital sights of ancient Olympia.

This project can be accessed in three different ways:

1. Via the "immersive website". 3D monuments of Ancient Olympia are accompanied by historical information, audio commentary, and video tours.

2. The mobile app enables an Augmented Reality (AR) experience, which brings the monuments to life at a real-world scale (at any place, at home or on-site at Olympia).

3. The immersive Microsoft HoloLens 2 exhibition, where visitors are surrounded by sights, sounds and virtual monuments. The multi-sensory tour is housed at the Athens Olympics Museum.

Ancient Olympia: Common Grounds features 27 ancient Olympian monuments, including the original Olympic Stadium, and Zeus and Hera's temples. To create the model of Ancient Olympia, Microsoft Artificial Intelligence processed hundreds of thousands of images of the site made by on-the-ground cameras and drones.

Digital representations were assembled from site photos and photogrammetry scans, excavator documentation, research articles, and sketched reconstructions.

Timeframe

The project was greenlit in February 2020. It took almost two years from conception to delivery.

Involved parties

Microsoft, Athens Olympic Museum, Iconem, Hellenic Ministry of Culture and Sports, and creative agency A_DA

Project Objectives

1. To digitally preserve and restore cultural heritage from the past.

2. To empower global audiences to embrace the idea of finding common ground through shared history.

Brett Volker, Co-Founder at A_DA: *"We're talking about the home of democracy, and values like peace, equality, harmony, fairness, that, arguably, are as important today as they've ever been, but that was true from the very beginnings of the ancient site of Olympia. And I think it was important for the Greek government to remind the world of that, and the important history that's associated with the site."*

Courtesy of Microsoft (c).

Courtesy of Microsoft (c).

Educational benefits

Brett Volker: *"Here is a great example of why this project is important from an education perspective. When we launched the project on-site with the prime minister of Greece, the Minister for Education was also there with a group of schoolchildren, who showed the Prime Minister the 3D assets on the phone as part of the app. What was interesting is that you really had to teach a lot of the older generation that was there on the day how to use the app, whereas all of the schoolkids immediately picked it up, knew exactly what to do, and were showing them, including the Prime Minister, how to do it. It was really exciting, just rewarding proof of why we need to be thinking about the digital preservation of historically important sites and presenting them in mediums that are now second nature to younger generations.*

And from an educational point of view, we spent so much time working with historians and archaeologists to be as accurate as possible. That's going to be valuable in educational curricula in the future and the way that is most engaging for future students to learn about things like this."

Obstacles and challenges

1. Finding an efficient, streamlined workflow between the technology team and the archaeologists and historians. *"It did definitely take a while to get those two disciplines talking to each other, and understanding what was possible and not possible from the technology side"*, Brett Volker said.

2. Accurate representation of the site and artefacts, many of which do not exist today.

Brett Volker: *"There is a 3000-plus year history of this site, so we had to choose a moment in time for each monument, because there were different buildings in different states over the years. Once we chose that time, we poured through 1000s of pieces of literature and documentation to make sure that this was historically accurate down to the bricks and the stones. The focus was not to build the most glamorous-looking game engine, high-fidelity experience, we wanted it to be accessible to as many people around the world as possible. So the focus was more on making sure that the production was at a level that most people with access to a mobile phone, computer and broadband could experience it."*

3. The beginning of the project coincided with the Covid-19 pandemic, which made team work more complicated.

4. The website is available in more than 20 languages. A lot of time was spent on translations and making sure that the Greek is translated to English in a way that properly represented the project as well.
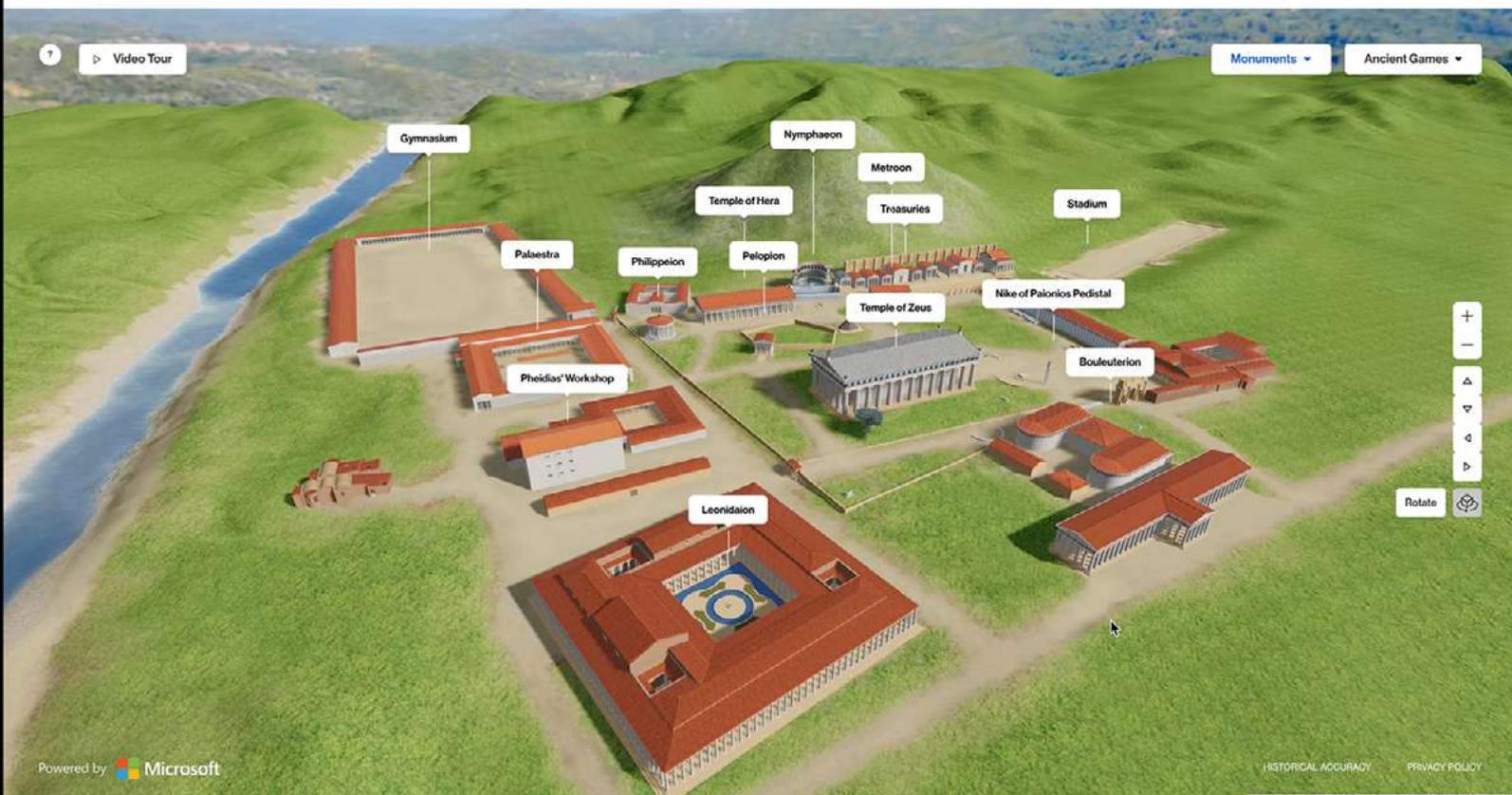
Courtesy of Microsoft (c).

Major takeaways

Brett Volker: *"My major takeaway is just how important and beneficial these types of projects are going to be in the future from an educational perspective. We need to find ways for more of this work to happen. I think it's really important that cultural institutions, historical landmarks and sites, governments, and private industry work together to make sure that this work is done well and that it's available for educational curricula, in a way that's going to excite and motivate the students of the future."*

AR APP "THE BOOKCASE FOR TOLERANCE"
LEARNING ABOUT PREJUDICE AND DISCRIMINATION THROUGH
DIGITAL STORYTELLING AT ANNE FRANK HOUSE (NL)

Institution
Anne Frank House

Location
Amsterdam, Netherlands

Description
The Anne Frank House is an independent organisation dedicated to the preservation of the place where Anne Frank went into hiding and wrote her diary during the Second World War. The organisation brings the life story and the work of Anne Frank to the attention of as many people as possible worldwide, partly with the aim of raising awareness of the dangers of antisemitism, racism and discrimination and the importance of freedom, equal rights and democracy

Staff members
Around 100 staff members

Project
AR app Bookcase for Tolerance

Timeframe
November 2020 - November 2021 (work on the app)

Concept

The Anne Frank House believes that education is a powerful tool to counter prejudice and discrimination. The project «The Bookcase for Tolerance» aims to achieve this by sharing Anne Frank's story and modern-day, authentic, personal stories and struggles. Though it's crucial to not draw direct comparisons between Anne's and our protagonists' stories.

Involved parties

Anne Frank House for the stories and the project management; Innocean for the general concept and the project management; MediaMonks for the AR app development; Massive Music for the Music compositions; Johan Kramer as director of the teaser of the app; Elliot Page as voiceover of the teaser video; Ted Alkemade as director of the short documentaries and the trailer of the project; Yvette de Wit for all photography stills; Sven Schrader for photography of the folders; Hagens PR for the PR campaign.

Project objectives

To use the power of personal testimonials to educate people, in order to influence their attitude and their behaviour towards those considered to be 'different' - so we can all live in a more tolerant world. A world without discrimination.

Approach to digital learning

Digital Project Manager Charlotte Bosman emphasises**:** *"Our mission is to bring the life story and the work of Anne Frank to the attention of as many people as possible worldwide, partly with the aim of raising awareness of the dangers of antisemitism, racism and discrimination and the importance of freedom, equal rights and democracy.*

We tell this story in the museum, but also on digital platforms, so we can reach as many people as possible. Not everybody can come to Amsterdam, because of physical or financial limitations. Therefore it is important to be in places where your audience is also present. And for us, that means we need to be present in the metaverse."
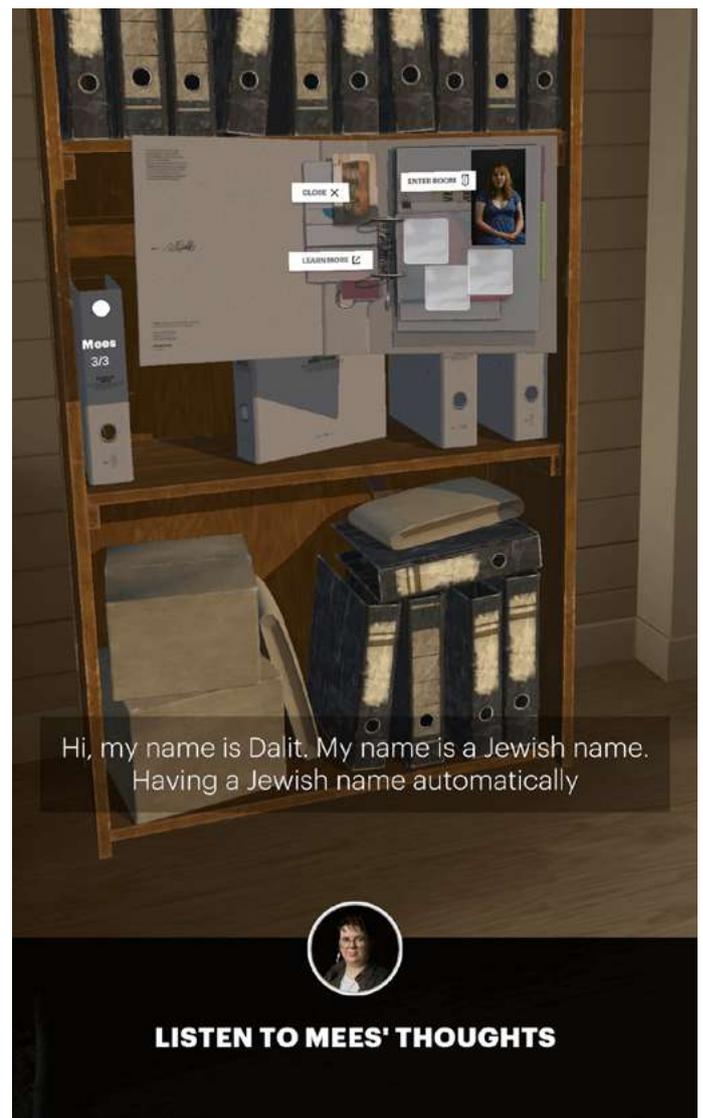
Innocean Berlin // MediaMonks // Anne Frank House (c).

Innocean Berlin // MediaMonks // Anne Frank House (c).

Learning benefits

According to Charlotte Bosman, people can learn that discrimination is still here in society: *"It could be your own daughter, son or neighbour, who is experiencing the dangers of antisemitism, racism or prejudice. It has always been around, but you can do something about it."*

Challenges

To find the right protagonists for the project.

Major takeaways

"Although it's sometimes hard for us to tell contemporary stories because our main audience expects us to tell about the history and life of Anne Frank, it's crucial that we do so," Charlotte Bosman said.

Recommendations

Charlotte Bosman:

Don't just start with digital because of the technology, but make sure you do some research into your audience and create something that brings value to your audience. And if a website, app, VR-experience or podcast is the way: do it!

CENTRO HOSPITALAR DO PORTO MUSEUM: VR MUSEUM AND 360º TOUR. DIGITAL INTERPRETATION, MEDIATION AND CULTURAL PROMOTION OF THE HERITAGE OF HEALTH SCIENCES (PT)

Institution
Centro Hospitalar do Porto Museum (MCHP)

Location
Porto, Portugal

Description
The MCHP collection currently holds more than 8,000 items and consists mainly of historical and scientific cultural artefacts. Comprising thousands of pieces, its collection is largely made up of instruments of various medical specialities such as medical-surgical, laboratory, imaging, and pharmacy, including various hospital support tools

Staff members
The permanent staff is formed of 4 full-time and 2 part-time staff members

Project
Centro Hospitalar do Porto Museum: 360º virtual tour and museum

Timeframe
The project started in March 2020 and became available to the public in March 2021

Concept

As a result of the Covid-19 pandemic, the Centro Hospitalar do Porto Museum (MCHP) has adapted its working methods and since 2020, it has been developing a set of technological tools to be made available on its digital platform - hospitalsantoantonio360 - under the funded program "ProMuseus 2019".

The platform is available in 4 languages (Portuguese, English, French and Spanish) with more than a hundred interactive points of interest and tactile animations, multilingual audio description, panoramic captures, 3D photographs and illustrative videos. It offers the visitor a virtual tour of the Neoclassical building of Hospital de Santo António. This includes the museum's emblematic spaces as well as the exhibition areas and various representative museological objects, with a 360º viewing detail and a quality of 12k, providing an interactive and multi-sensory experience.

As a modular platform the tour and the objects have been complemented with new resources, under the "ProMuseus 2021" programme, which allow the users to access the information autonomously, with respect for access issues and cultural diversity:

1. Audio description – spoken summary of the information delivered in 4 languages, enabling people with visual impairments to autonomously experience the content which they could not access otherwise.

2. Availability of complementary information in digital format and an interactive educational component as tools for consolidating information and for playful interaction with different segments of the public, thus making them more critical, participatory and aware.

3. The digital platform is expected to be updated further with new functionalities.

Approach to digital learning

Taking advantage of the digital potential, this project - in addition to contributing to the MCHP optimising its mission and achieving its goals - allowed the museum to grow as an institution in the service of the community, developing its educational potential, promoting equality, inclusion and democratisation of its cultural offer.

Starting from the belief that the dissemination of Health Sciences is a way to encourage curiosity and knowledge in future generations and anchoring this in a social and educational strategy to raise awareness of health literacy, this project represents a benchmark from which the museum aims to continue creating new cycles of mediation, digital and technological consolidation, as well as strengthening the MCHP as a more open and meaningful museum for its audiences.

The execution of the digital platform allowed the MCHP to ensure the safeguarding and public enjoyment of its heritage by different types of target audiences, disseminate access to information about their collections through inclusive digital communication, and promote the application of modern technological solutions for the interpretation, mediation and cultural promotion of the heritage of Health Sciences.

MCHP has been reinforcing its programming of educational, scientific and cultural activities aimed at ensuring accessibility to the collections for the public school programs and the surrounding community. An example of this is their digital educational workshops that make reference to specific themes of education for health and heritage.

Centro Hospitalar do Porto Museum (c).

Project objectives

1. Providing more information about the numerous pieces in MCHP's permanent exhibition.

2. Ensuring greater accessibility to collections located in decentralised locations in a hospital context.

3. Ensuring access to the National Monument building itself, of indisputable historical and heritage value, especially when entry was highly restricted during the pandemic by offering aerial and panoramic images of the neoclassical building, as well as the 360º capture of emblematic areas.

Outcomes

This advanced interactive virtual tour has allowed the MCHP to:

1. Make available and promote new forms of accessibility, interpretation and promotion of its collection.

2. Modernise the way of communicating the heritage of Health Sciences.

3. As well as increase the dissemination and visibility of the research work of the collections and preservation of the memory in which it has been invested.

Results, learning benefits and impact

1. Enriching the experience of digital mediation between the public and the Museum.

2. Guaranteeing access to its cultural heritage, its institutional history and Health Sciences for different types of visitors, at any time and in any place.

3. The platform has allowed the MCHP to implement access resources that promote equality, social inclusion and the democratisation of the cultural offer, with a view to bringing the community closer to the institution.

4. Based on the virtual visit platform the MCHP has also been consolidating its learning program, developing didactic information and communication tools in its digital educational practices.

5. The platform has also promoted guided online visits, providing its visitors with dynamic views from multiple perspectives that create an interactive point of contact with the collections, and that bring health in connection with its social, historical, technical, artistic and scientific contexts.

Sonia Faria, Museologist: "*The availability of these digital tools for accessing their heritage spaces and their collections allowed the museum to expand their social and educational functions in previously unexplored ways, opening the way for interactive and dialogic communication with their audiences and new possibilities for their access, certainly conquering new audiences and making a difference in the area of education.*"

Challenges and obstacles

1. Technical aspects:

1.1 Contrast and lighting issues in the 360° captures.

1.2 Weight limits of museum objects photographed in 3D.

2. Organisational challenges:

Entry of the technical team into hospital areas in the midst of a pandemic situation.

3. Digital infrastructure:

3.1 The need to acquire digital equipment with specific technical characteristics, such as a portable computer, high-quality webcam with a built-in microphone, earphones sets with adapter.

