




# The Process Is Part of the Solution: Insights from the German Collaborative Project *museum4punkt0*

by Katrin Glinka

A stylized illustration of a museum gallery. In the foreground, a man with glasses is kneeling and working on a display case containing ancient tools like spears and arrows. To his right, a woman is interacting with a large, articulated robotic arm mounted on a pedestal. In the background, other visitors are seen: one person is seated at a desk with a computer, and two others are standing near a large window or screen. The scene is filled with various museum exhibits, including a classical statue on a pedestal and a large abstract painting on the wall. The overall style is modern and digital, with a color palette dominated by purples, blues, and greys.

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Most digital innovations implemented in museums are focused on the result: the digital product or application as part of the museum experience.

In recent years, a number of digital applications have been implemented within museums, such as exploratory interfaces to collection databases, digital visitor guides, or Virtual Reality exhibitions. Most digital innovations are focused on the result: the digital product or application as part of the museum experience. The development process often takes several years of intensive work, relies on interdisciplinary collaboration, workflows, and structural requirements, which, to date, are still rare in museums. This complex and challenging process, which includes ideation,<sup>1</sup> technological research, and iterative development is almost never communicated and discussed in the museum field because of the emphasis laid on the resulting digital product or application.<sup>2</sup> In this sense, the otherwise meticulous documentation, focus on research and reflection, and preservation and communication of knowledge as core elements of the museum's mission are often neglected when it comes to digital innovation.

For the three-year collaborative project *museum4punkt0* (2017–2020), the Beauftragte der Bundesregierung für Kultur und Medien (Federal Government Commissioner for Culture and the Media, or BKM) funded a nationwide project that values the reflection and documentation of the process as a central tenet of the diffusion of innovative solutions. Under the consortium leadership of the Stiftung Preußischer Kulturbesitz (Prussian Cultural Heritage Foundation, SPK), six institutional partners, which represent the heterogeneity of Germany's museum landscape in terms of organisational structure, thematic scope and experience with digital technologies, develop use cases and prototypes that are supposed to not only introduce digital approaches into the museum experience, but also document the development process and ensure reusability. Consequently, the collaborative project will publish the digital prototypes and applications as open source code, while also putting an emphasis on the documentation of the process, the evaluation of the resulting applications, and a reflection of workflows and institutional structures.

## Overview

In the present article, I will first contextualise the project by discussing the thematic scope of 'digital' projects or applications in museums. I will then introduce the participating institutions within *museum4punkt0* and their related specific use cases, and will then present the range of objectives and use cases to highlight the underlying purpose of the project, that is, to develop a variety of reusable prototypes that are applicable to a broad range of museums. Finally, I will explain the ways in which collaboration, documentation, and reflection are devised within the project itself and how the results and findings are then exchanged with other institutions and museum professionals.

Although more and more museums use digital technologies to conduct object-related research, organise their collections, enhance visitor experiences, or communicate with the public, these technologies are mostly developed in academic fields outside the core museum disciplines or commissioned by external businesses or partners. In most museums, digital technologies are regarded as a commodity or service, rather than a field of research in itself. In light of this discrepancy, I will conclude the article by highlighting the need to facilitate research at the intersection of core museum disciplines and computational fields of study as well as to acknowledge that these interdisciplinary research activities are equally relevant aspects of museum work.

My intention herein is not so much to present comprehensive solutions or conclusive findings that can be reproduced exactly, as to offer insights into a process that has only just started—a process of collaborative action, reflection, and discussion, with the overall aim to foster a professional discourse that contributes to the shaping of the (digital) future of museums.

## Where is the 'digital' in museums?

Besides institutional IT departments within an organisation's general infrastructure, there are several areas in which digital technologies have been playing a crucial role in changing the way museums fulfil their mission. The focus of digital projects within museums and other cultural heritage institutions has been set, for some time, on the digitisation of collections and the creation of digital records. The most recent ENUMERATE Survey, published in 2015, showed that 84 per cent of the 1,000 European museums that participated in the survey had digitised at least some of their collections to a varying degree (Nauta and van den Heuvel 2015).

### Other institutional incentives towards digitisation

Despite this promising streak, digitisation is still perceived as a challenge by many institutions, due to the sheer quantity and heterogeneity of collection items and the resulting requirements in expertise, technology, and preservation measures needed throughout this process. At the same time, interdisciplinary research in information sciences, computer sciences, museology, art history, computer graphics, and other disciplines are working on improving digitisation processes for a variety of collections and material (Cane et al. 2018; Rogers 2016; Hess et al. 2015, Santos et al. 2014).

It essentially focuses on adapting databases and semantic web technologies to specific requirements in cultural heritage (such as ResearchSpace.org), setting standards for documentation and developing ontologies (such as the CIDOC CRM), facing the challenge of semantic information retrieval (Isemann and Ahmad 2013), as well as developing computational methods of analysis and extraction of metadata (Crowley 2016; Bell and Ommer 2016; Resig 2014; Klavans et al. 2009), to name but a few. These activities inform museum work and will, in the long run, help even more museums digitise and digitally access their collections.