3.2 Update of the software.

3.3 Development of poor digital skills of the MCHP Educational Service team.

Major takeaways

Sonia Faria:

1. Providing an innovative, interactive and sensorial experience in exploring health collections and making a difference in knowledge, interpretation and mediation around health topics, the development of this digital transformation project has allowed the Centro Hospitalar do Porto Museum to achieve a differentiating and dominant role in preserving the historical meaning of the material culture of Health Sciences. The diffusion of this innovative vision of health collections has allowed the museum to increasingly acquire a prominent position in the area of health education.

2. The virtual visit has been assumed as a means of amplifying the institution's technological and cultural offer, participating in its internal and external communication strategy contributing to a more complete view which extends to all the Centro Hospitalar Universitário do Porto but also open to the community.

3. Integration of the Centro Hospitalar Universitário do Porto into three new European reference networks for rare diseases - ERKNet, ReCONNET and RITA - enabling international auditors to digitally get to know the hospital and our story in a pandemic context.

4. Development of digital skills and training of the team in the area of accessibility, essential to obtain technical knowledge that allows them to implement these new digital tools in the work they develop.
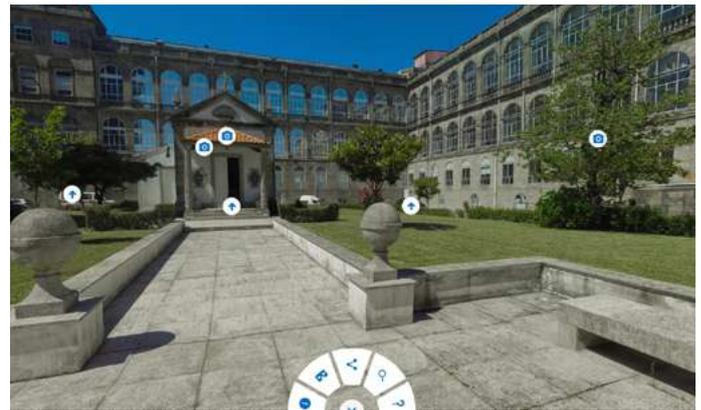
Centro Hospitalar do Porto Museum (c).
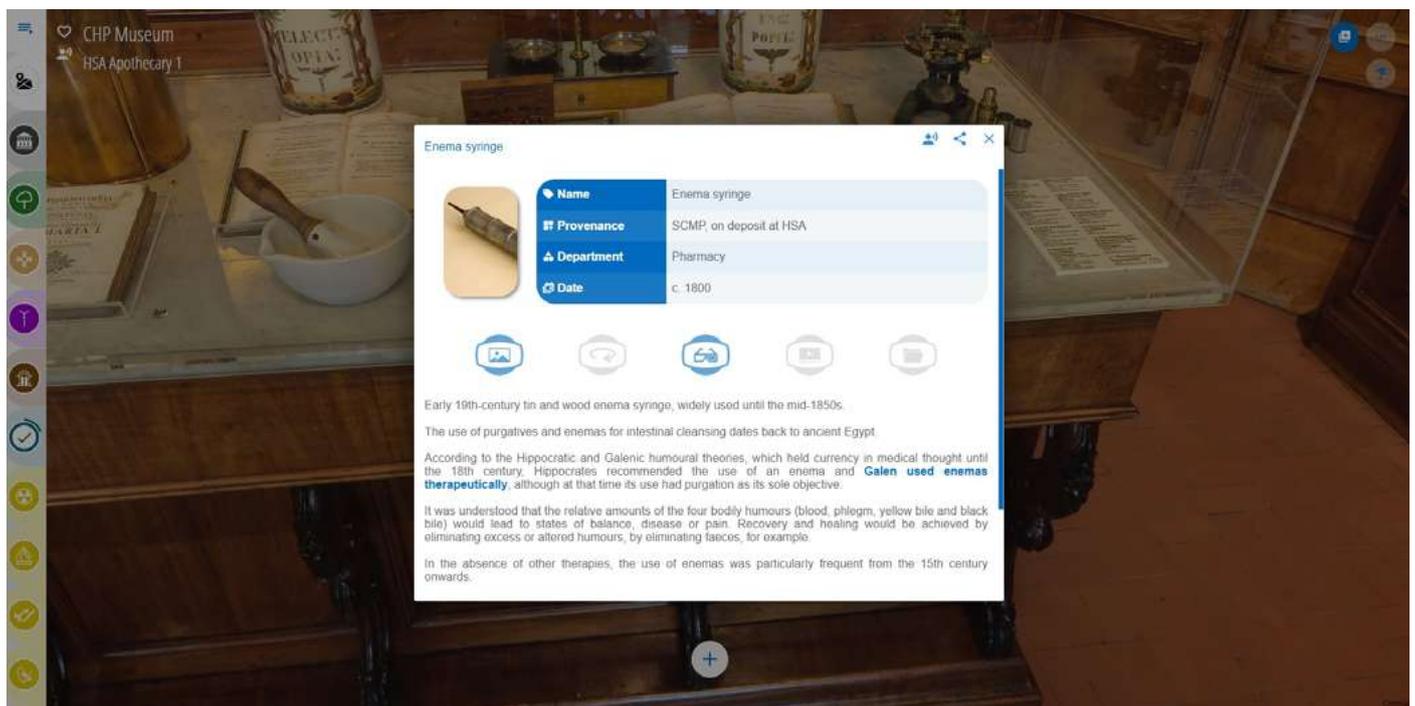
Centro Hospitalar do Porto Museum (c).

HOLO-MUSEUM: TEACHING STEM WITH 3D HOLOGRAMMES DIGITAL LEARNING RESOURCES FOR THE SCHOOL CURRICULUM AT THE IMPERIAL WAR MUSEUM (UK)

Institution
Imperial War Museum

Location
London/Duxford, UK

Description
The Imperial War Museum London is one of the five branches of the Imperial War Museum in England. Its collections present the stories of people whose lives have been impacted by conflicts involving Britain and the Commonwealth since 1914, through unique documents and objects ranging from weapons, uniforms and equipment to diaries and letters, photographs and paintings

Project
Digital learning resource and 3D hologram of the Merlin engine of the Spitfire aircraft

Timeframe
2021

Concept and context

One of the STEM (science, technology, engineering and math) learning resources provided on the website of the Imperial War Museum offers students aged 11-14 to explore the Rolls-Royce Merlin engine of the iconic Spitfire aircraft through holographic technology. With a pair of anaglyph (3D) glasses and the desktop application Holo-Museum, students get access to a 3D hologram of the legendary engine. This experience allows students "to go beneath the fuselage" of the aircraft and to explore the engine in detail. The hologram was developed by the UK-based company Perception Codes, who specialise in desktop Augmented Reality (AR).

While developing the digital learning resource about the Merlin engine of the Spitfire, which is one of the most well-known objects in the museum, the Public Engagement and Learning Team of IWM decided not to look at the engine purely through a historical lens but to focus on the STEM aspects (in particular, chemistry and physics).

In the film included in the learning resource, experts from IWM and from the STEM-based charity and social enterprise The Skylab reveal the chemical combination of atoms and molecules that combust inside the Spitfire's engine and propel it through the air. After watching the film, the students can take on a challenge to create their own propeller, and make their predictions on its performance.

Before designing their own propeller, the students are recommended to explore the Merlin engine through holographic technology. A pair of 3D blue-red glasses can be made by the students themselves, or purchased online. As part of a pilot project, 13,000 3D glasses were sent to schools in the vicinity of IWM Duxford, which was home to the first Royal Air Forces squadron that received the then-new Spitfire.

All of the steps for making the model are laid out in the downloadable template and the Teacher Notes. In the curriculum links accompanying this resource, teachers can find out more about how this resource is mapped against some of the themes and content topics found in the curricula for England, Wales, Scotland and Northern Ireland.

Approach to digital learning

John Glancy, the then-Executive Producer for Schools and Families at IMW and one of the initiators of the development of the digital learning resource with a holographic experience, highlighted that the pandemic accelerated the switch to digital hybrid engagement. Before the pandemic, digital learning was often an "oversight" or an "afterthought" and it was often limited to a downloadable PDF file accompanied by a couple of images. *2020* "completely changed that."

The Morpheus Project (c).

The Morpheus Project (c).

Objectives

1. To find a way to be innovative at a time when museums could not rely on physical access to its collections, and to explore in which ways the museum can use technology to support.

2. To create an engaging learning experience, something that will be used for fun and learning. It was really important for the IWM to choose an object for a holographic experience which could be developed into a learning resource.

Challenges

1. 3D scanning. The engine is a complicated piece of engineering consisting of thousands of components. It was important to make sure that the scan was accurate. 3D scanning is associated with a lot of aspects such as the size of the object, the intricacy of the object, the resolution of the scan, and how it all fits together.

2. Work with evolving technology that people don't really know or understand yet. It is challenging to do something completely new, to understand how to market something that has not existed before, and to create an audience for something for which there is no precedent.

Takeaways

John Glancy: *"I think the major takeaway for me was we're at the start of something interesting and something potentially really exciting. What we created is a really great learning resource. <…>*

Now, at the moment, it's incredibly time-consuming and incredibly expensive. But the one thing that we know for sure about tech, it will get cheaper and it will get easier.

So once we get to that point and ultimately anybody can be sitting in their home and look at the museum in 3D from the comfort of their own sofa, or somebody in the UK could have an engaging and worthwhile cultural experience in a museum in Berlin without getting on a flight or travelling on a train or whatever, and vice versa, then I think that's a really interesting world for us to live in."

Recommendations

John Glancy believes that *"bravery and trust are probably the most important things for anybody who is thinking of some innovative digital initiatives. Too often the museum sector and the tech sector run in parallel to each other. It is important not to be scared to cross over the threshold and have a conversation with somebody on the other side of the fence, be that a tech company that wants to do something like the Holo-Museum, or be that a museum that wants to explore some innovative digital work. This type of work happens because of conversations, and trust comes into it as well."*

HOLO-MUSEUM AND MORPHEUS METAVERSE PROJECT
THE METAVERSE FOR LEARNING AND EDUCATION

What is the Holo-Museum?

As previously mentioned, a 3D hologram replica of the Imperial War Museums' Spitfire Rolls Royce Merlin II Engine is available in Perception Codes' Holo-Museum. In Holo-Museum, visitors can also learn about the unique collection of minerals from the Grigore Cobălcescu Museum of Mineralogy and Petrography, explore an innovative steam locomotive from the Science Museum Group, or access historical objects from the Anglo-Boer War Museum's Anglo-Boer/South African War Collection. These experiences in Holo-Museum are best enjoyed with a pair of anaglyph glasses or on a desktop screen with a webcam. These collections are set to expand as new museum partners collaborate with the Holo-Museum.

Moreover, with Holo-Exhibition users can become curators of their own Holo-Museum. The application allows you to import and view your own 3D models (as .obj and .fbx files) in a volumetric environment, a term that co-founder and CTO Krisada Chaiyasarn emphasises: *"Our Desktop-Augmented Reality technology creates the illusion that users can almost see into the depth of their computer screens. It feels as though there is depth behind the screen which makes 3D models pop-out. This volumetric environment is what turns an ordinary 3D model into an AR experience."*

Interview with co-founder and CEO Sirisilp Kongsilp

What is the aim of the Morpheus Project?

We want to create a place where we can showcase artefacts from different museums around the world. Only a handful of people have the opportunity to visit diverse museums outside of their own countries. What we want to do with museums is to create an opportunity, a place where people can come and engage with artefacts, digitally, in one place.

Imagine school students who go to museums. They have teachers and they have their peer group. Imagine you have all these avatars representing students and teachers. And the avatar from the museum, which is the curator, is there in the Metaverse. Now they go around and then they see the object that is not physical, but it's the digital representation of it, which is so realistic. When the student interacts with it, it looks just like they are in the museum. It looks like it's in the glass display. And then you can have your friends talk about it. You can have someone narrating about the object. So that's one of the things that we would like to do.

The Morpheus Project (c).

The Morpheus Project (c).

What are the educational benefits of the Morpheus Project?

One of the biggest mandates for museums, I assume, is to share cultural heritage with everyone, as much as possible; to share the knowledge that belongs to us. [My co-founder, and I], as university lecturers, have had the opportunity to visit various museums and experience diverse cultures worldwide. But we see that a lot of people, especially young people, do not have these opportunities. So what we want to do is to bring different cultures closer to everyone. And that is what we hope to achieve with Morpheus and Holo-Museum. A space for people to connect with other cultures and see the artefacts as if they are floating in front of them. That is what we hope to achieve. With Metaverse, learning will never be the same again.

What are your future prospects?

So on the first note, we hope that we can onboard more items and more museums, and bring these items and cultures to more people. But later in the upcoming years, early next year, we are going to open the metaverse world so students of all ages can come and learn about the contents of these museums. We also hope that we can provide financial support back to the museums through Holo-NFT as well. In the long run, I just hope that we gamify these educational and cultural aspects in the Morpheus Metaverse. I hope that we can have a game that's basically not just for the sake of enjoyment, but also for the sake of us learning about the world and also reflecting on each individual's knowledge.

THE FINNISH METAGALLERY AND THE 1900 PARIS WORLD FAIR: AN ARTISTIC EXPLORATION OF THE METAVERSE LEARNING ABOUT THE PAST IN DECENTRALAND (FI)

Institution
Finnish National Gallery

Location
Helsinki, Finland; Decentraland's Museum District

Description
The Finnish National Gallery is Finland's largest art museum and a national cultural institution. The Finnish National Gallery comprises the Ateneum Art Museum, the Museum of Contemporary Art Kiasma and the Sinebrychoff Art Museum, and is home to the 45,000+ artworks-strong Finnish art collection. The three museums welcome over 600,000 visitors annually

Size
Over 45,000 artworks and related archival material. Approximately 75% of the artworks have been digitised

Staff members
280

Project
The Finnish Metagallery in Decentraland

Timeframe
The Finnish Metagallery was opened on 4 October 2022 and it will close on 31 May 2023

Concept

The Finnish Metagallery has taken the form of the Finnish Pavilion of the 1900 Paris World Fair on the virtual reality platform Decentraland. The Finnish Metagallery can be accessed via a web browser on a computer. Visitors access the exhibition by logging into the virtual world and choosing a digital avatar to enter and move around Decentraland. Visitors can explore the exhibition and chat with other visitors who are visiting at the same time.

In the Finnish Metagallery, visitors can see some of the works that were present in the Paris pavilion in the year 1900. These include works by Väinö Blomstedt, Albert Edelfelt, Magnus Enckell, Albert Gebhard and Pekka Halonen and unique frescos in the cupola of the pavilion by Akseli Gallen-Kallela. In the spirit of equality, the museum wanted to showcase artworks by Finnish women artists from the same era: Fanny Churberg, Elin Danielson-Gambogi, Amélie Lundahl, Helene Schjerfbeck, Venny Soldan-Brofeldt, Beda Stjernschantz, Helena Westermarck and Maria Wiik.

DCL Scene
26,84

Oleksandr Murashko: Annunciation (1907-1908)
Year of digitization: 2012
Collection: National Art Museum of Ukraine donors 2022
Provenance: Received from the collection of A.I. Sobkevich in 1947

This work of art is from the National Art Museum of Ukraine. Help the museum save artworks such as this from destruction in the middle of the war. Click on the painting and donate to protect and restore its art collection.

The Finnish Metagallery. Finnish National Gallery (c)

Artworks have been grouped thematically; male artists, female artists, "queer" and "animals" were the themes added in 2022. For 2023, the Finnish National Gallery has chosen "peace" as the Metagallery's theme. In addition to works from the Finnish National Gallery's collection, the pavilion features two images from the collection of the National Art Museum of Ukraine.

The Metagallery was created by design and innovation studio Adventure Club using open source code. Once the pavilion in Decentraland has closed its doors, the coded structure will be added to the virtual world's resource centre for anyone to use, free of charge.

Involved Parties

Finnish National Gallery, the Finnish Innovation Fund Citra, Decentraland, design and innovation studio Adventure Club Adventure Club, PR agency NetProfile.

Objectives

1. To recreate a historic space that people cannot visit anymore, and to let them see some of the artworks visitors of the Paris World Fair would have seen in 1900.

2. To see how artworks from the Finnish National Gallery fare in a virtual world. How do people interact with them? How prone are the visitors and avatars to taking part in suggested activities? Will they visit once or time and again? The museum team will also gain deeper insight and analysis on visitor behaviour, like how many times the avatars visited, how long they staid and how much they interacted in the pavilion.

As Johanna Eiramo, Director of the Digital National Programme of the Finnish National Gallery noted: *"We gave our visitors the possibility to change the theme of the art seen on the walls and to vote for new ones. If they signed up with their crypto wallet, visitors received a token. We wanted to see if we can activate people to do more than just visit and see art. Voting was not very active because it required a crypto wallet. Our second vote, choosing the work of art that best represents the idea of peace, did not require a crypto wallet. Visitors were taken back to the the FinnishMetagallery.fi site instead. That worked a lot better."*

Learning benefits

1. In the Finnish Metagallery, visitors get access to the virtual collection of artworks from the Finnish National Gallery and historically accurate information about the pavilion.

2. *"I think there's a lot of educational content that could be shown on Web3. You could turn the pavilion into a mathematics or a coding lab,"* Johanna Eiramo said, commenting on the educational opportunities of the Metaverse. She also noted that from an educational point of view, the ability to visit the virtual worlds of Decentraland as a group, to discuss what you see in a chat room, and to listen to audio material instead of reading text, can make the educational experience more interactive.

3. Moreover, the project, as a whole, can be very informative for the museum community interested in how museums can be involved in the Metaverse space. The project website contains informative content not only about the Finnish Metagallery, but also about general concepts related to Web3. The Digital National Gallery programme plans to gather, digest and publish practical information about being active in Web3, both as a visitor and a contributor.

The Finnish Pavilion of the 1900 Paris World Fair/Lahti City Museums archives (c)

The Finnish Metagallery. AdventureClub.io (c)

visited the Metagallery during the campaign. Ad blockers and cookie consent decisions, for example, were identified as some reasons for the lack of eventual visits.

Johanna Eiramo shares in this regard: *"People either didn't get to the final destination or timed out or they tried to go via a mobile device. Decentraland does not function on mobile devices at this point. It's early days for the wider consumer base to visit virtual worlds and be comfortable with that. There's quite a bit of interoperability that doesn't run smoothly between Web2 and Web3, for instance. I don't think there's anything wrong with Decentraland. They've just made some technical decisions, no mobile access, for instance, and that decision impacts visitor behaviour. But that is exactly why pilot projects are important".*

Major takeaways

1. 3,500 visitors (as of the end of January 2023) from all over the world. The average time spent is under 2 minutes. The longest time spent on-site has been 7+ minutes and the shortest is just an avatar coming in and then leaving again directly.

2. *"I think it's very important that art and culture are involved in Web3 now, when it is still growing and finding new forms. Art and culture should be more available to more people and obviously we need to take it to where those people are. We need to show that gaming isn't the only way to spend time in virtual worlds, but there is also a place and space there for culture, art and history"*, believes Johanna Eiramo.

3. *"Culture is a resource and it is valued also in Web3. The museum district of Decentraland gave us the plot of land for free, so we could pilot showcasing art in their virtual world. How great is that?"* Johanna says.

Recommendations

1. *"If you haven't started to look into the possibilities of the Metaverse, you should. I think that's number one,"* Johanna Eiramo recommends to museum professionals.

2. Johanna stresses out how important pilot projects are: *"Be brave and go ahead and create a pilot project. You need some sort of a budget, but most likely you can start with a reasonable one. Look for collaborators. We've received a lot of support and opportunities by just discussing our plans with companies and organisations who are already involved within Web3."*

Challenges

1. Access to Decentraland without a powerful computer, stable internet connection and recommended systems requirements can be difficult.

2. Navigation in Decentraland can be challenging. You need the exact coordinate to find the right place. Alternatively, you can host an event, that can then be posted on the event notice board. New users find their way best via a direct link.

3. People, especially less digitally savvy friends of art, might be hesitant to visit virtual worlds and try out something new.

4. Marketing. The project got a lot of attention on social media but this did not convert to visits in the same amount. For example, 16,000 people might be clicking on a banner, but only 2,100 people

THE KEEPER COUNCIL AND THE KEEPER OF PAINTINGS: IMMERSIVE GAMING EXPERIENCES AT THE NATIONAL GALLERY, LONDON (UK)

INTERVIEW WITH LAWRENCE CHILES

Lawrence Chiles is Head of Digital at The National Gallery, London.

Keeper Council is a free game for Roblox extending The Keeper of Paintings Augmented Reality app experience at the National Gallery in London.

How do you define the Metaverse?

I'm still getting to grips with what the term Metaverse means. I think this is the way that you can exist and have a presence in other digital spaces. And that's becoming prevalent in various different platforms that already exist and new ones that are trying to define it.

Could you tell us about the projects The Keeper of Paintings and the Keeper Council?
How have you come to the idea of presenting the National Gallery in virtual space?

The Keeper of Paintings was commissioned by the National Gallery, London, and StoryFutures, Royal Holloway, University of London, as part of StoryFutures China, a research and development project funded by the Arts and Humanities Research Council (AHRC). StoryFutures China is led by Brunel Design School, Brunel University London. The initial brief for that was looking at a cultural exchange project in immersive technologies between the UK and China...

The project started just before Covid-19. So it was going to go in a very different direction. Instead of focusing on a theme or a piece of art history research, we were looking at the theme of art science as a starting point, and we entered into that initial phase. There were a lot of conversations initially around what that might look like. Working with the Chinese partners, we found out that children and families were the common audience. And so out of that, we started working much more closely and brought in our learning team. And our learning team got a very new strategy looking at co-creation or child-led learning. So that really informed the direction of the piece because we have done a few projects that are sort of creative R&D projects, and we were able to start off on that footing and then set the parameters really for then doing a co-creation project with children.

Screenshot from the game The Keeper Council on Roblox, The National Gallery, London.

Screenshot from the game The Keeper Council on Roblox, The National Gallery, London.

We were going to make an AR game. We didn't know that Roblox was going to be the thing, but we did know that we wanted to find something that was going to engage children and then also be able to think about immersive spaces. To be honest, the reason why it went that direction as well was because the original brief was very much thinking about physical, on-site, immersive, but because of the restrictions in Covid-19 and of where we were, it naturally started moving in a different direction.

"We've always been interested in the challenge of seeing the gallery's paintings in different contexts and seeing them in different spaces."

I think the [previous project](#) we did in VR brought painting back in connection with its original setting in Italy. So this idea of how you could use digital technology to transport people, whether that's through AR, VR, what does it mean to put people in these spaces and what can we learn? There's been something we've been building towards over the last four years, and I think in the two projects we've done with StoriesFuture we've learnt a lot because they have been research projects, so testing with audiences, testing in the gallery and really analysing the data to think what works for audiences has been such a strong part of it.

The Gallery previously might have had thoughts about all roads leading to a physical visit with a real painting. Those questions and what we did during Covid-19 in terms of access to our collection and doing virtual tours, thinking about virtual exhibitions that we launched, all those things have been able to put the gallery's paintings in these different contexts, in different spaces. So whilst it's not the metaverse, I think we've got people around the idea now that it's not a secondary experience to have the paintings in different spaces.

What are the learning benefits of these games?

The storytelling was really crucial. It's all about ways of looking: how you look at paintings, and how you look at our paintings in particular. Our paintings are quite challenging and are also quite complex. So there is a collection of 2,600 paintings in the Western tradition. They have lots of rich stories to tell, but they can obviously be a barrier in terms of what kids may be used to seeing and reading, and having access to in terms of modern media. We've got paintings with severed heads. We've got paintings with dramatic scenery and big stories that are very hard to tell. We have given the process the game mechanic, it's clue based, and so it incites children to think about how they're going to learn. When they get to a painting, it invites them to decipher those clues.

It makes them look in particular ways. So all the time, whilst they are getting factual information such as the name of this painting, the artist, or the date, it's really driving them to be inquisitive, and then it's through what you collect because as the paintings give you the gems, which is a lovely moment of interactive digital interaction. The gems give you power to look, and you collect six different types of ways of looking at paintings. So, they learn factual stuff about paintings, but that's really part of the story. The story is about how they build the skills to do it.

Screenshot from the game The Keeper Council on Roblox, The National Gallery, London.

What would be your recommendations for museums taking the first steps towards the Metaverse and considering it as an environment for designing learning experiences?

Don't overcomplicate it. The tools are starting to be out there now. If you can work out a really inventive story, the tools and techniques around it can actually be relatively simple because it's all about how to do that storytelling well. What story are you trying to tell, or what are the actions you're trying to get people to do? The narrative keeps the two worlds working.

DIGITAL COMMUNICATION, CHATBOTS AND ARTIFICIAL INTELLIGENCE

INTRODUCTION

Why not fantasise that we could ask what inspired Albrecht Dürer or which technique he worked in, and not pose the question to a museum curator or a literary source, but to the artist himself? Or imagine that the bust of Nefertiti from the Neues Museum in Berlin could tell us when and how it came into the museum collection, whether it was intended by the sculptor as a model for a larger sculpture or was it a finished standalone artwork? Or could the queen even tell us what her name means on her own behalf?

In a way, this is possible through the use of chatbots, or in other words, computer programmes that attempt to simulate the conversation of a human being via text or voice interactions. Either predefined by museum curators and educators or generated by Artificial Intelligence, answers to the questions of users could be delivered via a chatbot on behalf of a museum team, a specific character (e.g an artist, a writer, or a historical character) or a museum artefact. Chatbots can also provide visitors with educational resources such as articles, images or videos related to the museum's collections and recommend additional learning resources or museum activities based on visitors' interests or preferences. Chatbots can be deployed over apps, and integrated into institutional websites or messenger services.

An interesting example of a chatbot app is the project "Mein Objekt" ("My object"). One example of the application of this app by museums is the "Ping! Die Museumsapp" ("Ping!The Museum app") project, developed by the Badisches Landesmuseum Karlsruhe in collaboration with gamelab.berlin, the Stiftung Humboldt Forum as part of the museum4punkt0 initiative. This app allows museum visitors to select an object they are interested in while swiping profiles with images and short information about these objects, start a conversation with it, and learn the fascinating stories behind the artefacts directly from the artefacts themselves. The app allows starting a chat only if there is "mutual sympathy" between the user and the object. Conversations can evolve in several directions thanks to different response options. The texts for the chatbot were developed by museum staff in cooperation with a community of citizens and students. In another adaptation of this app - "Mein Objekt - Senckenberg" (Senckenberg Museum für Naturkunde Görlitz) users can chat with birds, carnivorous plants or otters. The Open Source code for the application "Ping! Die Museumsapp" is available for download on GitHub in the community account of museum4punkt0.

Text-based chatbots can be employed within existing social messaging apps, such as for example, Facebook Messenger or Telegram. Later in the chapter, we will see how messenger services can be used for conveying the story of the Berlin Wall from the perspective of three people

who dared to flee from East Berlin to West Berlin through the sewers. In this project, the messages with the stories on behalf of the eye-witnesses are planned to be sent out via newsletter push.

Chatbots can be integrated into museum websites, as in the case of the Musée des Augustins in Toulouse, where Dame Tholose, an emblematic artwork of the collection, offers remote visitors different paths to travel through time and through the collections in an interactive way.

AI chatbots

Artificial Intelligence technology in chatbots allows them to interpret text messages sent by users to find an appropriate answer (Natural Language Processing) or to recognise pictures of artworks (Computer Vison) to share content related to it and to "learn" on their own, using previous conversations with visitors, based upon which new responses are generated (Machine Learning). The potential of AI chatbots for digital museum learning onsite is being explored in an ongoing research project "CHIM - Chatbot in the Museum", one of whose goals is to develop a speech- and text-based AI chatbot that should not only provide answers, but also ask questions and draw museum visitors' attention to image details.

One example of a chatbot powered by Artificial Intelligence is the ChatGPT chatbot, also known as Generative Pre-trained Transformer 3, launched in November 2022 by research and development lab OpenAI, which within a few months became a technology trend that has also caught the attention of the museum community.
The GPT chatbot is based on an AI algorithm designed to understand and generate human-like language. An exhaustive overview of different applications of ChatGPT for museums, including for learning and engagement of museum visitors online, and a series of experiments with the application have been recently done by Elizabeth Merritt, director of the American Alliance of Museums' Center for the Future of Museums in the Alliance's blog.

> Could you answer a question, whether your creator intended you as a model for another sculpture or as a finished artwork?

> ...Nefertiti is typing
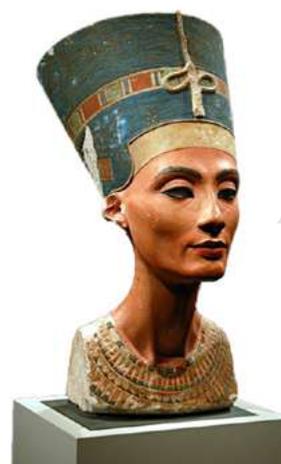
Picture of the Nefertiti bust in Neues Museum, Berlin. Photograph by Philip Pikart, distributed under a CC BY-SA 3.0 license.

We have also experimented with the ChatGPT and have imagined that we address a question directly to the sculpture bust of Nefertiti from the Neues Museum in Berlin.

"ChatGPT, let us imagine that you are the sculpture bust of Nefertiti in the collection of the Neues Museum in Berlin. Could you answer a question, whether your creator intended you as a model for another sculpture or as a finished artwork?"

As the sculpture bust of Nefertiti, I was created during the 18th dynasty of ancient Egypt, sometime around 1345 BC. My creator was the renowned sculptor Thutmose, who was one of the most talented and celebrated artists of his time.

As a sculpture, I was likely created as a finished artwork, rather than as a model for another sculpture. It is believed that I was made as a tribute to Nefertiti, the Great Royal Wife of the pharaoh Akhenaten. My beauty and elegance were meant to capture the essence of the queen and to immortalize her image for posterity.

Thutmose would have carefully selected the materials he used to create me, which included limestone covered in layers of gypsum and painted with brightly colored pigments. He would have worked with great skill and precision to create my lifelike features, which include a slender neck, high cheekbones, and a regal headdress. While it is possible that Thutmose may have used sketches or models to create me, the level of detail and artistry in my finished form suggests that I was intended to be a standalone artwork. And indeed, my enduring fame and influence on subsequent art and culture suggest that my creator succeeded in his goal of capturing the beauty and majesty of his subject for all time.

We regenerated the answers several times and each time the answer varied. In the first case, the chatbot provides a response on behalf of the sculpture itself, whereas the second and third responses already refer to the fact that the AI model does not have the consciousness to fantasise and cannot be a physical object. Thanks, fair enough!

As an AI language model, I don't have a physical form or consciousness to imagine myself as the sculpture bust of Nefertiti. However, I can provide an answer to your question based on my knowledge of ancient Egyptian art.

The bust of Nefertiti was likely created as a finished artwork, rather than as a model for another sculpture. During the 18th dynasty of ancient Egypt, sculptures were typically created as standalone artworks, rather than as models or prototypes for other works.

Moreover, the level of detail and artistry in the bust of Nefertiti suggests that it was intended to be a finished artwork. The sculptor, Thutmose, carefully selected the materials and worked with great skill and precision to create the lifelike features of the queen. The delicate features, the intricate headdress, and the subtle facial expressions all suggest that the bust was a work of art in its own right.

It is possible that Thutmose may have used sketches or models to create the bust, but it is unlikely that he intended it as a model for another sculpture. The beauty and elegance of the bust of Nefertiti have endured for over three thousand years, making it one of the most celebrated works of ancient Egyptian art.

Furthermore, in the first two cases, the answer was rather unambiguous in favour of the bust of Nefertiti being conceived as an autonomous artwork, whereas the third version already allowed for the possibility that the bust had been produced for another sculpture and was not a standalone masterpiece. At least the third answer emphasised that the question was a topic for debate among the scholars, which more accurately reflects the position outlined by the museum.

As an AI language model, I cannot actually be the sculpture bust of Nefertiti or any other physical object. However, based on my knowledge, I can provide an answer to your question.

The question of whether the sculpture bust of Nefertiti was intended as a model for another sculpture or as a finished artwork is a matter of some debate among experts. Some scholars believe that the bust was created as a model for other works of art, while others argue that it was meant to be a standalone masterpiece.

There are several factors that suggest that the bust was intended as a finished artwork. For one, the level of detail and artistry in the piece is extraordinary, with every aspect of the queen's face and headdress rendered with exquisite care. This level of detail suggests that the bust was created as a standalone work of art, rather than as a model for other sculptures.

Additionally, the fact that the bust was found in the studio of the sculptor Thutmose, rather than in a workshop where models were produced, supports the idea that it was a finished work of art.

However, there are also arguments to be made for the idea that the bust was intended as a model for other sculptures. For instance, it is possible that Thutmose created the bust as a template for other artists to use when creating statues or reliefs of Nefertiti. Some scholars have also suggested that the bust may have been part of a larger statue or group of sculptures that have since been lost or destroyed.

In the end, the question of whether the sculpture bust of Nefertiti was intended as a model for other sculptures or as a finished artwork may never be definitively answered. What is certain, however, is that the bust is a stunning and enduring masterpiece that continues to captivate and inspire people around the world.

It would be rash to take the ChatGPT's answers at face value without checking the sources, but nevertheless, the result of our experiment, due to the speed of response generation, the argumentation and the structure of the answer, which also includes relevant historical facts (which in such cases require additional verification in the first place), made an overall positive impression on us.

In spite of the existing limitations and biases, AI chats can open up interesting possibilities for museum mediation and meaningful storytelling for diverse audiences. Experimentation, knowledge exchange with other museums and organisations, including research centres, digital and innovation labs of academic institutions, and collaborations between museum professionals and digital experts can be especially valuable in the process of exploration of the potential of AI and AI-powered chatbots for museums and their engagement with digital visitors.

DIGITAL STORYTELLING VIA MESSENGER: A FIRST-HAND HISTORY OF THE BERLIN WALL AT BERLIN WALL FOUNDATION (DE)

Institution
The Berlin Wall Foundation

Location
Berlin, Germany

Description
The Berlin Wall Foundation documents the history of the Berlin Wall and the escape routes from the GDR as part and effect of the division of Germany and the East-West conflict in the 20th century. It conveys history at the historic site

Size
Berlin Wall Foundation includes five locations:
Berlin Wall Memorial, Marienfelde Refugee Center Memorial, East Side Gallery, Memorial Günter Litfin and Parliament of Trees. The Foundation is preparing a new memorial site at Checkpoint Charlie

Staff members
Approx. 60 permanent employees and almost 70 self-employed, freelance guides and educators

Project
Brennpunkt Checkpoint Charlie
Digitales Storytelling Via Messenger

Timeframe
The project launch is planned for August 2023

Concept

In January 2022 a new digital project about Checkpoint Charlie started, which will take a look at the history of the Allied checkpoint and the GDR border crossing point at Friedrich-/Zimmerstraße. The news and pictures of the US and Soviet tanks at Checkpoint Charlie in October 1961 went around the world and made the site world famous.

The story of the construction of the wall to the confrontation of the tanks is conveyed from the perspective of an eye witness in real-time via messenger service. Between August and October 2023, participants will be transported back to 1961, and receive text and voice messages from statements by a contemporary witness, some of which are historically documented and some of which are part of the personal storytelling. In this way, they get insights into the events as well as into the thoughts and feelings of the contemporary witness. They can also interact with the contemporary witness and respond with their own comments. The plan is to produce animated films that will be sent out to provide the historical background. The dramaturgy for the messenger is currently developed by the museum's team together with students of Free University Berlin over a period of six months (a winter semester). The offer is aimed at young people aged 14 to 29 in the entire German-speaking area and will run until the end of 2023.

The project is part of the federal program «Youth remembers» (funding line SED-Unrecht) and is funded by the German Federal Government Commissioner for Culture and the Media.

Involved parties

Berlin Wall Foundation, Free University Berlin, Deutschlandfunk Nova (radio station).

Approach to digital learning

The Berlin Wall Foundation is working intensively on the topic of digitisation and digital learning. Especially during the Covid-19 pandemic, digital structures (clouds, streaming services, conference tools) were created, and digital learning opportunities were developed and expanded, as many people were unable to visit the Berlin Wall Foundation's historical sites.

Digital learning offers many new opportunities for the Foundation's outreach work. Innovative digital projects allow the Foundation to reach new and more diverse audiences, create new and alternative approaches to history, and experience new methodologies. It enables the museum to pick up young people in their digital surroundings and habits, and actively involve them in our outreach work. With the project «Brennpunkt Checkpoint Charlie. Digital Storytelling via Messenger-Dienst», Berlin Wall Foundation would like to implement another digital project in which, above all, users can participate and interact.