With such a focus on the digital reproduction and cataloguing of collections, the areas of digital expertise in the context of museum work are often confined to the documentation and study of collections, and mostly related to the custodian role of museums. Likewise, the ENUMERATE Survey evidences that institutions publish only 32 per cent of their digitally reproduced and born-digital heritage collections online for general use and will mainly provide digital access to the collections for academic research purposes (cf. Nauta and van den Heuvel 2015).

More public-facing digital projects within museums are often developed in the communications or marketing departments. Here, institutions use digital technologies to communicate relevant information to the public, such as their programme, mission, current events, exhibitions, and opening hours. This is done through a variety of formats: websites, blogs, wikis, or digital advertisement. Additionally, social networking sites allow institutions to communicate with the public, engage in public conversations, or launch participatory formats on social media channels (Vogelsang et al. 2016). Within this range, formats exist that are primarily used to collect metadata and other information about collection items, known under the terms 'crowdsourcing', 'social tagging', or 'folksonomies', (Trant 2008; Cairns 2013 and Ridge 2014). These formats can also be connected with gamification principles that create incentives to participate through 'rewards' (Wieser et al. 2013).

At the other end of the spectrum, social media is used to broaden the audiences, who learn about a museum or exhibition through formats such as 'Instawalks'. These events are organised by museums and used to invite groups to wander the museum, often before the main opening. The participants are then encouraged to share their digital photos on platforms such as Instagram with a suggested 'hashtag' or 'geotag'. A number of hashtags initiated by private individuals or people working outside museums were developed into regular campaigns, including #museumselfie or #askacurator (Dixon 2014). These are complemented by hashtags that were started by museums, such as #HowDoYouMuseum (Museum of Natural History Los Angeles) or #museumweek, a global initiative organised in partnership with UNESCO.

### Collections and museum objects online

The last few years have also brought about new initiatives in museums: websites are not only used to publish information about the museum, but also as a medium through which the actual museum objects are made accessible to the general public. This is usually done by either manually selecting museum objects and contextualising them through captions, texts, audio, video or other forms of narration, or by publishing metadata and digitised objects from the museum database, most often through search interfaces.

The first approach concentrates on a limited number of manually selected objects that are framed by editorial content and audience-oriented narratives specifically produced for this purpose.<sup>3</sup> The second approach allows a museum to publish all of their collection data online, at least the assets that have been deemed publishable. Often, these collection data and digital reproductions will also be added to aggregation platforms, such as the Deutsche Digitale Bibliothek (German Digital Library) or the Europeana Collections.

With this second approach, greater quantities of collection items become available to the public, but the accompanying information is limited to the existing metadata, often lacking in in-depth information and audience-specific narratives. Such online collection catalogues traditionally provide a search interface as the primary access point to the data and reproductions. Consequently, users must be able to define their interest as specifically as possible or even require expert research skills, such as familiarity with the scientific terminology used in the metadata.

In an effort to expand these existing forms of user interaction, a third approach builds upon the observation that such search-focused interfaces to collections limit the ways in which the (non-expert) public can use museum collections. Here, the main objective is to evade the search box as a single point of entry and instead make use of visualisation techniques and exploratory interfaces.

Such 'generous' approaches provide rich, navigable representations of large digital collections and allow the user to interactively engage with a collection, learn about it, and navigate the digital knowledge space that exploits images, contextual metadata and innovative forms of display (Whitelaw 2015). The transfer and application of visualisation techniques to cultural heritage data follows a similar approach. This interdisciplinary strand of research creates visual and often interactive graph-like representations of large datasets of cultural heritage data or museum collections that allow for visual analysis with a 'distant viewing' approach. Provided that a dataset also include high-resolution reproductions of the collection items, visualisation interfaces can interlink 'distant viewing' with interactive display modes that also support 'close viewing' of the digital reproductions (Glinka et al. 2017).<sup>4</sup>

These examples are mostly focused on employing digital technology to inform the public about the museum or allow interaction with a digitised collection remotely (e.g. from a home computer). Beyond that, digital technologies are frequently used as a means to display, communicate, and narrate within the museum space and exhibition. This includes apps that guide a visitor through an exhibition, together with exhibition features such as multitouch tables, digital walls and other interactive displays that provide additional information, or Virtual or Augmented Reality applications that offer an immersive experience and a digital layer to engage with.

### Interdisciplinary collaboration

Public-facing digital projects and developments often come about as part of interdisciplinary research projects, research-oriented settings at the fringes of museum work, or when commissioned directly by a museum. In Germany, digital developments in museums are seldom considered to be a core element of the museum's research mission. However, museums do conduct domain-specific, object-related research facilitated by digital technologies and they publish the results of their research in digital formats.