In recent years, numerous digital programs have been developed that create different access points. They are aimed at individual visitors and groups:

Online-exhibition, funded by Kulturstiftung des Bundes

Augmented Reality-App "Cold War Berlin", hybrid App for Android and iOS, funded by the German Federal Government Commissioner for Culture and the Media, "Youth remembers"

Interactive map, citizen science project, funded by by the German Federal Government Commissioner for Culture and the Media, Neustart Kultur, Launch 26.4.2022

Der Mauerbau 1961 The Building of the Wall in 1961: A Search for Traces in the Center of Berlin (audio tour)

60 Jahre Mauerbau, podcast

Online-Führung – 1961 | 1989 Online guide: 1961 | 1989. the berlin wall

Online-Filmanalyse, Online-Zeitzeugengespräche Online-Workshops

Objective

To bring the stories about escape from East Berlin to West Berlin to the audience in a digital form so that people all over the world can have access to them and learn about the history of divided Berlin and Germany.

Learning benefits

Young people can get in touch with everyday history through personal interaction via Messenger. Through biographical learning, they can understand the impact of the history of German division and the Cold War. Time barriers can be removed and users become part of the story themselves. In this way, users experience the famous site of Checkpoint Charlie in a new and more personal way.
The project might contribute to inspire users to inquire about or work through their own family history.

Challenges

1. Limited human resources.
2. The inability to develop the project in English as one of the resulting challenges.
3. Limited financial resources.
4. Develop a dramaturgy that captivates users over a period of several months
5. Reach the target group independent of location

and develop an appropriate approach for the messages

Recommendations

Project leads: Lisa Albrecht and Birgit Wienand

Use your networks and talk as much as possible about your project, your experiences and challenges. Share ideas with colleagues from other institutions, experiment with new formats and last but not least: Don't be afraid of technology.

Tank confrontation at Checkpoint Charlie © Stiftung Berliner Mauer, photo: Gerhard Neumann (c).

Institution
Musée des Augustins (closed until 2024)

Location
Toulouse, France

Description
The collections of medieval sculptures are among the richest in Europe. Among the masterpieces on display are the Romanesque capitals of the Daurade, Saint-Sernin and Saint-Etienne, all the sculptures of Rieux (14th century) and Notre-Dame de Grasse (around 1470)

The 17th and 18th centuries are well represented with works by Rubens, Murillo, Vigée-Lebrun, Houdon, etc. In the spectacular Salon Rouge, French paintings from the 19th century (Delacroix, Ingres, Benjamin-Constant) and early 20th century (Manet, Vuillard, Toulouse-Lautrec) reside alongside remarkable sculptures (Rodin, Claudel, Marqueste, Falguière)

Size
9,000 m² (including the cloister garden), about 700 works on display

Staff members
20 (excluding administrative, technical and security/surveillance functions)

Project
Talk to Dame Tholose, the chatbot

Timeframe
3 months, launch of the chatbot in December 2020

Concept

The Dame Tholose chatbot from the Musée des Augustins is a webpage interface that allows French-speaking online users to discover the collections and obtain some practical information about the museum.

It is a tool for both mediation (first intention) and information (second intention). In its first version, two paths were offered:

• *The museum through time: discovery of the evolution of the building and the museum through the centuries;*

• *Animals and Co.: a brief overview of the cute, frightening or mythological creatures which belong to the museum's display. This path offers the opportunity to discover 10 works from the collections representing animals.*

Another option briefly presents the work currently in progress at the museum.

In order to renew the museum offer in 2022, two new courses have replaced the paths "The museum over time" and "Animals and Co":

• *"A la mode des Augustins" (a game where the user composes an outfit using elements – headdress, top, bottom, shoes, accessories - from works in the museum) and "My private visit" (tour centred on the female artists in the collection).*

How does this AI chatbot work?

«In this chatbot the AI serves two purposes: interpreting text messages sent by users to find an appropriate answer, and recognizing pictures of artworks to share content related to it. As we work with many cultural institutions, we have developed and trained powerful machine learning algorithms on the questions that visitors ask most, in several languages,» explained Marion Carré, co-founder and president of Ask Mona, the studio that developed the Dame Tholose chatbot.

Musée des Augustins (c).

Musée des Augustins (c).

Context

This chatbot project was developed while the museum was closed. The Musée des Augustins closed its doors to the public in May 2019 for renovation and improvement of its accessibility standards. In this context, it is also important to note that for technical reasons, the institutional site augustins.org and the edutainment site Junior Augustins were closed at the end of 2020. They offered numerous educational and scientific resources: a catalogue of digitised exhibitions, instructions for work available on the website, audio tracks, educational files for teachers,

games, tutorials, etc. These two sites have been temporarily replaced by a mini-site with a limited number of pages and functionalities (current site).

Involved parties

Project manager, tour guide, exhibitions & partnerships manager, web/multimedia manager, service provider AskMona.

Approach to digital learning

Digital technologies allow the Musée des Augustins to interact with its audiences during this long period of closure during reconstruction works (as well as the pandemic). A chatbot is a complementary tool to other forms of mediation or learning which makes it possible to capture audiences by elaborating on themes raised by the works: comparisons, historical explanations, art history.

Objectives

Ghislaine Gemin, Head of Communications Department: *"In the situation where direct access to the collections was impossible, it seemed essential to us to maintain and increase our online presence by diversifying the digital offers and resources."*

1. The chatbot was therefore designed as a tool to bring the museum to life during its closure by promoting the history and the collections. It also compensated for the decrease in offers on the website.

2. Another more subtle objective was to follow the transformation that would occur during the reconstruction. After reopening, the museum will have a new modern entrance, different from the rest of the building which dates from the 14th and 19th centuries. The path "The museum through time" shows that the building has constantly evolved and changed over the centuries, according to the needs of the remodelling of the city.

Musée des Augustins (c).

Musée des Augustins (c).

Learning benefits

Ghislaine Gemin believes that *"lively, light and playful, it brings a touch of freshness to a somewhat limited site without neglecting an educational part."*

The chatbot allows users to learn about the museum's collection in a playful and interactive manner while the museum is under reconstruction.

Obstacles

1. The main obstacle was the Digital Department (IT department) which is extremely vigilant about any security breaches that could harm the community (the museum is a service of the Toulouse town hall).

2. The budget for the project has to be renewed each year (especially if new paths/scenarios are created) and we are now contracted to the service provider.

Future prospects

After reopening the museum there are plans to develop the chatbot to inlcude a more practical component (opening information, prices, programming, etc.).

Reccomendations

Ghislaine Gemin:

1. Explore some social networks that offer real possibilities for mediation.

2. Connect digital to other experiences, and promote multi-sensory methods for a universal approach.

3. Always keep in mind that digital is a means, not an end, and anticipate the implementation time (very time-consuming for museum staff) and the budget.

GAMES AND PLAYFUL
LEARNING

INTRODUCTION

Digital games in museums can be a valuable tool for interactive remote learning both for kids and adults. Museums employ digital gaming to interactively ease visitors into collections, to test their knowledge, or to enable them to develop new skills and cocreate in a playful manner. Gaming experiences accompanied by additional educational resources can become an engaging addition to the school or high school curriculum. Such an example is the game Prisme7, which invites the public to discover some works from the collection of the Pompidou Centre, and is intended to be used together with additional resources by teachers in middle and high school.

The handbook "When Museums Meet Videogames", which was produced from a series of events organised by the community of museum professionals We are Museums, includes "inspirations and instructions that show the range of possibilities one can look at when wanting to dive into a potential collaboration with a videogame studio and or a museum" (Museum Lab: When Museums Meet Videogames). This handbook and its related YouTube videos can serve as a good starting point for museums and cultural institutions that are considering incorporating digital games into their educational programming.

Games and Extended Reality

Extended Reality represents a new frontier for gaming design and allows museum for creating immersive learning experiences.

Augmented reality is one of the mediums that can be combined with the gaming experiences. One of the most well known examples of using AR for gamified experiences for exploring the museums onsite is the game "Pokémon Go", where users can 'catch' Pokémon hiding in the museum around them. However, games can be experienced in AR also from the comfort of home. One of the examples is the game Snapture, which explores the sculpture collection of the Bode Museum in a playful way.

The Virtual Reality or metaverse platforms also provide museums with opportunities to design immersive gaming experiences for remote users of different ages. Such opportunities will be examined in our report using the example of a VR game created by the Hellenic IT Museum in cooperation with the VR ed-tech platform Musemio or the game The Keeper Council developed by the National Gallery in London on the Roblox platform.

Games and hackathons

To create gaming experiences, museums not only involve established tech companies or startups, but also young game developers and designers through the hackathon format, as can be seen from the example of the hackathon Coding da Vinci. Museums and cultural heritage can provide developers with Open Access data, with which participants are free to implement any ideas of game prototypes and to develop their creative and technical skills. Thus in the game experience "Troja" which was praised with an audience award and created by the participants of the hackathon Coding da Vinci (Baden-Württemberg 2022) players are invited to discover different phases and artefacts of Troy, play mini-games, for example, small quizzes and to rebuild the city of Troy as a 3D model while archaeologist Heinrich Schliemann, who discovered Troy, guides gamers through the game. In another example, Masters students from Furtwangen University participated in a Coding da Vinci hackathon, and created a digital card game "Unravelling Art" with the data set from Augustinermuseum and Staatsgalerie Stuttgart, in which works of art are drawn and assigned to different exhibitions according to certain rules. The aim is to learn more about the background of the paintings as the game progresses. The better gamers classify the works of art, the more points they collect.

A MAZE. Museum Online Game Jam is another example of a hackathon, in which game developers from different countries came together virtually in 2021 to create fourteen online game prototypes together with the Leibniz Research Museums within 48 hours. In an exchange with mentors from the Leibniz Research Museums, the participants of the hackathon sought out objects from their digital 3D and 2D collections and incorporated them into their game worlds. The games can be discovered in short teaser videos and tried out on the Leibniz Research Museums website.

lab.Bode / Staatliche Museen zu Berlin, 2023 (c)

One of the participants of the A MAZE hackathon, game designer Anna Dohy, shared with us her thoughts on the learning impact of games. She said about her experience at the hackathon:

"If players feel motivated, they are willing to invest time and energy in memorising patterns and understanding complex concepts. Good games have the superpower to motivate players and are therefore valuable tools for teaching and learning design. It is difficult to capture players' attention simply by presenting them with information or an object. But when they have to work for it, or use it as a resource to achieve their goal, they develop a personal meaning and connection with the object, making it an integral part of their story.

During the AMaze game jam, we used museum objects to prototype these kinds of games. We experimented with different motivational techniques (such as ownership, empowerment, achievement or social influence) to find out what works best in a museum setting. Initiatives like this are perfect for exploring new ideas without taking risks and can be a great source of inspiration for later projects."
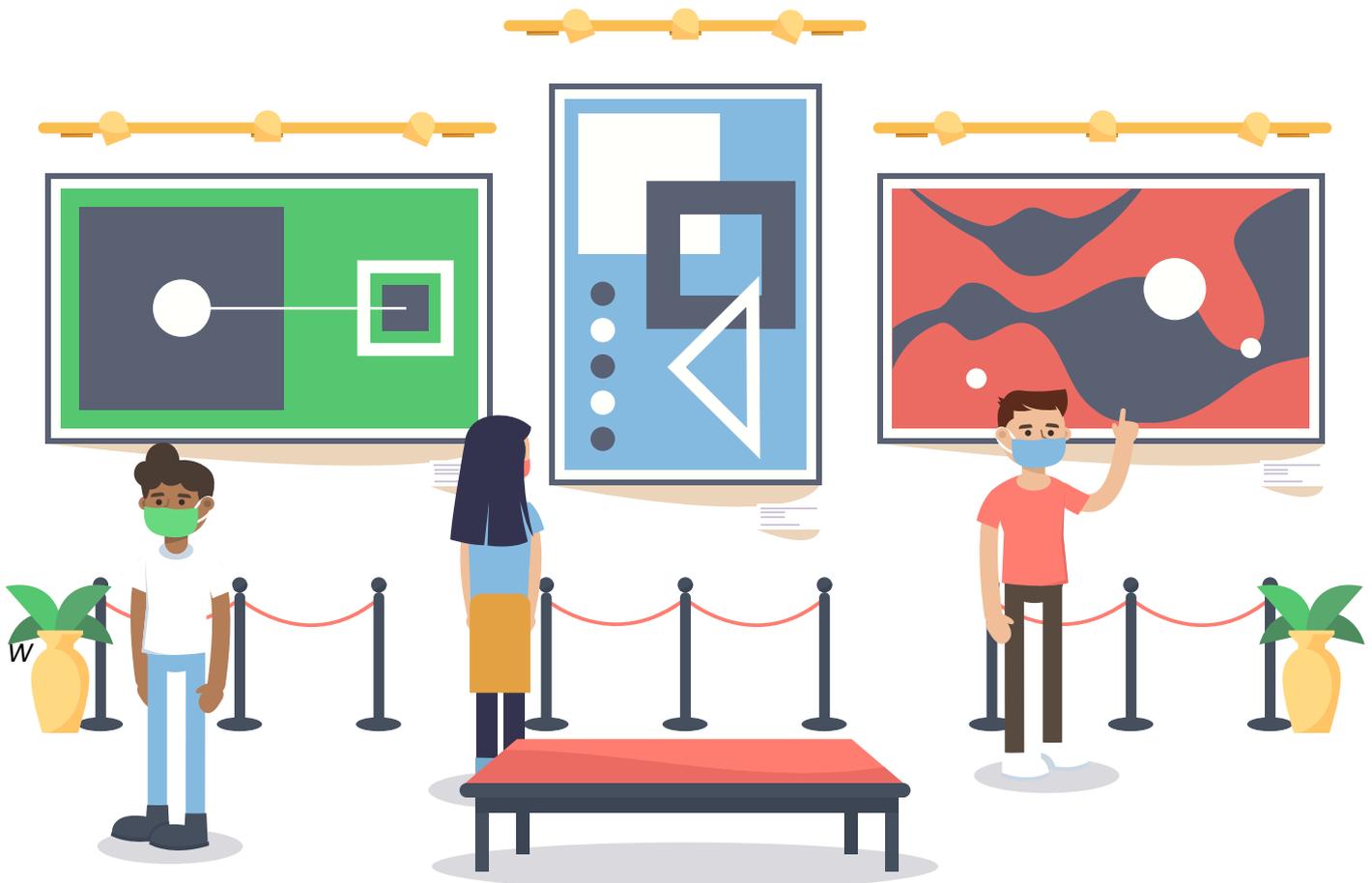
LEARNING THE BASICS OF ENGINEERING WITH A VR GAME FOR CHILDREN AT HELLENIC IT MUSEUM (GR)

Institution
Hellenic IT Museum

Location
Thessalonikis, Greece

Description
The Hellenic IT Museum®, the biggest IT Museum in Southeast Europe, started its activities in 2008, and since 2012 the Museum has constituted the first official Greek organisation that gathers knowledge about the development in the field of Informatics from 1970 to the middle of 1990s. With the motto «The museum that clicks with you», the Hellenic IT Museum is the «time machine of Informatics» in Greece

Size
The museum's collection consists of over 7,500 exhibits. From the first wooden mouse (replica), storage media in refrigerator size, to 15kg laptops!

Staff members
3 people. Also, the museum has five members on its Advisory Board

Project
VR game for children

Timeframe
The project launched in May 2020

Concept

The concept of the project is the cooperation between the Museum and a British company, Musemio, to develop a mobile app. Playing in a virtual world inspired by technology, children are encouraged to get to know computers by participating in several challenges and learning computer and technology basics with the purpose of understanding computer history. Children will have the chance to wander inside a computer and learn what its components are. They can also explore Commodore or Apple computers. To make this happen, VR glasses are used. The users of the app wander through the museum's exhibits.

About Musemio

Musemio is a VR ed-tech platform for kids based in London. Musemio helps cultural institutions to create educational and immersive content for family audiences.

"Our expertise lies in producing interactive stories featuring artefacts and narratives that implement clear learning objectives", highlights CEO and founder of Musemio, Olga Kravchenko.

Involved Parties

Olga Kravchenko and Kaitlin Fritz from Musemio and George Tsekouras, Hellenic IT Museum's Founder.

Approach to digital learning

For the museum, digital learning is a combination of any type of learning that is accompanied by technology or by instructional practice that makes effective use of technology. It encompasses the application of a wide spectrum of practices, including blended and virtual learning.

During the lockdown the museum's projects needed to move online. The biggest case was the 3D Virtual Tour of the museum. This case was easy for the team because before the Covid-19 lockdown, the museum staff had already created the 360 degree virtual tours, and during the lockdown, the team chose extra tools for the virtual tour, for example an audio tour that was set up in this virtual environment.

Musemio (c).
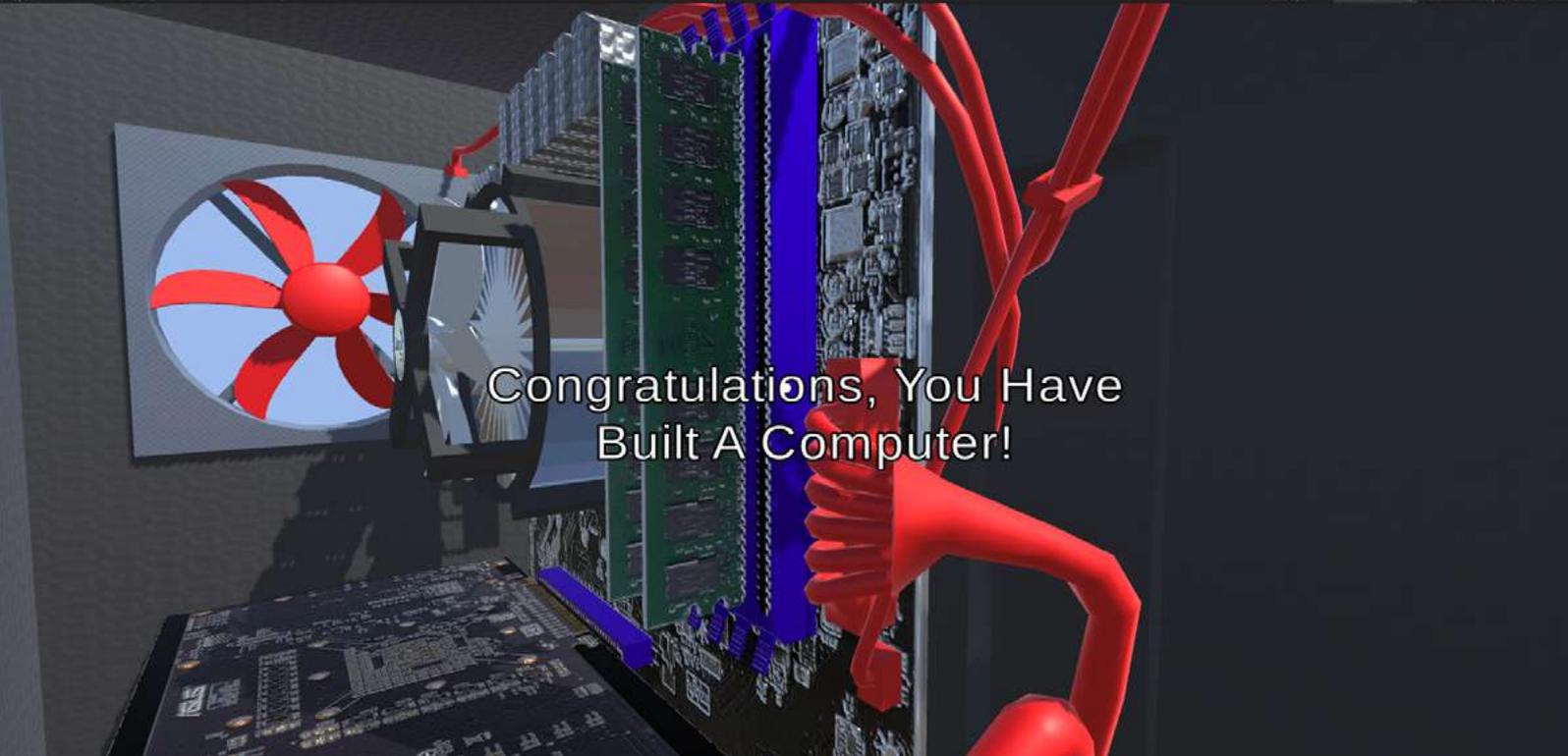
Musemio (c).

Objectives

1. To encourage children to learn about computers and the basics of engineering and computer history by playing a VR game and completing several challenges.

2. To introduce the Hellenic IT Museum to audiences from all over the world.

Obstacles

1. The shortage of staff of the museum and the workload made the delivery of certain parts of the project slower.

2. On the final line to launch the project, the process slowed down due to the lockdown.

3. The lack of physical meetings as all the necessary arrangements for the delivery of the project were remote.

Challenges

A major challenge was to be involved in a new project that uses cutting-edge technology as well as the cooperation between the museum and a foreign company.

Major takeaways

"The museum learned a different and new technology, which has been widely used in recent years. In addition, a major takeaway was the contact with a new market and the development of an app for a foreign market. Lastly, the manufacture of another educational tool available to our audience," highlighted George Tsekouras, Hellenic IT Museum's Founder.

Recommendations

"The most important goals will always have to be the educational character of the game, and the willingness to share online information with the public. Lastly, museums should be eager to cooperate with different companies and enterprises, even ones outside of their narrow circle of activity," noted George Tsekouras.
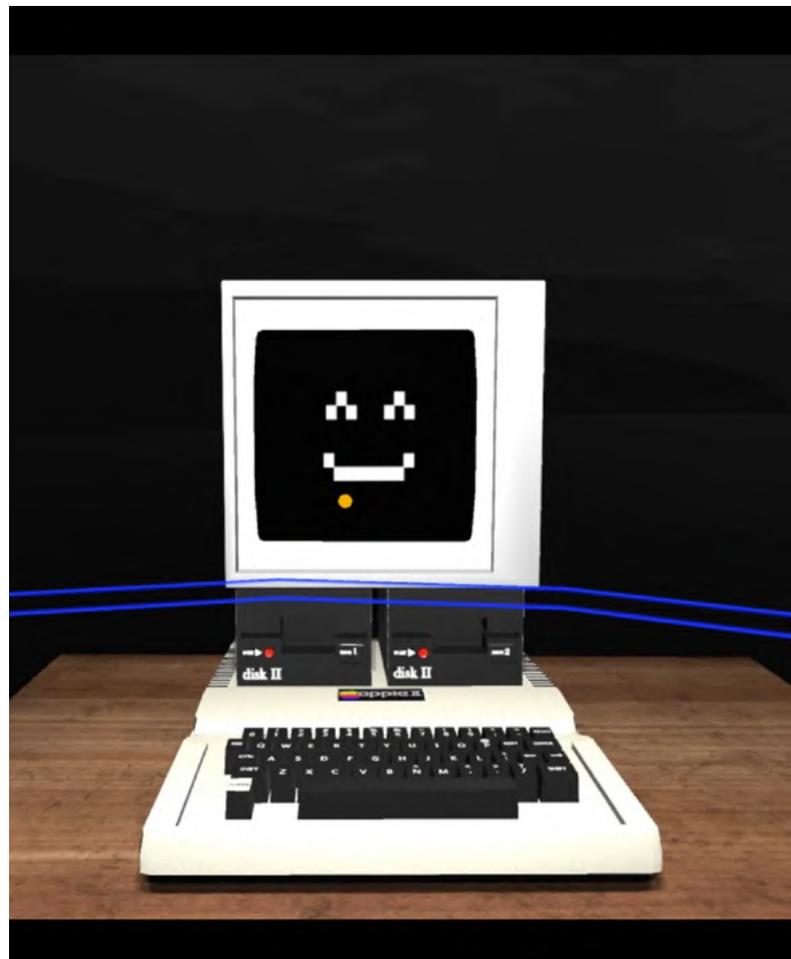
Musemio (c).

MASTERPIECES OF THE POMPIDOU CENTRE: AN IMMERSIVE AND EDUCATIONAL UNIVERSE OF THE GAME PRISME7 (FR)

Institution
Centre Pompidou

Location
Paris, France

Description
The Centre national d'art et de culture Georges-Pompidou, also known as Centre Pompidou or Beaubourg is a state arts and culture centre. Centre Pompidou includes the collection of the Musée national d'art moderne, temporary exhibitions, 2 screening rooms, a performance theatre, a conference room, a public reading library and a museum documentation and research centre, the Kandinsky Library

Size
The collection of modern and contemporary art brings together more than 120,000 works

The building extends over 10 levels of 7,500m2 each

Staff members
Around 1,000

Project
The video game Prisme7

Project
The game is available for free on mobile phones (iOS/Android) and computers (PC/Mac) for users from 12 years old. Now available in French, English, Spanish and Chinese. Designed in association with Olivier Mauco of Game in Society and Abdel Bounane of Bright

Timeframe
Launched in April 2020

Concept and context

Prisme7 is an educational video game, which invites the public to discover some works from the collection of the Musée national d'art moderne, interact with them, and explore the main principles of artistic creation.

After an initial introductory level, there are six game worlds where players can explore a selection of 40 major works from the Centre Pompidou collection. The character in Prisme7 is represented by an entity made up of molecules of light (which can be perceived as "artistic energy"). The players move around virtual worlds, collecting red orbs and some works to compile their own personal virtual gallery.

Game Levels:

Level 1: Colour and function. On this level, players must assign a colour to the objects that don't have one in order to continue.

Level 2: Colour and systems. In this level, players must group the colours together across a mirror, according to the principle of symmetry.

Level 3: Colour and activism. In this level, players discover certain passages of a large dehumanised city.

Level 4: Colour and emotion. Players must colour every corner of this level to reveal its structure and reconstitute the environment.

Level 5: Colour and spirituality. Players must match an object and a colour in order to activate each zone of the colourful space.

Level 6: Light and physics. Players use their light to forge paths and access zones previously out of reach.

Level 7: Light and immersion. In this level, players use their light and their shadow to eventually see their own work.

Prisme7 was designed thanks to funding from the "Éduthèque Innovative Digital Services" (SINÉ) call for projects of the French Ministry for national education and youth.

Approach

Olivier Mauco, Game Director of Prisme7, CEO of Game in Society and Co-Producer: *"And what if video games were also capable of playing with the rules of art and challenging their traditional values? As game designers, we have sought to produce a contemporary work that fits into the history of art. After all, who plays around with reality more than an artist does?"*

Learning and educational benefits

Guides to the works provide users with information about the works of art, including simple points and a detailed presentation. These guides are supplemented by a variety of resources: podcasts, educational files and videos. Some of these resources have been created specifically for teachers. They are available on the Eduthèque platform of the Ministry for national education and youth:

1. For the curriculum for middle and high school: ideas for workshops and uses of the game in class. The emphasis of these resources is on "trans-disciplinary uses and opening up possibilities for innovative teaching practices", such as the "flipped classroom".

2. Preparatory storyboards for the video game, with the idea of showing the process of devising and designing the game.

3. Tips are also provided to unlock certain levels of the game and go directly to a given sequence for a teaching session.

Challenges

1. Mixing the world of museum and gaming.

2. Creating a great workflow where anybody can understand each other.

3. Create a digital piece that bridges the field of videogames and the art world: playability was the main challenge, making the game playable, fun and non-discriminant.

Obstacles and limitations

The core public of Prisme7 is the teenager that doesn't go to museums. Moreover, gamers can criticise games made by non-gaming industry actors.

Major takeaways

Getting into the field of videogames was a major claim for le Centre Pompidou: the museum is open to you, art is accessible, it is not just an elite thing.

Recommendations

Olivier Mauco:

Define the core motivations. Don't try to mimic. A game must be compliant with your activities as a new format. Don't do a game because games are cool. Make it because you believe it is a new medium, like video used to be.
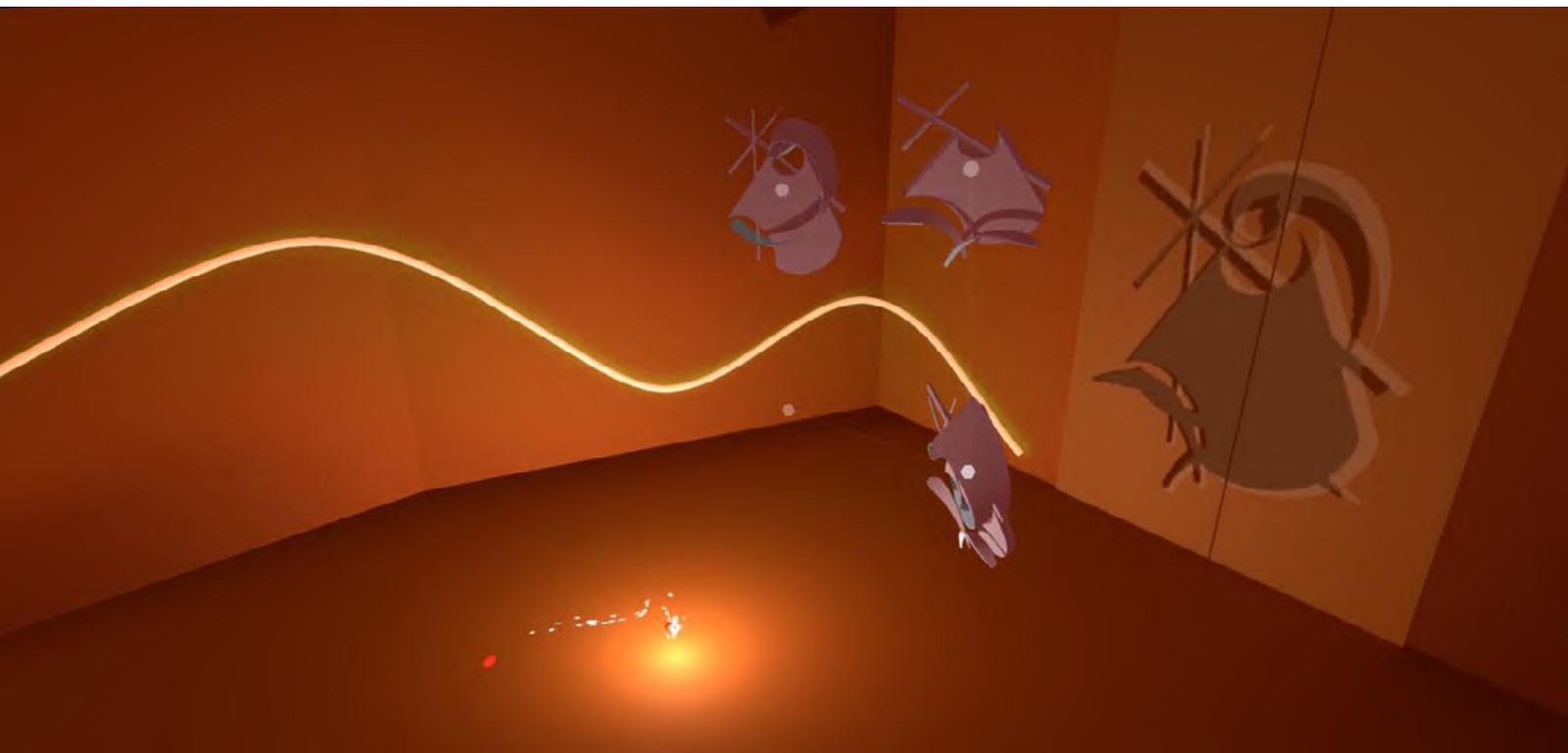
Screenshot from the game Prisme7, Game in Society (c).

TWIDDLE: DISCOVERING MUSEUM COLLECTIONS AND SOLVING TASKS WITH LEIBNIZ RESEARCH MUSEUMS (DE)

About the museums

The collections and archives of the eight Leibniz Research Museums comprise well over 100 million objects and form the foundation for research into the history of the earth and its biodiversity, the history of culture and technology, and the preservation of scientific and cultural heritage.

Concept of the game

With the game twiddle, the Leibniz Research Museums are helping to ensure that visitors have fun exploring the topics of the research museums on «A World in Motion». The game builds on the existing exhibitions of the respective museums and makes the topic «A World in Motion» more visible as an extra layer.

Another essential objective of the game was the development of a research module within the game. The collection of research data was to be integrated as far as possible into the game itself, i.e. the visitors answer questions relevant to the game, which can be evaluated simultaneously by the research partners.

Timeframe

The first thoughts about a discursive communication format started already in February 2020. In the actual process of implementation, the idea of a discursive smartphone game was developed. After commissioning the game agency, it took about 14 months until the game could be launched - it was significantly delayed by the events of the Russian war of aggression on Ukraine.

Involved parties

The following institutions were involved in the game development through their representatives:

- Deutsches Bergbau-Museum Bochum
- Deutsches Museum, Munich
- German Maritime Museum, Bremerhaven
- Germanisches Nationalmuseum, Nuremberg
- Museum of Natural History, Berlin
- Römisch-Germanisches Zentralmuseum Mainz
- Senckenberg Society for Natural History, Frankfurt
- Museum Koenig, Bonn
- Leibniz-Institut für Wissensmedien (IWM), Tübingen
- Leibniz Institute for Science and Mathematics Education, Kiehl

The project was coordinated by the Leibniz Association Head Office, which develops the formats across museums as part of the Leibniz research museums' action plan 'A World in Motion'.

Game development: playersjourney, Berlin

Major objectives

The mediation format is intended to achieve three central goals through a playful, discursive approach:

1. Appreciation of cultural diversity as part of the reality of our lives.
2. Reflection on one's own life reality/cultural contexts and one's own actions in a changing world.
3. The fun of interactively and playfully dealing with the topic.
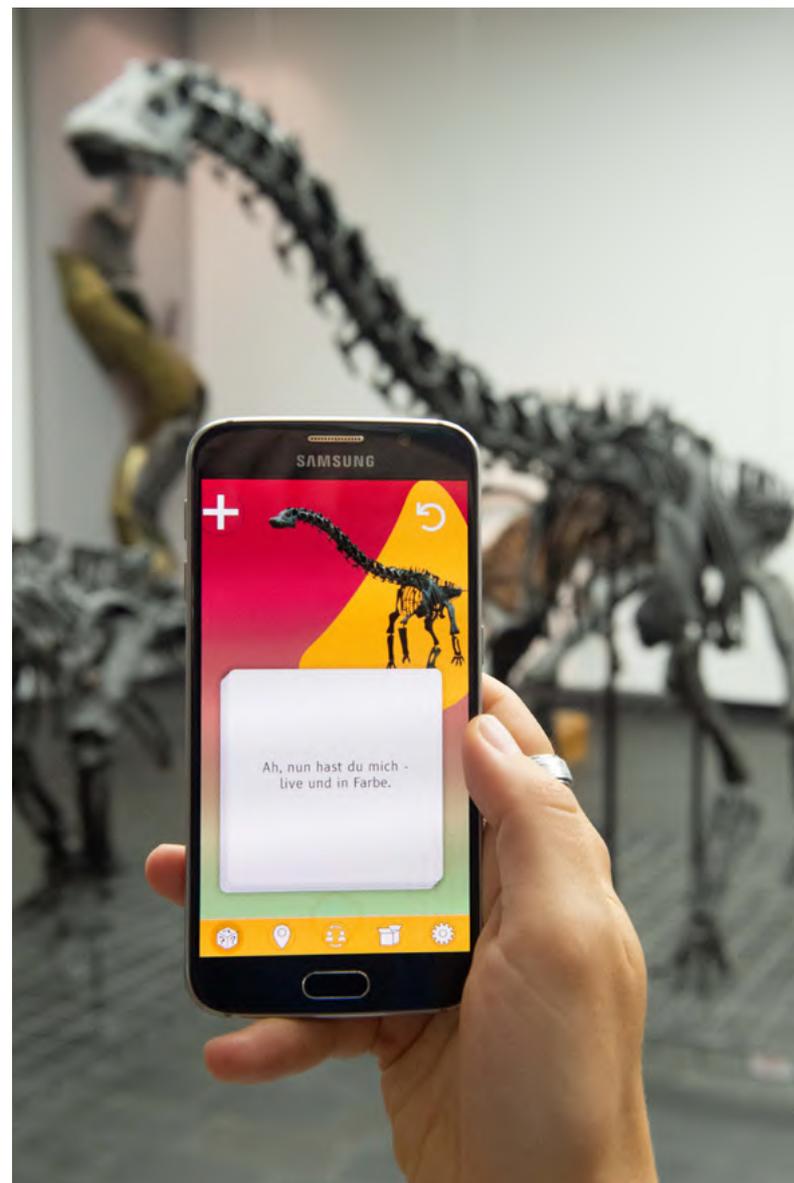
Leibniz Research Museums (c).

Desired outcomes

To attract new, younger visitor groups to the museums and at the same time to research their play behaviour.