Nonetheless, the actual research subjects conducted from within the museum seldom include 'digital' topics and aspects that are likewise relevant in disciplines like human-centred computing or user-centred design. Collaboration with these disciplines is fundamental when developing visualisations, immersive environments, or any other given digital 'product' or 'tool' in a museum context. In order to truly realise the innovative potential of digital technologies, museums need to value interdisciplinary collaborations and regard external disciplinary knowledge as substantive to their own research. Until recently, results of interdisciplinary projects in collaboration with museums were predominantly published in domains outside the museum field, for instance visualisation research, the Digital Humanities, or Computer Sciences, as the above-cited references illustrate.

In addition to cooperating in interdisciplinary research projects, museums rely on outsourcing the development of digital applications and media to digital agencies or companies. Here, the ideation, design, and development are regarded as an external service that is merely built upon the museum's content. When this is the case, digital expertise is confined outside the museum, which will make the development of digital expertise within the institution harder in the long run. Long-term maintenance of digital media and applications in museums often poses a challenge, probably related to the fact that museum professionals are often either only superficially included in the development process, or do not have access to the required expertise that would help them better understand a digital product, its creation and upkeep.

In what follows, I will illustrate how *museum4punkt0* has been conceived to show the significance of research on digital technology in museums. My aim is to demonstrate that there is a need to increase digital expertise, foster collaboration between museums, and publish source codes, documentation, and evaluation under licenses that support reusability. The project focuses on visitors, knowledge transfer, and public outreach and hence corresponds to the museum's purpose of exhibiting and communicating.<sup>5</sup> At the same time, the project's principle is also to fulfil the museum's purpose of research and thus takes a research-oriented approach when developing digital applications in the museum context.

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## ***museum4punkt0*: objectives and structure**

The range of goals and aspirations that can be summed up as the core motivation of *museum4punkt0* include the aim to develop digital expertise, as well as use cases that fully exploit the potential of digital communication, technology-enabled learning and visitor-orientation, and the facilitation of participatory approaches and multi-perspective narration in museums. Within this scope, the value and potential of digital technologies are acknowledged, and the need for cultural heritage institutions to invest in digital expertise is addressed.

At the same time, *museum4punkt0* is the first project in Germany for which cultural heritage institutions of different sizes and institutional profiles are supporting each other in the collaborative development of digital applications and use cases. They are also encouraged to network actively with organisations and institutions beyond the project's scope.

With this collaborative approach, *museum4punkt0* acknowledges that collective action is regarded 'as a sustainable method of supporting upgrades in museums' technological infrastructures and digital offerings' (Johnson et al. 2015, p.12). It likewise recognises the value of collaboration between institutions in the sharing of technology-centred expertise, especially when it includes smaller museums that have a limited budget dedicated to innovation. Therefore, the partnering institutions of *museum4punkt0* were selected because they represented the heterogeneity of the German museum landscape in terms of size, thematic scope, organisational structure, level of expertise in digital projects, geographic location, budget, and audience.

The project's main objective is to investigate how digital technologies can be used effectively to fulfil the museum's missions, especially technology-enabled education, knowledge transfer, interpretation, and visitor orientation. The project does not promote isolated initiatives that only remain a unique and short-term addition to existing formats, but studies the need to adapt and improve infrastructures, integrating new forms of expertise and workflows, as well as the continuous training of employees.

Thus, the results of the project are twofold: on the one hand, the use cases in the participating museums will encompass communication- and visitor-oriented products that enhance the museum experience; such as Virtual Reality experiences, Augmented Reality applications, games, navigation tools, citizen science applications, and multimedia guides. On the other hand, these products will be used in practice, so as to generate insights that will also be of value to other cultural heritage institutions. This includes the testing and evaluation of methods in user research, the implementation of new workflows in the museum as part of a user-centred development process, as well as carrying out trials to fulfil infrastructural requirements.

All of these results will be openly published on an interactive platform dedicated to the project: a website that acts both as a collaborative space and communications hub. It will be developed over time and thus grow throughout the project. On this platform, we will provide the source codes of our applications, publish open access papers, and present other forms of documentation and publications to the public. Other museum professionals are encouraged to re-use our developments and findings.

## **Project structure**

The project consists of six theme-based sub-projects that each are either led by one or two partnering institutions. Although the individual project teams are working on their respective use cases independently, they are encouraged to discuss mutual questions concerning the choice of technology, methodology, or other practical work-related areas with the other project teams. Given the heterogeneity of the consortium, a project management group working with SPK is responsible for the generation of synergies and the identification of similarities that can then serve as a basis for collaboration within the overall project. The group also supervises the joint project financially and advises the project partners in their research, choice of technology, and methodology.

To do this, the organisational structures of the partners, as well as their thematic disparity and their respective approaches and audiences, must be taken into account. The project management group is also tasked with the creation of the 'virtual space' that serves as a communications hub and as the central platform upon which all products, insights, and other outcomes will be published openly. Before focusing on the formats that we devised specifically in order to ensure that the overarching goals of the project would be reached, I will briefly describe the six sub-projects, so as to illustrate the broad range of topics that *museum4punkt0* encompasses.

### **Staatliche Museen zu Berlin**

The first sub-project within this framework is developed by the Staatliche Museen zu Berlin (SMB) and approaches the overall topic from three angles. One of the main aims articulated is to address challenges that concern digital infrastructure, in particular the fact that digital technologies and workflows have, to date, not been implemented in all the departments of such a complex and extensive organisation. Insofar as many other German museums, regardless of their size, face a similar situation, this sub-project makes a case that is applicable to other institutions as well. It brings to the fore fundamental questions of digital infrastructure needed for outward-facing digital products, applications, and visitor service. By documenting and analysing the entire process, this first module will produce valuable insights and articulate lessons learnt, which can be of later use to other museums in Germany.<sup>6</sup>





Fig. 1. Digitising biographical material at the German Emigration Center Bremerhaven.  
© Deutsches Auswandererhaus Bremerhaven / M. Krane

The second angle builds on existing visitor research in museums and expands it methodologically by including recent research in museology, visitor studies, user-centred design, and other developments in the field. Through a thorough quantitative and qualitative survey, the team examines and classifies visitor motivation into types, in order to extract a set of ‘personas’. By learning more about visitors and their motivations, the project team is able to draft new formats that are tailored to the needs and requirements of different audiences. At the same time, the team applies assumption-based methods that are common in design processes, together with iterative and agile development. Thus, new ideas can be developed, tested in rapid prototyping, and more can be learnt about tailoring a digital product for specific audience groups.

The third angle is the actual development of new digital products, as part of an overall visitor journey. The interplay of the individual phases (before, during, and after a museum visit) is considered a visitor journey. Here, the team analyses existing touchpoints (both digital and analogue) between visitors and the museum, and conceptualises additional digital products that improve or complement the visitor journey. These applications include general information services, such as a service chatbot integrated in the Facebook messenger platform. Another prototype is focused on knowledge transfer and uses Augmented Reality to supply additional information about exhibits during a visit to the Gemäldegalerie. By overlaying information on a handheld tablet, the visitors learn more about the original functional context of the works or object biographies. They can also study the X-ray image of the painting by ‘scanning’ it with a tablet. Moreover, in the near future, the prototypes will encompass web-based formats, such as augmenting the existing online collections database with exploratory modes of interaction for a broader audience.

#### Deutsches Auswandererhaus Bremerhaven

The second institutional partner, the Deutsches Auswandererhaus Bremerhaven (German Emigration Center) takes a theme-based approach that corresponds to their institutional setup, which uses real family stories and reconstructions of historical settings to illustrate diverse facets of migration. Their use case investigates how digital technologies can be designed and integrated into an overall museum experience to encourage dialogue on migration and immigration. The objective, here, is to understand how digital communication tools and immersive environments can help convey subjective, biographic, and emotional aspects of emigration and immigration (Fig. 1).

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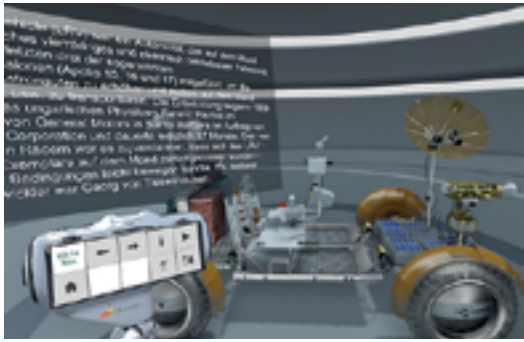


Fig. 2. Prototype for a 3D visualisation of the moon rover in a VR environment. © Deutsches Museum / VR-Dynamix



Fig. 3. 3D model of the moon rover in an extraterrestrial setting. © Deutsches Museum / Time in the Box GmbH

The Deutsches Auswandererhaus Bremerhaven is building up a parallel setting in order to compare the impact of a ‘traditional’ exhibition that provides a narrative backdrop for original objects and conventional museum media such as wall texts and audio, with the impact of a setting that solely relies on Virtual Reality. Here, an exhibition narrative that evokes, through the life of a war prisoner, forced migration during World War I, is simultaneously implemented in two rooms. Given that it accompanies this parallel exhibition with extensive visitor research, this use case will help the museum better understand and evaluate the potential and limitations of immersive technologies that stir up empathy in visitors.

Another format of visitor engagement focuses on fostering dialogue between the museum and its visitors. By implementing a web-based ‘dialogue platform’, the museum encourages the sharing of personal migration or immigration experiences, family histories, and participation in surveys on contemporary political discourses or historical events.