Learning benefits

The players should get to know the individual museums and some of their objects. They should understand that there are different perspectives on things and facts and that our decisions, including personal ones, have short- but also long-term effects on life.
On a meta-level, they should learn that there are eight Leibniz research museums that work together - and have developed this game together.

The target group of the game

The main target group is teenagers and young adults between the ages of 16 and 35. Since this target group is rather underrepresented on most of the sites, the game is also to be used to attract further visitors of this age group.
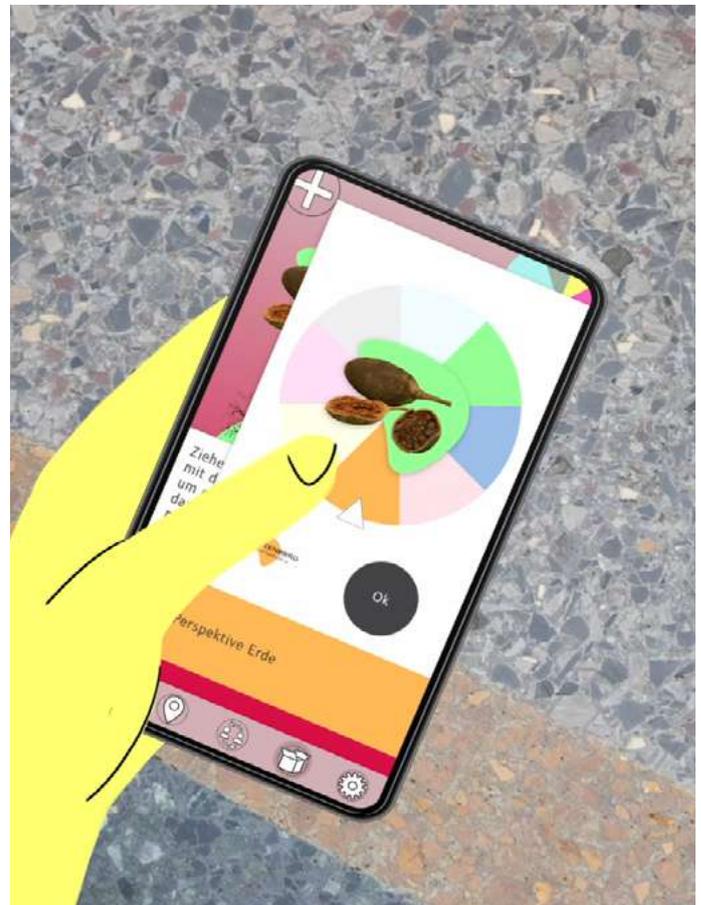
Leibniz Research Museums (c).

Leibniz Research Museums (c).

Obstacles and limitations

1. One hurdle is more of a financial nature: the team had to put the game out to tender without having a concrete idea of how to implement it. The concept and implementation were part of the same tender and the same budget, which made planning and the selection of possible companies for implementation difficult.

2. Another hurdle is bringing together eight different museums with very different themes into one overarching project. The goal was not only to develop a common basis, but also game content that fits together across museums.

3. The narrative threads of the game in the eight museums are linked via individual (virtual) objects that are exchanged between the players in different museums. In this way, new points of view/perspectives continually emerge along the way. These negotiation processes were time-consuming, but also enriching for the content team.

4. Good cooperation with a professional partner who has a comprehensive understanding of the museum as an institution - especially with so many museums involved is another key factor. Project management that focuses on sustained and active communication is the basic prerequisite for the whole process.

Challenges

The team:

"*In terms of content, the most difficult task in the project was to work out the cross-museum elements of the game and assemble them coherently. We did not always fully succeed in this. Organisationally, project management fell a bit short - the eight museums with their very different thematic backgrounds and the large project teams added an enormous amount of complexity that had to be grasped.*

In addition, the start of the development phase still fell during a period of severe constraints due to the Covid-19 pandemic, so no face-to-face workshops could take place in the early phase. One or two more intensive, multi-day workshops during the development phase would have allowed the large, diverse team to grow together more quickly and would have significantly improved development time."

Major takeaways

The collaboration among the museums was extremely productive and goal-oriented. When selecting game designers, one should make sure that the agencies already have extensive experience in working with museums. In addition,

one should expect to have to supervise the development phase of the game very closely and comprehensively; there are many interfaces between the various museums, but especially between museums and the agency.

Often there are also linguistic and technical hurdles, such as how an exhibit must be contextualised, or how a certain part of the game logic functions or is named. This is why, especially with such a large, diverse team, face-to-face workshops are important in the early development phase.

Recommendations

The team:

To recall the intention of the game again and again in each development phase and to check if it is really kept or fulfilled. If the time and financial possibilities exist, the idea generation phase should be decoupled from the development.

Leibniz Research Museums (c).

museum4punkt0: WHAT MAKES DIGITAL MEDIATION SUSTAINABLE?

INTERVIEW WITH FREYA SCHLINGMANN

Freya Schlingmann is Head of the Central Steering Team (Team Z) and coordinates with her team the network and its events as well as all communication and offers for the German speaking museum landscape.

What museum4punkt0 stands for?

museum4punkt0 stands for digital cultural education. The network links cultural institutions from all over Germany. Across institutional boundaries and disciplines, the network develops digital offers for new ways of learning and participation in museums. museum4punkt0 shares the knowledge, experience and project results pooled in the network with the entire cultural landscape.

The project results that have been implemented since the start of the collaborative project in 2017 are available on the museum4punkt0 website. All interested parties can access the codes provided on GitHub. The results can be filtered by project, rubric and keywords, and there is a full text search.

The museum4punkt0 website sees itself as a platform for the topic of digital education, which will be further expanded. In addition to the results from the joint project, references to public events and information about the individual projects, the platform includes recommendations on the topic of digital learning and mediation.

Germany-wide networking: partner institutions in the museum4punkt0 network, graphic: Prussian Cultural Heritage Foundation / museum4punkt0 / Julia Rhein, edited by Robert Rausch, CC BY 4.0 (c).

Museum4punkt0 work show on 24.06.2022: 27 projects from museums with different orientations from all over Germany gave an insight into the range of possibilities of digital cultural mediation. © SPK/photothek.de/Thomas Trutschel.

What does the network do?

In the museum4punkt0 network, teams from a wide range of institutions are working on [27 projects](#).

The projects range from the development of various Virtual and Augmented Reality applications, gaming apps and multimedia guides to participatory platforms and extensive user research.

The structure of the network

The Prussian Cultural Heritage Foundation (Stiftung Preußischer Kulturbesitz - SPK) heads the joint project for digital mediation. The central steering team (Team Z) manages the network, coordinates the exchange of knowledge and shares network expertise with the cultural heritage landscape. Team Z regularly invites all teams to a network-wide exchange. With the aim of involving as many institutions as possible, Team Z designs needs-oriented public events that are also aimed at smaller institutions and colleagues with less digital experience.

Timeframe

The joint project was initially designed in 2017 for three years and has been extended until June 2023.

The goals of the network

To support as many museums as possible in developing and implementing digital mediation offers that are suitable for their institutions in a resource-saving manner.

What is meant by sustainability in the context of digital programmes in museums?

There are three pillars of sustainability: ecology, economy and social issues. And in this case, sustainability has mostly aspects in the economic pillar. Museums have limited resources, and so we shouldn't be reinventing the wheel again and again. A lot of museums have similar use cases and therefore we should reuse good digital education and mediation tools in different museums and with different objects.

However, this also touches on the aspect that we shouldn't programme code for long-term applications, like collections and throw it away after a few years or months.

We have to talk about building sustainable codes for sustainable projects. So we don't have to relaunch it every five years and lose all the achievements we made on a deeper technical level with the next design rebrush. We aren't big economy players like Mercedes-Benz, which has a big marketing and development budget. We need to focus on the life cycle management of applications, as we can't rebuild them all the time.

What is sustainable digital mediation for museum4punkt0?

At museum4punkt0 we intend to reuse the results of the network.

Therefore we distinguish between three kinds of re-using:

1. The reuse of fully developed applications, like VR-Applications.

2. The reuse of open source codes, like "Mein Objekt" or "Ping!Museumapp".

3. And the reuse of know-how, like guidelines, toolkits, operational concepts, and field reports, for example, learnings out of an AR-project.

Could you tell us about some of the museum4punkt0 projects? What makes them sustainable?

"Ping! Museumapp" (developed under the name «Mein Objekt») is a mobile application, which allows a personalised and playful exploration of exhibits of the Badisches Landesmuseum Karlsruhe. The prototype of "Mein Objekt" was developed by the Gamelab Berlin and Humboldt Innovation GmbH on behalf of the Humboldt Forum Foundation. The initial prototype was further developed and implemented for the first time at Badisches Landesmuseum. The code for the application is available for download on GitHub in the account of museum4punkt0.

In an immersive VR application "Abenteuer Bodenleben" ("Adventure Soil Life") developed by Senckenberg Museum für Naurkunde Görlitz visitors are shrunk to the size of a woodlouse. 200 times smaller they can experience closely and in 3D more living creatures within one cubic meter of soil than people on earth. This is an example of a fully developed application which can be reused by other institutions.

Interactive game station for the playful mediation of history by the Stiftung Deutsches Historisches Museum, keyvisual "Leipzig '89 - Revolution reloaded", Photo: DHM © Gerhard Gäbler, Illustration: Alexander Roncaldier.

Museum4punkt0 work show on 24.06.2022: Germany's first Minister of State for Culture and the Media Claudia Roth and President of the Prussian Cultural Heritage Foundation Hermann Parzinger examine the application of one of the 27 sub-projects. © SPK/photothek.de/ Thomas Trutschel.

The Virtual Museum for Children and Young People (in German VIMUKI - Virtuelles Museum für Kinder und Jugendliche) combines an online learning platform with a video conferencing tool where exhibition companions guide users through the museum in virtual tours. The tours can integrate 3D models of individual exhibits, short films, live broadcasts to other locations and other tools in order to tailor the tours to the groups. The platform was developed by Historisches Museum Saar and further developed together with Historisches Museum der Pfalz. This platform can be used by other museum institutions.

The game "Leipzig '89 – revolution reloaded" of the Stiftung Deutsches Historisches Museum focuses on the historical turning point of the revolution in Leipzig on October 9, 1989. Users choose the role of one of seven contemporary actors and take on different perspectives on historical decision-making situations and individual expectations of the future. The same game mechanic with different subjects and roles can be applied by any museum.

Can the museum4punkt0 projects be used by museums outside Germany, or is the work of the network aimed exclusively at the German landscape?

Yes, of course, unfortunately, all the reports and documentations are only available in German, but if someone speaks German or solves the translation issues, we would really look forward to seeing it reused.

What would be your recommendations to museums which intend to develop sustainable digital learning projects?

1. *Well-defined strategy is necessary*.

2. *Rely on technical expertise.* Find a good expert who can advise you on technical issues. Even better to have a CTO or software developers in-house.

3. *Collaboration is crucial.* This is the DNA for museum4punkt0. Our members meet regularly, advise and consult each other. The peer consulting method which we use has proven to be efficient.

4. *Collaboration on a technical basis.* Work on code together. We should talk about which area of expertise it is interesting to collaborate in. Is it maybe the audio guide? Because everybody needs an audio guide and you know, they only need the basic functions such as some buttons. And this is something which can be shared.

SUMMARY

INSIGHTS AND RECOMMENDATIONS

Although many of the digital initiatives described in this publication were still in operation before the pandemic, there is no doubt that the past three years have seen a fundamental shift in the museum sector towards appropriating new formats and seeking innovative approaches to the engagement with remote audiences and designing engaging learning experiences in the digital space. Partnerships with digital agencies, established leaders of the tech industry, or newly established start-ups have offered museums access to a wide range of cutting-edge technology solutions and the space to experiment with Artificial Intelligence, Machine Learning, Extended Reality, Web3, 3D visualisations or gaming design. Moreover, increasing Open Access to museum data and Open Source solutions have allowed cultural heritage institutions to test new formats of digital learning and visitor engagement through co-creation, co-curation and data reuse.

At the same time, application of digital solutions, tools and Open Access policies have revealed numerous challenges and obstacles for the museum sector. At the beginning of the pandemic, when digital programming became often the only option for engagement with remote audiences, many museums faced the obstacle of a lack of technical skills in the team, a lack of technical equipment and software, poor awareness of technological advancements, or budget constraints holding back the digital transformation. In addition, the increasing pace in the use of digital technologies and solutions has raised the question for museums as to how to make the digitalisation process sustainable and long-term. Moreover, as can be seen from the example of many of the projects presented in the report, work with digital providers has turned out to be sometimes challenging due to different visions of digital processes and strong differences in work cultures in the museums and tech industries. What is also significantly important are the concerns that have been raised about the actual value of "digital" and the risks of the application of digital tools for their own sake, especially after the ubiquitous digitisation of museum programmes and the lifting of coronavirus restrictions

and the opening of museums. One of the most frequently voiced recommendations by museum professionals in our interviews was the utmost importance of prioritisation of meaningful knowledge transfer and storytelling, the thorough concept and idea behind the digital project.

This summary provides some conclusions which are drawn from case studies and desk research, and based on a series of conversations with museum practitioners and digital experts involved in the development of digital projects across the European museum sector in the period from the beginning of 2020 up to the end of 2022. The following observations, first-hand recommendations and links to additional resources, projects and toolkits, can bring some ideas and inspiration to museum professionals, educators and policymakers exploring opportunities which digital tools, technological solutions and Open Access policies can offer to the cultural heritage sector.

The list of observations and recommendations gained from museum professionals during our conversations far exceeds the selection made for this summary, so to have a comprehensive idea of how selected museums in the last three years designed digital learning experiences for remote visitors, what new formats and innovative solutions they have experimented with, what challenges they have encountered and what takeaways and recommendations they can share with colleagues, we recommend that readers familiarise themselves with each case study and interview.

PLANNING AND IMPLEMENTATION

DON'T START A DIGITAL PROJECT JUST BECAUSE OF THE TECHNOLOGY: NO "DIGITAL" FOR THE SAKE OF THE "DIGITAL"

"You should question whether using technology is the best way of doing what you want to do"

Adam Stoneman,
IMMA

"Think deeply about pedagogies and processes of engagement, and the role of technology within that"

Adam Stoneman,
IMMA

"Always keep in mind that digital is a means, not an end"

Ghislane Gemin,
Musée des Augustines

FIGURE OUT WHAT IS REALLY NEEDED: DO RESEARCH, ASK THE AUDIENCE, DISCUSS WITH COLLEAGUES

"Make sure you do some research into your audience and create something that brings value to your audience"

Charlotte Bosman,
Anne Frank House

"First, you figure out what you want to do and then secondarily, you think about how you want to do it and how the digital could be a way of doing that"

Adam Stoneman,
IMMA

"Depart from existing needs and opportunities, then venture into the market to find the right solutions"

Olivier Van D'huynslager,
Design Museum Ghent

THE CONCEPT AND THE STORY TAKE PRIORITY

"The concept has to come first"

Adam Stoneman,
IMMA

"Think well what story are you trying to tell and what are the actions you're trying to get people to do"

Lawrence Chiles,
National Gallery in London

"Narrative keeps the two worlds [physical and digital] working"

Lawrence Chiles,
National Gallery in London

DESIGNING DIGITAL INITIATIVES DIFFERS FROM PROGRAMMING ON-SITE EXPERIENCES AND REQUIRES NEW WAYS OF THINKING AND DIFFERENT FORMATS

"It can be quite challenging for cultural institutions because this move to the digital means that they have to find new ways of thinking about content creation (that differs from analogue media) in order to leverage the true potential that lies in these new (web)technologies"

Olivier Van D'huynslager, Design Museum Ghent

"Platforms such as Instagram, TikTok or Facebook demand individual approaches and offer specific ways of learning"

Olivier Van D'huynslager, Design Museum Ghent

"Experiment with new formats"

Lisa Albrecht and Birgit Wienand, Berlin Wall Foundation

SET A LONG TERM STRATEGY, DEFINE YOUR GOALS AND PLAN AHEAD

PLAN FUNDING CAREFULLY: STRATEGIES FOR LONG-TERM DIGITAL LEARNING PROJECTS SHOULD INCLUDE A PLAN FOR ONGOING FUNDING AND MAINTENANCE OF THE PROJECT

This helps to avoid situations in which, for example, a museum commissions a digital agency to develop an application with a certain budget, but without taking into account that the further maintenance of that application may also require funding

ENSURE THAT THE TEAM IS CAPABLE OF THE IMPLEMENTATION OF THE PLANNED DIGITAL PROJECT

"It's important to make sure that you have all the right people on board"

Olivier Van D'huynslager, Design Museum Ghent

RELY ON IN-HOUSE STAFF AND ITS DIGITAL CAPACITIES

REACH OUT TO EXTERNAL EXPERTS AND DIGITAL PROVIDERS

"Even better to have a CTO (Chief Technical Officer) or software developers in-house"

Freya Schlingmann, museum4punkt0

"... it is important to decouple the backend and the front end of what you're building, and not just put everything in one company"

Olivier Van D'huynslager, Design Museum Ghent

TESTING DIGITAL PROJECTS BEFORE THE LAUNCH AND STARTING WITH PILOT PROJECTS CAN BE A GOOD IDEA FOR MUSEUMS

"Test, test, test"

Veronika Liebl,
Ars Electronica

"Be brave and go ahead and create a pilot project"

Johanna Eiramo,
Finnish National Gallery

"Together, try to find new ways to make a smaller project or case study"

Helena Åberg,
Moderna Museet

DIGITAL LEARNING PROGRAMMING CAN REQUIRE MORE AWARENESS, DIGITAL COMPETENCIES AND TECHNICAL SKILLS FOR THE MUSEUM STAFF

"Digital maturity, awareness and competencies within cultural heritage institutions remain relatively poor"

Olivier Van D'huynslager, Design Museum Ghent

BOTH EXPERTISE FROM THE COMMUNITY OF TECH EXPERTS AND EXPERIENCED MUSEUM PROFESSIONALS AND A VARIETY OF DIGITAL MATERIALS, REPORTS, PROFESSIONAL EVENTS AND ONLINE COURSES PROVIDE ACCESS TO USEFUL INFORMATION

Such projects as CHARTER - The European Cultural Heritage Skills Alliance (2021 - 2024) maps the needs of the cultural heritage sector in order to identify skills shortages and mismatches with the aim of developing fitting training programmes for cultural heritage professionals.