#### Deutsches Museum

The Deutsches Museum explores a technology-focused use case centred on scientific and technical knowledge communication and on the exhibition of unique technological masterpieces. The Munich-based project team explores the potential of 3D digitisation and visualisation for museum and scientific communication. Within this thematic scope, the team not only applies and develops innovative communication concepts by making use of virtual reality (hereafter VR) and 3D visualisation, but also advocates for their purposeful implementation within museums.

The Deutsches Museum actively reflects and communicates on the project’s development process. A designated space within the museum is set up as a ‘VRlab’, in which the visitors are part of an ongoing scientific investigation into the modes of operation, habits of perception, and forms of interaction made available by VR. Different formats of digital storytelling, interactive and virtual settings, and scientific communication are tested, evaluated, and documented.

The Deutsches Museum has implemented a number of prototypes, such as a VR-experience, in which the visitors can drive around in the Lunar Roving Vehicle on the moon’s surface and a VR-sequence in which the Sulzer steam engine can be operated. It will also publish practical guidelines for other museums, which will contain multifaceted information on implementing 3D technology in museums. This will help other museums in their understanding, conception, development, and installation of VR-based educational resources. The guidelines will encompass information on infrastructural challenges, tested technologies, as well as validated methods of digitally supported knowledge transfer (Figs. 2 and 3).

#### Schwäbisch-alemannische Fastnachtsmuseen

Two partnering museums, Narrenschopf Bad Dürkheim and Fasnachtsmuseum Schloss Langenstein, are working on a joint sub-project that centres on the intangible cultural heritage of the Swabian-Alemannic Carnival. Both museums are rooted in active local communities, for whom this cultural heritage is a defining part of their identity. As part of UNESCO’s Nationwide Inventory of Intangible Cultural Heritage, the Swabian-Alemannic Carnival carries great relevance for the region (Fig. 4).

With their joint use case, the two partnering Fastnacht museums are working on making this seasonal event come alive both inside the museums’ physical space, as well as remotely through digital media. Their specific use cases encompass technologies, such as 360 degree videos and Virtual Reality, in addition to participatory formats that allow users to upload music to a web platform. As a result, they contribute to a ‘virtual Fastnacht-band’. In combination with a number of other web-based or immersive settings, this sub-project aims to make the seasonal and intangible cultural heritage tangible and experiential at any time of the year (Fig. 5).



Fig. 4. A storytelling and conception workshop focused on an interactive, mixed reality museum guide. © Fasnachtsmuseum Schloss Langenstein





Fig. 5. Carnival activities enter the museum via VR. © Museum Narrenschopf Bad Dürkheim

In addition to the useful insights provided about the communication on, knowledge transfer of, experience and immersive representation of the Fastnacht carnival, the two partnering museums will produce another valuable outcome for other museums. As partly volunteer-run museums working on limited budgets, their use case must take into account the sustainability of their developments and face the challenges of the long term maintenance of their products. Given that documenting the overall process and reflecting upon the project are the two main objectives, this use case will help other smaller museums to plan and implement digital products in the future.

#### Senckenberg Museum für Naturkunde Görlitz

The main focus of the Senckenberg Museum für Naturkunde Görlitz (Museum of Natural History) is regional biodiversity. Their use case explores the potential of digital technologies as a means to communicate current scientific research in museums to the public.

As part of the Senckenberg Gesellschaft für Naturforschung, a group that encompasses six bio- and geoscience research institutes and three natural history museums, the museums' core mission is to make science and scientific findings accessible to the public. Within the project's framework, the museum develops prototypes that allow the visitors to better understand the inner workings of scientific research in museums. This includes Virtual Reality applications that allow visitors to experience immersively the biodiversity of the soil beneath their feet or Mixed Reality settings that animate fossils.

Another focus lies on prototypes that create knowledge through participation. Here, the principle of 'citizen science' is applied to the classification of soil animals as well as to the identification of changes in landscape by digitising historic photographs from private photo albums and including social-tagging functionalities.<sup>7</sup>

A sub-project is built upon the museum's vast scientific collections, which encompass more than 40 million objects. Its objective is to test and evaluate methods to visualise large-scale collection segments (Fig. 6).

#### Stiftung Humboldt Forum im Berliner Schloss

When the Humboldt Forum opens its doors in 2019, it will invite visitors to engage with an overwhelming range of topics, cultures, histories, and narratives that encompass more than 20.000 objects in display. In reference to Alexander and Wilhelm von Humboldt and their holistic scientific and intellectual legacy, which embraces both culture and the natural sciences, the Humboldt Forum will include a wide range of topics, collections, historic and contemporary discourses in a single physical space: the reconstructed Berlin Palace, located on the Museum Island. This sub-project acknowledges the need to include a multitude of narratives and interpretations related to the objects exhibited, and actualises the potential of digital media in doing so.

In light of institutional critique and discourses challenging the colonial past of European museum collections, this use case aims to establish dialogue and rethink the ways in which a museum can actively exchange with the global public. As part of a participatory video and storytelling framework, which allows the public to contribute with their own narratives, the Humboldt Forum also creates a toolbox that other museums and cultural heritage institutions will be able to use subsequently.

A second use case contrasts the magnitude of objects in the Humboldt Forum with a game-like app that is built around the principle of complexity reduction. The app focuses on identifying one object that best suits the interests of each visitor. In order to investigate the potential of mobile technologies to enhance visitor experience, this use case will experiment with algorithms and interaction principles that are common in recommender systems, location-based marketing, or other personalised services. In a research-focused setting, this sub-project, in collaboration with the Humboldt University of Berlin, will also consider questions related to data privacy and mechanisms of social networks. Likewise, this will help other museums to better understand the needs, fears, and preferences in terms of personalised services in museums (Fig. 7).

## Collaboration, documentation and reflection formats

The diversity of use cases illustrates the challenges that coincide with the ambition and explicit goals of *museum-4punkt0*: firstly, to develop and evaluate innovative digital technologies in museums, and secondly, to ensure that other museums will value the results and findings obtained, and re-use them in a variety of other contexts. This is done by first identifying similarities and transferable aspects within the project that could then be adapted to other use cases. This includes common conceptual challenges, promising methodological approaches and recurring uses of certain technologies. In order to structure these aspects and produce insights that can be shared with other museum professionals, we then developed different formats that focus on collaboration, documentation, and reflection.

### Collaboration

Six workgroups dedicated to core challenges and interests within the consortium were set up to support collaboration: 'Open access and legal questions', 'Digital education and knowledge-transfer in museums and visitor research', 'Collaboration and agile processes', 'Participative knowledge generation', 'Accessing digital objects', and 'Infrastructures in museums'. The partners were free to choose their

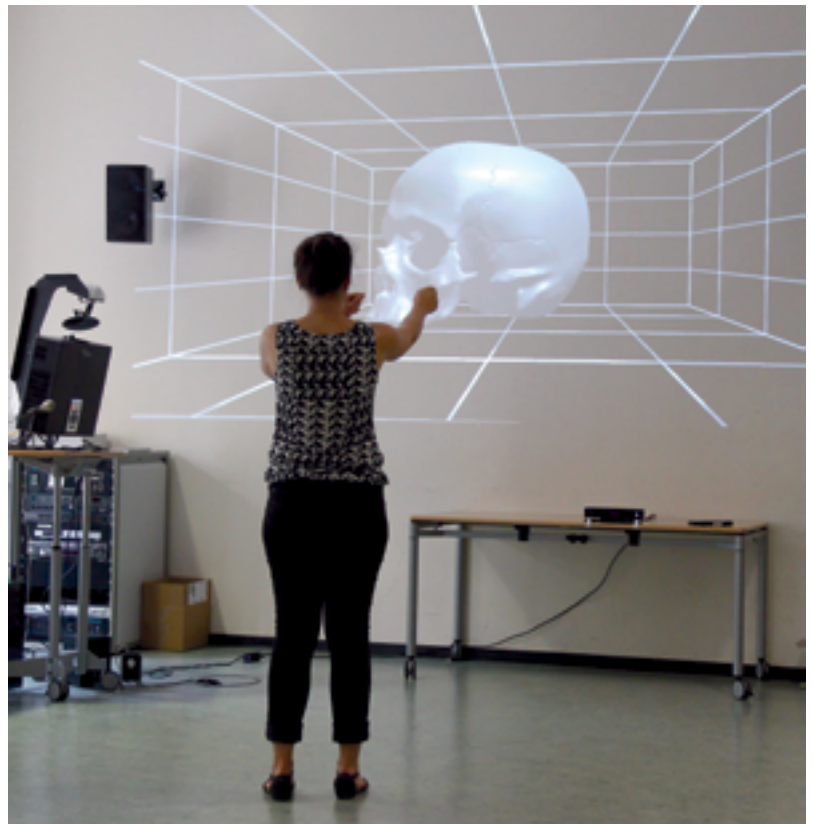


Fig. 6. VR and AR workshop at the Senckenberg Natural History Museum Görlitz.  
© L. Träger

workgroup. However, team members whose core responsibility overlaps with the topic of a workgroup were strongly encouraged to take part in the relevant group. Because of the geographic distribution of the partnering institutions throughout Germany, we decided to implement a project management tool.

Within this tool, forum and wiki functionalities offer the possibility to exchange ideas, discuss recent challenges, and share additional information on relevant topics. The tool can also be used to assign specific tasks within a workgroup. One purpose is to collect material and to document the development processes related to the workgroup's thematic scope. This material will then be processed and used as a basis for blog posts, such as work-in-progress insights, or as a basis for the general documentation and best-practice manuals that will be published at the end of the three-year project.