The toolkit «Empowering Museum Professionals With Digital Skills» provided by the project DigMus intends to support museum professionals with a more nuanced understanding of the possibilities of digital technologies

THE DEVELOPMENT OF DIGITAL COMPETENCIES AMONG MUSEUM STAFF, THEIR ADDITIONAL TRAINING AND EDUCATION CAN BE VALUABLE FOR DEVELOPING LONG-TERM DIGITAL STRATEGIES IN-HOUSE

"Instead of hiring external experts, the organisation made a conscious choice to increase skills internally"

Veronika Liebl,
Ars Electronica

"Capacity building is of the essence, not only to pertain the quality but also to allow employees to feel capable of and confident in their responsibilities"

Veronika Liebl,
Ars Electronica

The eBook "The Future of Museum Professionals in the Digital Era – The Success Story of Mu.SA" (Museum Sector Allians)

The Digital Culture Network has been created by Arts Council England to support arts and culture organisations to develop their digital skills

The DigCurV Curriculum Framework offers a means to identify, evaluate, and plan training to meet the skill requirements of staff engaged in digital curation

Digital Culture Compass is an online toolkit to help museums approach, assess and improve their digital activities

It has two elements: a Charter that outlines digital best practices and a Tracker that allows organisations to assess their approach to digital technology and develop plans for future work

COMMUNICATION AND COLLABORATION

WELL-ESTABLISHED COMMUNICATION WITHIN THE MUSEUM AND CROSS-DEPARTMENTAL TEAMS SHOULD NOT BE UNDERESTIMATED WHEN WORKING ON DIGITAL PROJECTS

Implementation of digital learning programmes often requires collaborative work between different museum departments, be that educational, curatorial, digital, communication or marketing departments. Certainly, well organised interdepartmental communication within an institution plays an important role for the success of such collaborative work

Creating of cross-departmental teams focusing on digital initiatives, as in the case of the Moderna Museet and "sofa tours", could be a valuable solution, especially for institutions without digital departments

As pointed out by Helena Åberg, the establishment of a digital group consisting of representatives from the different departments in the Moderna Museet, such as, for example, the communication department, the learning department and technicians was one of the major takeaways from the pandemic and "sofa tours'

> *"I think it's positive that we work together more in projects than we have done before"*
>
> Helena Åberg,
> Moderna Museet

COMMUNICATION WITH OTHER MUSEUM INSTITUTIONS AND THE EXCHANGE OF EXPERIENCE AND KNOWLEDGE WITHIN THE PROFESSIONAL COMMUNITY AND NETWORKS ARE VALUABLE FOR THE IMPLEMENTATION OF DIGITAL PROJECTS

> *"There is so much untapped potential! As a museum practitioner, I am most excited about the exchange with other professionals in the field and to learn from them and see how we can potentially up-take these learnings"*
>
> Veronika Liebl,
> Ars Electronica

> *"Strength/potential is in collaboration and summarising different viewpoints"*
>
> Olivier Van D'huynslager,
> Design Museum Ghent

Museum4punkt0 recommends institutions to collaborate on a technical basis as well and to work on codes for digital projects together.

MUSEUMS AND DIGITAL PROFESSIONALS MIGHT SPEAK "DIFFERENT LANGUAGES" AND HAVE DIFFICULTIES WITH UNDERSTANDING EACH OTHER BECAUSE OF DIFFERENCES IN WORKING CULTURES AND DIFFERENT VISION OF DIGITAL PROCESSES

"*It did definitely take a while to get those two disciplines talking to each other and understanding what was possible and not possible from the technology side*"

Brett Volker,
Ancient Olympia

"*When it comes to digital interfaces, people tend to only see what is immediately visible on the surface. What appears to be a small change for them can translate into complex problems beyond the surface, both in terms of software and database design*"

Olivier Van D'huynslager,
Design Museum Ghent

"*Sometimes, professionals from the non-art field have difficulties understanding artistic visions*"

Aida Šarac,
The National Gallery of Bosnia and Herzegovina

COMMUNICATION, TRUST AND EXPECTATION MANAGEMENT ARE CRUCIAL FOR SUCCESSFUL PARTNERSHIPS BETWEEN MUSEUMS AND DIGITAL AGENCIES. KEEP COMMUNICATION FLOWING, BE TRANSPARENT AND PROVIDE REGULAR FEEDBACK

"*Communication is crucial (for example, in terms of expectation management)*"

Olivier Van D'huynslager,
Design Museum Ghent

"*It is important not to be scared to cross over the threshold and have a conversation with somebody on the other side of the fence, be that a tech company that wants to do something like the Holo-Museum, or be that a museum that wants to explore some innovative digital work*"

John Glancy,
IWM

"*This type of work happens because of conversations, and trust comes into it as well*"

John Glancy,
IWM

ASSESSMENT, EVALUATION AND RESEARCH

In order to create more relevant and meaningful digital engagement programs, museums could benefit from better understanding their digital visitors, their behaviours, needs, demands and learning experiences. There are a number of approaches which can be used by museums for collecting quantitative and qualitative data about their digital audiences:

Online surveys (for gathering information about their demographics, motivations, and interests) and in-depth interviews

Eye-tracking or heat mapping (where do digital visitors spend more time on the website?)

Web analytics (collection, reporting, and analysis of website data)

Social media analytics (collection, reporting, and analysis of data)

As pointed out by Thomas Renz from the Institute for Cultural Participation Research (Institut für Kulturelle Teilhabeforschung) at one of the meeting of the network museum4punkt0, the professional world is only slowly discovering the possibilities of evaluating digital offers and thus can encounter methodological and data protection problems. According to Renz online surveys in the form of questionnaires are rarely completed to the end due to the short attention span of online users and therefore "empirically are less meaningful." Furthermore, it is difficult to find participating testers and to persuade them to complete the questionnaire. For these reasons, Thomas Renz advocates the implementation of surveys directly in digital offerings and events.

The "k:evatool" tool developed within the museum4punkt0 network at Klassik Stiftung Weimar for the evaluation of diverse digital mediation formats makes this possible. In addition to survey formats such as multiple choice and rating scales, the tool also enables data to be collected in the context of a video. Digital audience research is an important part of work of the network museum4punkt0 and their blog provides a number of useful resources that touch on different aspects of digital audience assessment. Here you can also find out what current issues related to digital audience research are of concern to the newly launched Visitor Research Network, which is run by the Berlin-based Institute for Museum Research (Prussian Cultural Heritage Foundation).

museum4punkt0: "k:evatool" of the Klassik Stiftung Weimar for the evaluation of digital educational offers, video module with time-based questions, screenshot: Klassik Stiftung Weimar, CC BY 4.0

ACCESS AND INCLUSION

MUSEUMS SHOULD MAKE USE OF THE OPPORTUNITIES PROVIDED BY DIGITAL INNOVATIONS FOR DESIGNING LEARNING EXPERIENCES IN A MORE ACCESSIBLE WAY OR BY USING ASSISTIVE DIGITAL TECHNOLOGIES FOR THE DEVELOPMENT OF LEARNING EXPERIENCES FOR VISITORS WITH SPECIAL NEEDS

According to the recommendation of Aida Šarac, who shared with us insights into an accessible app ARTSEE for children with autism, museums that intend to use digitised collections for remote learning and inclusion should create the content along with the target group, evaluate all of the easy-to-read textual contents with the representatives of the target group, and plan the feedback process from the users

EASILY ACCESSIBLE INFORMATION ABOUT DIGITAL LEARNING PROGRAMMES PROVIDED BY MUSEUMS AND USER-FRIENDLY SITE NAVIGATION ARE USEFUL

Digital programmes should be easily accessible and well presented on museum websites or any other digital channels of communicating information, so users are aware of their presence and do not need to navigate through the plenty of offerings on the website for too long

In addition, museum websites schould be accessible for diverse audiences. In the blog of the American Alliance of Museums you can find 10 Best Practices of Accessible Museum Websites

The checklist, published by Culture for All Service, can be used to assess accessibility of the website and web content

Accessibility Toolkit for Museum Digital Engagement

DIGITISED COLLECTIONS AND DIGITAL LEARNING PROJECTS ALLOW MUSEUMS TO REACH A WIDER AUDIENCE

Digitised collections enable remote visitors to access objects that are not available otherwise due to conservation requirements or a lack of exhibition hall space in the physical museum setting. For those who are unable to physically visit museums due to a variety of factors, it has also greatly facilitated access to museum heritage

Digitised museum collections can be helpful for engagement with the most vulnerable groups, for example, young people in a detention campus (Oberstown Project) who cannot visit a museum physically, or children with learning difficulties who might need alternative interpretation approaches (ARTSEE App)

In addition, thanks to a broad range of digital initiatives such as virtual tours or the online streaming of educational content, visitors unable to visit a physical museum are able to have an engaging educational experience from the comfort of their home, or their sofa, as we have seen in the example of "sofa tours" provided by Moderna Museet

OPEN ACCESS AND DIGITAL TECHNOLOGIES

OPEN ACCES ENRICHES THE POTENTIAL OF DIGITAL HERITAGE FOR EDUCATION, LEARNING, TEACHING AND RESEARCH

"Because we're public institutions, this (open) data should be accessible and usable because we hold it on behalf of the public" Merete Sanderhoff, SMK

Open Access allows for the creative reuse of museum collections and resources. Open Access data can be used without financial and legal barriers for scientific purposes and teaching or for the development of new educational resources or digital applications. The example of the hackathon Coding da Vinci shows a variety of opportunities open museums data provides for creating innovative digital applications, and what a significant role this process plays in the development of digital skills of the hackathon participants. The immense potential of open access to museum data for formal education is discussed in detail in an article by Lisa Peter.

For museum professionals curious about how Open Access might be incorporated into education and engagement with remote learners, the websites of Europeana and the Statens Museum for Kunst with information about different aspects related to Open Access and the GLAM Sector serve as valuable knowledge resources

CONSIDER OPEN SOURCE SOLUTIONS

"Open source technology and open standards can be empowering"

Olivier Van D'huynslager,
Design Museum Ghent

"Museums have limited resources, and so we shouldn't be reinventing the wheel again and again"

Freya Schlingmann,
museum4punkt0

This could mean that a museum doesn't have to commission a digital provider to create new code to create a new digital app, chatbot, or game, when there is already Open Source software available, and when customising it can save energy, human resources, and budget. Open source software means that the source code is published and accessible freely – anyone can download a copy of the code, use it, and update it. For instance, the Finnish Metagallery was created using Open Source code.

EXTENDED REALITY (AR AND VR) GIVES MUSEUMS THE ABILITY TO DEVELOP IMMERSIVE GAME-BASED LEARNING EXPERIENCES

WEB3.0 AND THE METAVERSE PROVIDE MUSEUMS WITH OPPORTUNITIES FOR EXPERIMENTS WITH DIGITAL VISITOR ENGAGEMENT

THE METAVERSE PLATFORMS OFFER MUSEUMS ADDITIONAL SPACE FOR INTERACTIVE ENGAGEMENT WITH DIGITAL VISITORS, MEDIATION OF EDUCATIONAL CONTENT AND STORYTELLING

In the Metaverse museums can create virtual exhibitions and interactive virtual tours, or host educational events (lectures, workshops, talks with curators and invited experts)	The exploration of museum collections in the Metaverse can be supplemented with game elements, as in the project of the London National Gallery "The Keeper Council"	Visitors can be brought together from all around the world into one space where their avatars can interact with one another or, for example, with a museum guide, school teacher or university professor

"If you haven't started to look into the possibilities of the Metaverse, you should"
Johanna Eiramo, Finnish National Gallery

"With Metaverse, learning will never be the same again"
Sirisilp Kongsilp, Morpheus Metaverse Project

On the other hand, in addition to the possibilities, the Metaverse comes with a number of limitations and challenges:

Access to metaverses without a powerful computer, stable internet connection and recommended systems requirements can be difficult	People might be hesitant to visit virtual worlds, and treat the Metaverse with scepticism	Navigation in metaverses can be challenging	Marketing of museum campaigns in metaverses can be challenging

NFTS DO NOT JUST CREATE ADDITIONAL OPPORTUNITIES FOR FUNDRAISING AND ADDITIONAL INCOME, BUT ALSO IN SOME CASES CAN BE CONSIDERED IN REGARD TO MUSEUM EDUCATION AND LEARNING

For instance, the educational Morpheus Metaverse offers users to use NFTs as a currency for knowledge exchange, motivating learners and educators to share and acquire knowledge in the virtual environment according to the principle "earn to learn".

The Finnish Metagallery website contains a wealth of information about the Metaverse in an accessible manner and could be a useful resource for museum professionals interested in the possibilities of Web3.0 for their institutions. Moreover, Ars Electronica runs an online educational program "Future Insights: Blockchain", which gives a basic understanding of blockchain technology. Another initiative which can bring useful knowledge about the Metaverse to museums is the innovation laboratory WAC Lab, organised by We Are Museums in collaboration with TZ Connect and the Blockchain Art Directory 2.0.

CHATBOTS SERVE AS A USEFUL TOOL FOR MUSEUMS TO ENGAGE WITH REMOTE VISITORS AND PROVIDE THEM WITH AN INTERACTIVE AND PERSONALISED LEARNING EXPERIENCE

AI-ENABLED TECHNOLOGIES ALLOW MUSEUMS TO DEVELOP PERSONALISED LEARNING EXPERIENCES AND ENABLE BETTER ACCESS FOR BROADER AUDIENCES

What would happen if we asked the chatbot ChatGPT powered by Artificial Intelligence how AI can be applied to digital learning and education in museums and included the received answer in this summary?

If we do, what is the correct way to refer to ChatGPT?
Should we credit ChatGPT as an author?
How legitimate is its use in our report?
What data did the algorithm rely on to answer this question?

The application of AI technology definitely raises a number of ethical issues and data privacy concerns, due to the lack of regulations. Ethical implications and algorithm biases shouldn't be ignored, yet it is worth considering the potential that AI has for museums.

We will take the liberty of including the answer provided by ChatGPT with additional notes in our report as the final chord of this section.

ChatGPT, how can AI be used for learning engagement with remote museum visitors?

ChatGPT: "AI can be used in several ways to enhance learning engagement with remote museum visitors, including:

Virtual Tours: *AI-powered virtual tours can provide remote visitors with a fully immersive experience of the museum without physically being there. Using machine learning, virtual tours can also suggest personalised itineraries based on visitor preferences*

Chatbots: *AI-powered chatbots can provide remote visitors with instant access to information and assistance, helping to answer questions and provide guidance throughout their virtual museum experience*

Personalised Recommendations: *AI algorithms can analyse visitor data and behavior to create personalised recommendations for remote visitors, suggesting exhibits and artifacts that are likely to be of interest based on their past behaviors*

Language Translation: *AI-powered language translation can help overcome language barriers for remote visitors, allowing them to access and understand museum content in their native language."*

Overall, AI can enhance learning engagement with remote museum visitors by providing them with personalized, interactive, and accessible experiences that are tailored to their interests and learning style, even when they cannot physically visit the museum".

In general, this answer gives a good idea of how AI can be used for learning engagement with remote museum visitors.

For museum professionals who have decided to open up the world of AI to their institutions, it may be useful to take note of the toolkit developed by the The Museums + AI Network. The aim of this toolkit is to support non-specialists to better understand the possibilities of AI, and empower a wide range of museum professionals to develop robust project plans

SUSTAINABILITY

WHEN THINKING ABOUT DIGITAL PROJECTS, MUSEUMS SHOULD BE GUIDED FROM THE BEGINNING BY THE PRINCIPLES OF SUSTAINABILITY. MAKING DIGITAL LEARNING PROJECTS IN MUSEUMS SUSTAINABLE REQUIRES CAREFUL PLANNING, IMPLEMENTATION, AND EVALUATION

LONG-TERM STRATEGY AND PLANNING AHEAD

Concept. Figure out what you want to do and then think about how you want to do. Do some research into your audience. Question whether using technology is the best way of doing what you want to do. The concept and the story take priority

Tests and pilot projects. Test digital projects with target groups before the launch. Start with with pilot projects

Funding. Strategies for long-term digital learning projects should include a plan for ongoing funding and maintenance of the project

Skills, expertise and training. Ensure that all the experts are on board. Creating of cross-departmental teams focusing on digital initiatives could be a valuable solution. Rely on in-house staff or external experts and digital providers. Invest in digital skills training for the museum staff

Assessment, evaluation and research. Research your digital visitors, their learning experiences, behaviours, needs and demands. Use quantitative (e.g. social media and web analytics) and qualitative methods (e.g. eyetracking, surveys and interviews)

COLLABORATION AND RESOURCE SHARING

Knowledge exchange and resource sharing. Maintain an exchange of expertise and experience with the professional museums community

Collaborations. Collaborate with other institutions, academic organisations, research centres

Collaboration on a technical basis. Work on code together

OPEN SOURCE SOLUTIONS AND REUSE

If possible reuse digital education and mediation tools from other institutions and choose Open Source codes

BE AWARE OF THE ENVIRONMENTAL FOOTPRINT OF DIGITAL TECHNOLOGIES

GLOSSARY

Application Program Interface (API)
Application Program Interface allows for internet developers and software programmers to query data from museums. The records include information about the artworks as well as digital images. Thanks to API, developers and programmers can more easily create their own applications that feature the museum's data and images.

Augmented Reality (AR)
In AR, 3D virtual objects from the physical world, for example, objects from a museum, or monuments from a historical or an archaeological site, are combined with an image of the real environment captured by the camera and presented as if the two are real. AR can be experienced through a smartphone or an app.

Artificial Intelligence (AI)
The ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings (Britannica).

Artificial Intelligence Chatbots
Chatbots are trained to have human-like conversations using a process known as natural language processing (NLP).

Blockchain
A blockchain is a database used to store various pieces of digital information in chronological order. These pieces are called blocks.

Creative Commons
An international leader in Open Access and copyright. Creative Commons provides free copyright licences to facilitate and standardise the sharing of creative work.

Extended Reality (XR)
XR is an emerging umbrella term for Augmented Reality (AR), Virtual Reality (VR), and Mixed Reality (MR).

Hackathon
An event that brings computer programmers and other interested people together to solve problems or create innovations (for example, to develop a new software programme or a digital application) over a relatively short period of time. The word hackathon is a combination of "hack" and "marathon".

Immersive
At its core, immersive describes an experience that augments your experience of the world. The immersive goal is to absorb you into any place, time, or environment using all of your senses (Musemio).

Linked Data
Linked Data is an internationally adopted standard for presenting digital information over a network in which each subject can be uniquely identified (Getty).