In order to further foster collaboration between partners and allow them to discuss certain developments, challenges, and topics more thoroughly, the consortium meets in person approximately every three months, usually for two or three days. These regular meetings are hosted by the partner institutions. Thus, focus can be set upon recent developments or installations in the host institution and on discussing the respective solutions *in situ*. Additionally, the meetings are used to present, test, and evaluate prototypes that the partners are working on at the moment, for instance new Virtual Reality sequences, click-through prototypes of mobile applications, or wireframes for a website. During these meetings, the group also decides on future topics, discusses findings and general observations, and offers feedback and support to the group members (Fig. 8).

Thanks to regular meetings, focus can be set upon recent developments or installations in the host institution and on discussing the respective solutions *in situ*.



Fig. 7. Mock-up and brainstorming session for a museum app. © SPK / S. Faulstich

In addition to collaboration within the consortium, we also encourage collaboration with external partners. This serves the goal of including additional perspectives in our daily work, as well as enriching the expertise and thematic scope at hand. One way to serve this purpose is the invitation of associated project partners. These are institutions that are not only included in all channels of communication within the consortium but also invited to all meetings and other activities. Another form is organised as a project collaboration with expert institutions, such as UNESCO or the Wikimedia Foundation. These project collaborations are mostly monothematic in scope. With the German delegation for UNESCO, for example, we discuss ways to illustrate and communicate intangible cultural heritage as part of the development of web-based communication formats.

### Documentation

The core purpose of the project is to foster digital expertise in museums, develop and evaluate digital products and technologies within museums, and ensure the re-use of the results and findings. One of the measures taken towards these goals is, as explained earlier, a strong focus on documentation. In order to be able to mirror the different approaches, products, and types of results within the consortium, this documentation will not focus on a single format.

Throughout the project, the partners publish blog posts that document and describe their process and progress within their respective use cases. The workgroups collaboratively write best practice guidelines. Depending on the kind and present state of the use case, videos and work-in-progress reports will be added to the available formats. Results from visitor research, A/B testing, or other more research-oriented activities are presented at conferences or submitted as scientific papers. The source code of the digital products and applications will also be published, including a thorough documentation of the code and findings from accompanying evaluations and user tests.

### Reflection

Although the heterogeneity of the participating project partners already ensures that a variety of viewpoints, disciplines, and methods are discussed in the context of *museum4punkt0*, we identified the need to include additional formats of reflection and the inclusion of external expertise. One of these formats is run under the title 'museum4punkt0 | impulse'. Each institutional partner can suggest and organise individually specific events within this framework. This can encompass, but is not limited to, public talks by external experts, hands-on workshops, presentations of best practice examples, panel discussions, or interviews. All of the events are either recorded or documented in another suitable format and later published on the web platform so that other institutions can learn from our encounters as well.

In line with the project's commitment to innovation, additional collaborations with external research institutions are strongly encouraged. Instead of solely approaching the individual work packages as assignments that can be commissioned from commercial suppliers, we encourage a more open-ended research approach, which would coincide with recent research in other fields. Thus, we hope to introduce current and future-oriented perspectives and scientific discourses, which, in turn, will foster a culture of reflection within the project and encourage discussions.



## Research at the intersection of Humanities and computational methods

Digital technologies are becoming more and more relevant in cultural institutions and have introduced new forms of interaction and knowledge transfer, as well as a diversification of communication channels with the public, experts, or researchers. As part of this development, new discourses have emerged. They are at the intersection of technology, the Humanities, and other museum-related fields that inform our discussions and developments within *museum4punkt0*.

Technological shifts are not the only elements that define our overall approach. The project also reflects a more general and ongoing change in museums that has resulted in a stronger emphasis on visitor orientation, transparency about the inner workings and key tasks of an institution, as well as opening previously hidden areas of museums, including, for example, the concept of 'visible storage', or the integration of documentary material on the restoration of artworks in their exhibitions (e.g. Tate's 'Restoring Rothko' video feature).<sup>8</sup> Museum professionals nowadays also write blogposts or tweet about their daily work. Likewise, some communications departments publish features on YouTube and other video platforms, or document the day-to-day work in a museum in Instagram stories. These outward-facing activities use digital technologies to portray the inner workings of museums and thus allow the public to better understand the processes of museum work. This shift represents an important step towards a more process-oriented positioning of museums, even if it essentially sheds light upon non-digital areas of museum work and research.

The opening of spaces and areas of activity that previously were hidden from public (non-expert) sight is also accompanied by a rising scholarly interest in the meaning and significance of this phenomenon (Brusius and Singh 2018). Nonetheless, disciplinary discourses from within the field of museum studies, art history, cultural theory or other museum-related fields, are still mostly focused on the physical exhibition and storage areas of the museum and are seldom related to digital storage, preservation, and display issues (Glinka et al. 2015).

As a response, *museum4punkt0* advocates for the acknowledgement of the process of digital developments as part of museum-related research and practice. What our experience with *museum4punkt0* has shown us thus far is that, in the digital age, research in museums must not only be conducted in specialised disciplines and object-related fields such as art history, natural history and science or archaeology, but also facilitate research at the intersection of the Humanities and computational methods and, most importantly, acknowledge these interdisciplinary research activities as relevant aspects of museum work.

The *museum4punkt0* project contributes to this shift in perception by acknowledging these fields of research as being part of the museum's scientific mission. Research from different fields within the Humanities and other specialised disciplines have long been established as one of the core pillars of museum practice. The project likewise regards other disciplinary approaches, whether it be advances in computer sciences, human-computer interaction, design research, or data-driven analysis, as valuable extensions that should be studied, tested, and evaluated in a museum setting. Not only can we build upon such inherent similarities as, for example, between methodologies in visitor research and user-centred design research, but we can apply these related methodologies to our daily practice as a common basis for iterative developments and regard them as a scientific foundation and reference for our work.

Just as museums communicate scientific findings on topics related to their core disciplines (be it in exhibitions, publications, or scientific talks), so too should research at the intersection of the Humanities and computational methods be recognised as a valuable contribution to scholarly museum discourses. Especially in the case of applied scientific approaches, the results of museum-related digital research are not only relevant in expert fields. Such interdisciplinary research in museums also requires a close dialogue with the public, for example in the context of requirement analysis or when prototypes or products are iteratively tested with visitors. Museum audiences, in turn, gain new insights from being included in the process and at the same time contribute to the creation of new digital formats that provide access to objects, knowledge, and experiences by help of digital technologies.

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Fig. 8. Members of *museum4punkt0* share insights into the implementation of digital technologies in museums. © SPK / S. Faulstich

Specialised discourses help us understand how the ‘display’ of objects in the physical and social space of the museum determine the way in which we perceive and interpret their history, narrative, and meaning (Karp and Lavine 1991). Likewise, the display of museum objects and narratives communicated through a digital screen or interface needs to be understood as something that has to be scrutinised, reflected upon, and meticulously designed to support the narratives of curators, scientists, or the public.

The *museum4punkt0* project provides a basis for such discourses, by developing and discussing a variety of digital applications and products, which will also be studied and scrutinised with regard to their inherent structuring meaning and ‘politics of display’. Accordingly, digital technologies allow us to directly communicate with defined audience groups and to create participatory formats that enhance the authorised museum narrative with a multitude of perspectives, which challenge set opinions and introduce alternative voices to an otherwise canonical and often authoritative and historically induced narrative.

*museum4punkt0* hopes to contribute to a growing interest in the above topics and foster a vivid discourse within museum practice and theory through collaboration, documentation, and reflection—not only for questions of representation and institutional responsibility, but also in terms of the practical development of digital products, which aim to create, for the public, new ways of engaging with the countless objects of wonder museums hold.

#### NOTES

<sup>1</sup> The term ‘ideation’ is used in design and technology contexts to describe the process of generating, refining, and communicating ideas and solutions as part of an overall design and development process.

<sup>2</sup> Iterative development is a method within software development that is characterised by developing a system in repeated cycles (iterations) that include planning, requirement analysis, design, implementation, testing, and evaluation.

<sup>3</sup> One example is the ‘Online Features’ by the Metropolitan Museum of Art. Available at: <https://www.metmuseum.org/art/online-features> [Accessed 10 October 2018].

<sup>4</sup> For an overview of graphic and interactive representations of cultural heritage collection data, see Windhager et al. 2018.

<sup>5</sup> I am referring to ICOM’s definition of the museum as an institution that ‘acquires, conserves, researches, communicates and exhibits [...] the tangible and intangible evidence of people and their environment’ ICOM. 2017. [Online]. *ICOM Code of Ethics for Museums*. Available at: <https://icom.museum/wp-content/uploads/2018/07/ICOM-code-En-web.pdf> [Accessed 7 December 2017].

<sup>6</sup> The process, amongst other things, includes the drafting of an invitation to bid, taking into account the requirements for the installation of hardware and new technology within landmarked buildings, as well as training employees to maintain a system.

<sup>7</sup> ‘Citizen science’ describes formats through which non-scientists can help to analyse or collect data, mostly as part of a project led by a research project or institution.

<sup>8</sup> See, for example, the project ‘Transparent Museum’ at the Hamburger Kunsthalle. This exhibition project highlights aspects of museum work that normally are hidden from the public. Available at: <https://www.hamburger-kunsthalle.de/en/transparent-museum> [Accessed 10 October 2018].



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