Metaverse
The idea of the Metaverse was introduced by Neil Stevenson in his 1992 science-fiction novel "Snow Crash", where he described a 3D computer-generated parallel universe in which users may communicate with one another through avatars.

There is no commonly accepted definition of the Metaverse yet. Overall, Metaverse refers to a continuous three-dimensional virtual environment based on blockchain technology, in which users represented by avatars can simultaneously interact with each other or with digital objects. Rather than a single shared virtual environment, the current version of the Metaverse implies a range of different types of virtual environments or "metaverses". The term "metaverse" is often used alongside the term "Web3" or "Web 3.0", which, without going into details, means a new iteration of the World Wide Web based on blockchain technology.

Non-fungible token (NFT)
An NFT is a unique representation of ownership in a digital way. This ownership can be created, assigned, and transferred within a digital ledger, e.g., a Blockchain. Like a physical object, this ownership cannot be copied or multiplied 1:1 within the ledger. This is due to the underlying mathematics that secure the ledger (cryptography). This property differentiates NFTs from other digital files that can be copied and hence, have no scarcity or clear ownership. NFT ownership can also grant ownership to additional files outside of the ledger, such as digital images. While the digital images outside of the ledger can potentially be copied, the NFT acts as a record of owning the file. (This definition was provided by Stephen Holzer, CEO of Patron of Art exclusively for this glossary).

Virtual Reality (VR)
Virtual reality (VR) is the use of computer modelling and simulation that enables a person to interact with an artificial three-dimensional (3D) visual or other sensory environment (Britannica).

Open Access
"All over the world, museums are digitising and sharing their collections freely to accommodate the cultural user of today and tomorrow, a cultural user not satisfied with being a passive spectator to culture. This cultural user wants to be an active participant and to use culture in their own life. And the conclusion is clear: Far more – including those who don't use the physical museum – use the collections when they can actively select, re-use, remix, and share artworks. These initiatives collectively go under the headings of Open Access and open data – or the more specific #openglam (where GLAM stands for Galleries, Libraries, Archives, Museums)" (SMK)

Open Data
Data that anyone can freely access, use, change and share - restricted at most by measures that preserve their origin and openness. Open data must be clearly marked as such, i.e. licensed.

Public Domain
The works in the Public Domain have been identified as being free of known restrictions under copyright law, including all related and neighbouring rights (Creative Commons)

ChatGPT
An Artificial Intelligence programme that interacts with users via text, answering questions and responding to prompts. It was trained on huge data sets and uses a "natural language" model that mimics how people actually speak. ChatGPT was developed by OpenAI and launched in November 2022.

INTEGRATING ONLINE OPEN ACCESS COLLECTIONS INTO MUSEUM LEARNING

USING EUROPEANA TO SUPPORT DIGITAL LEARNING

LISA PETER

INTEGRATING ONLINE OPEN ACCESS COLLECTIONS INTO MUSEUM LEARNING - USING EUROPEANA TO SUPPORT DIGITAL LEARNING

For smaller cultural heritage institutions, ongoing online learning resource creation is often a more feasible option to develop remote learning content compared to large-scale project-based content development. While these resources tend to be less publicly visible than their (often better-funded) project cousins, they can play a central role in an organisation's relationship with the formal education sector.

A 2021 report into the usage of online heritage-based tools, resources and digitised collections in formal education in the EU countries revealed that 38% of teachers used tools and materials created by cultural institutions during the Covid pandemic[1]. While a follow-on report in 2022 highlights the challenges around making these materials and resources easier to discover for educators, the case for putting resource and effort behind online learning content that makes good use of online museum collections is clear, and a number of cultural heritage institutions have already started to add roles that focus on digital learning to their education teams[2]

In addition to using the collections that their own institutions hold (and have been able to digitise thus far), Open Access collections of digital assets can help support the development of online resources and learning scenarios. Where individual collections struggle to illustrate a certain point, or where they are aiming at supporting curriculum topics that transcend borders - be they institutional, geographical, or cultural - Open Access collections can help to put local holdings into context, or open up conversations between geographically dispersed objects of a shared provenance.

Open Access and its Use in Education

Originally used predominantly for academic research outputs that were made publicly accessible for free, 'Open Access' by now refers much more broadly to content that can be freely used, shared, and reused on the internet. In the context of digital museum collections, this often means digitised items that have been made available to use and re-use freely. They can usually be accessed either via institutional online catalogues (i.e. museum websites) or via aggregators and platforms the organisation collaborates with, such as ArtUK, Europeana.eu, Flickr, the German Digital Library, Internet Archive, Sketchfab, or Wikimedia Commons.

The materials and items available in any one collection do not always map over in an ideal way to the topics covered by the relevant curriculum, but they are nevertheless an important and integral part of the story. Open access museum collections can support the stories local collections can tell, and thereby enhance digital learning activities and make them more attractive for teachers to use with their students.

For example, artefacts that are dispersed geographically can be virtually united. A case in point are the medieval Lewis chess pieces that are held at the National Museum of Scotland in Edinburgh and at the British Museum in London. They are by now available as 3D scans on Sketchfab, which makes it possible to create learning materials that use pieces held in either organisation.

Similarly, Open Access can be used to put sources into conversation with each other. Very successful examples of this would be the many resources on the Historiana platform that highlight experiences of both World Wars from all sides. Historiana uses Open Access materials from Europeana.eu and from individual institutions such as the Imperial War Museum to create these teaching materials, and they even offer a free online tool to create digital learning activities with the help of primary sources.

In a slightly different vein, Open Access digital cultural heritage is also a great resource for learning activities that focus on creative responses. Because the files are made available under open licences, activities such as hacking, creating collages, or other creative digital reuse of collections can be encouraged without fear of infringing copyright. Europeana, for example, runs annual competitions about creating digital stories and gifs from Open Access cultural heritage images, GIF IT UP and Digital Storytelling Festival. The competitions are open to anyone and provide excellent opportunities for creative minds to explore online collections and use them, either for fun or to illustrate and inform a story they would like to showcase[3].

In short, Open Access digital cultural heritage can serve as a digital library of collections that can be used by museum educators to enhance local digital collections and to put them into a wider context.

1. Magdalena Biernat, Agnieszka Urbańska, Teresa Nobre, Alek Tarkowski, Maja Bogataj (2021). Remote education during the pandemic: Teachers' perspective.
URL: https://centrumcyfrowe.pl/en/remote-education-during-the-pandemic/ [last accessed 18/09/2022].
2. Biernat, M., Janus, A., Czetwertyńska, A., (2022) Open GLAM & education: Teacher's and educator's perspective on digital culture resources.
URL: https://centrumcyfrowe.pl/en/openglam-2022 [last accessed 18/09/2022].
3. Further examples of how their open access materials are re-imagined and re-used by educators and creatives can be found here: https://pro.europeana.eu/the-europeana-website/about-europeana-eu [last accessed 28/04/2022].

Screenshot of EUROPEANA website.

EUROPEANA

In order to go into a bit more detail about what kinds of learning activities and learning scenarios can be created with the help of Open Access materials, Europeana's education activities have been chosen as an example of how Open Access materials can enhance museum education. The Europeana initiative started in 2008 and is funded by the EU. Their main overarching goal is to make it easy for people to use and reuse digital cultural heritage for research, education, or just for fun. It encompasses different bodies: a) the Europeana Foundation that runs two platforms, Europeana.eu for end-users, and Europeana Pro for professionals, b) the Europeana Network Association (ENA), and c) the Europeana Aggregators Forum.

The Europeana.eu describes itself as "Europe's digital library, museum, gallery and archive, providing online access to a vast store of cultural heritage material and collections from across Europe".[4] The Europeana.eu is run by the Europeana Foundation, which among other supporting activities to cultural heritage professionals, works as a central European aggregator of collections data from museums, galleries, libraries and archives across Europe. There is a special emphasis on content that is free to use, share, and download, although works and items that are licensed differently are also included.

Furthermore, the Europeana initiative promotes digital cultural heritage through establishing relationships with sector professionals as well as educators throughout European countries, and it supplies advocacy on behalf of the sector at a supra-national EU level. Over the last couple of years, it has also established a number of public-facing initiatives such as competitions and festivals, which aim to popularise the use and re-use of digital cultural heritage with the wider public

Europeana Education

The Europeana's Network Association of professionals is organised by different 'communities' made up of sector professionals who signed up as Europeana Network Associates. These networks are open to cultural heritage professionals, and becoming a Network Associate is free and quick. One of these communities is their Education Community, which brings together education professionals from all over the European Union, such as school teachers, teacher trainers, researchers, and - increasingly - museum educators.

The Community aims to showcase the benefits of using cultural heritage assets for formal education and in order to do so, it collaborates with other European education networks and initiatives, such as European Schoolnet and the history teachers' organisation EuroCLIO. Although it might look like the Europeana's collections are predominantly being used by educators throughout Europe at

Images/screenshots of Teaching with Europeana.

first glance, as both the European Schoolnet's Teaching with Europeana and EuroCLIO's learning resource platform Historiana are aimed at primary and secondary school teachers, there are also examples of museum educators making use of Europeana's extensive collections to illustrate their learning activities.

As Europeana already had an educational branch to its activities around promoting digital cultural heritage, the Covid pandemic and the ensuing increase in remote teaching and demand for high-quality digital assets that can be used in virtual classrooms has given this area a significant push.

In 2020, Europeana Education community started to collaborate with the Network of European Museum Organisations (NEMO) on strengthening museum educators' awareness of the possibilities to create learning content using its Open Access digital collections. This can be an important tool for cultural heritage institutions to build relationships with teachers and schools across Europe, as they can make use of said content in their teaching. Since then, the Massive Open Online Course of Digital Education with Cultural Heritage, which runs

in collaboration with the European Schoolnet on their free continuous professional development platform for school teachers throughout Europe, has opened up to museum educators too.

This free course is a good starting point for anyone interested in using Open Access materials to create their own learning resources, as it takes participants through the necessary steps: from searching for appropriate material to designing learning scenarios that can be implemented by education professionals. The MOOC will run again in 2023.

Those learning scenarios can be accessed freely via a number of ways: on the Teaching with Europeana website, in the Teachers section on the Europeana.eu (also called Europeana Classroom), or via the online publication of an interactive resource handbook that was put together in response to the pandemic in 2021.[5]

5 Mossuti, G., Vlachou, E., Delmiche, M., and Crespo, I. (2021).
Digital cultural heritage in times of pandemic, a collection of resources created by and for educators.
Brussels: European Schoolnet. *https://indd.adobe.com/view/d92ef8f3-e3ca-4c43-9c07-01968d96272f* [last accessed 28/04/2022].

MASSIVE OPEN ONLINE COURSE
27 February 2023

DIGITAL EDUCATION WITH CULTURAL HERITAGE
#DigitalEducationMOOC

Funded by the European Union

Bedienungsanleitung Schreibmaschine Adler Spezial, Roscheider Hof Open Air Museum, Germany, CC0

Lead image of MOOC.

Sample Learning Scenarios

All learning scenarios that are published on Europeana.eu follow the same structure, stating aims and outcomes of the lesson, topics covered, student age, curriculum links, etc. All materials used are directly linked in the document, so that educators basically have all the digital materials at hand that are needed.

I am going to highlight just two of the many learning scenarios that have been developed by museum educators so far in order to showcase how digital assets of various formats and from a number of geographically dispersed collections have been put together to support teaching in the classroom.

The first is a resource on Making a Medieval Book, aimed at post-primary learners, and created by the consortium of European libraries and museums behind the Art of Reading in the Middle Ages (ARMA) project. This learning scenario collates Open Access content in a learning scenario that can be used by teachers to explore the process of creating a manuscript in their classrooms: from designing the layout of the page to include text as well as illuminated initials and illustrations, to making ink, learning to write in the Carolingian or Gothic script, to painting the illuminations and binding the pages together.

The learning scenario helpfully suggests modules within the lesson that are grouped by topic, so in case there is not enough time to teach the whole scenario, educators can leave out modules if need be. Combining informative videos, online exhibitions and blogs - hosted either on Europeana.eu, on other Open Access platforms, or on institutional websites - the scenario encourages students to carry out relevant and active research in online collections that pique curiosity and encourage further exploration. In order to combine these digital activities with more manual creative activities, there are also a few opportunities to deepen the learning, for example, by mixing ink from foraged plant materials or watered-down paint, and using this to practice medieval scripts.

The online exhibitions and blogs in particular bring together source material from a wide range of manuscripts held in the collections of the organisations participating in the project. They offer a wealth of information as well as creative inspiration to students, including more light-hearted talking points, such as the illuminated initial E in a 16th-century songbook from Bruges below.

[Zoo-anthropomorphic E. Songbook of Zeghere van Male, Bruges, 1542 (Cambrai, Bibliothèque municipale, Ms 126 B, f76v - CC BY-NC). One of the examples used for illuminated initials in the Making a Medieval Book learning scenario.]

This learning scenario is a great example of combining digital and research skills with more hands-on and experiential activities, and it makes very good use of the digital assets the organisations involved have made available.

Another learning scenario called We are all different yet we are all the same manages to bring together geographically dispersed assets to support local holdings. Created by Asunción M. Martínez Llano from the Museu de Altamira in northern Spain, it uses prehistoric artefacts and artworks to highlight how popular culture has shaped present-day views of these civilisations.

The resource is aimed at young teenagers, and starts with exploring their views and preconceptions about prehistoric cave dwellers as a warming up activity. The museum educator then continues to introduce findings from the Altamira cave in present-day Spain and puts them in a wider context through adding collection items from other museums, including interactive 3D scans of objects, spread across four European countries: France, the United Kingdom, and Germany.

It would be easy to then simply relay accurate information about the paintings, tools and artefacts to the group, but instead, the museum educator is being interviewed and questioned by the students. This way, the learners acquire knowledge pro-actively and are able to assess their preconceptions from the beginning of the lesson, for example, about clothing worn by or the manufacturing skills of prehistoric people. Finally, the conversation is then opened up further to include discussion of cultural stereotypes and how limiting they can be in our understanding of the past as well as the present.

It is great to see how digital assets that are held by different organisations across different countries can be brought together to enhance the museum education that is carried out at one institution.
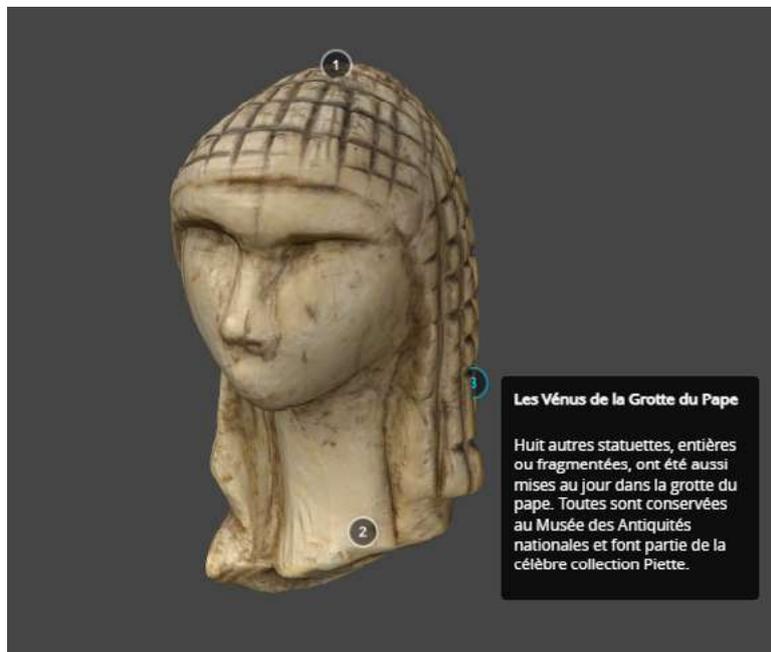
[Dame de Brassempouy / Dame à la capuche, Musée d'Archéologie nationale, domaine national de Saint-Germain-en-Laye, 3D model, CC-BY-NC-SA].

One aspect that might prove tricky in this respect is the linguistic richness of collections data, i.e. the necessity to translate descriptions and further information about the items. The Europeana. eu platform is improving their multilingual functionalities. Far from perfect, this is one of the priorities for the Europeana initiative, making their content more accessible and more accurate translations will be provided in the future. Some of the learning scenarios and educational resources themselves are available in European languages other than English though, and the database on Teaching with Europeana is searchable according to language.

In sum, Open Access materials are a great way to enrich local collections used for remote online learning, and they form an additional resource museum educators can tap into. If you are a museum educator, regardless of whether your institution aggregates content or not to Europeana. eu, you can take part in the Europeana initiative for free, and benefit from their network association and education community by signing up as a member, or by using their open and free resources.

AUTHORS' BIOGRAPHICAL DETAILS

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Kristina is a museum professional with experience in project management, curating and education. Her research interests centre around technological innovations in museums and informal digital learning. From 2020 to 2022 Kristina carried out research on adult learning and digitalisation in European museums at the Network of European Museum Organisations, supported by the German Chancellor Fellowship of the Alexander von Humboldt Foundation. In 2023, she joined the Sculpture Network as an executive board member.

Kristina has worked and conducted research at Documenta und Museum Fridericianum, the Victoria & Albert Museum, the State Pushkin Museum of Fine Arts, Berlin State Museums and MoMA. She is an Awardee of the Volkswagen Fellowship, the International Fellowship Programme of the Prussian Cultural Heritage Foundation, and the Chevening scholarship.

Kristina holds an M.A. in Arts Administration and Cultural Policy from Goldsmiths, University of London. She studied Art History at MSU (B.A., M.A.) and Humboldt University

Lisa Peter

Lisa is a public engagement professional with experience in programme and audience development, digital transformation, project management and international partnerships.

Her career has focussed on the development of wide-ranging engagement initiatives, often focusing on digital programmes. Together with other partner organisations in the heritage and higher education sectors, she has found ways of engaging new audiences with cultural materials. Whilst leading on projects with the BBC and the British Council and by managing EU-funded transnational projects, Lisa championed access to cultural content for harder-to-reach audiences.

While working in a heritage-adjacent sector these days, Lisa remains involved with British and international cultural heritage organisations. She is a board member of the Wordsworth Trust and an executive committee member of the Digital Learning Network (DLNET). In addition, Lisa supports the Group for Education in Museums (GEM) as part of their International Task and Finish Group, and was a jury member of Europeana's Digital Storytelling Festival in 2022.

IMPRINT

Network of European Museum Organisations

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