Breaking boundaries, creating connectivities: Enabling access to digitized museum collections

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Abstract. Museum staff as gatekeepers to cultural heritage are central to enabling or constraining user interaction with museum objects. However, organizational barriers frequently hinder staff's ability to invest in expanding user access to digitized collections. In this chapter, we analyze staff practices that help create online opportunities for user engagement, which we argue is a process of actively expanding and negotiating infrastructural boundaries of connective capacities. These boundaries constitute and expose an "installed base", which refers to the backbone of infrastructure, and the existing practices and norms from which work takes place. Drawing on two case studies, our analysis suggests that changes to the infrastructure, including the expansion of digitized collections and tools, builds on and is shaped by the installed base. By centering user needs and leveraging their place in diverse heritage networks, staff are able to overcome infrastructural boundaries that shape and hinder practices of designing for access. This study illustrates, in particular, the ways in which staff are compelled to negotiate perceptions of what constitutes both an "authentic" museum object and a professional museum role in order to enable user access to digitized collections.

Keywords: Digital cultural heritage, Digitized collections, Infrastructure studies, Accessibility, Museum staff, Installed base.

1 Introduction

In an increasingly pervasive digital media ecology, museums have been restructuring and shifting their work practice including how they create access to cultural heritage. Forms of digital media, such as online collections and social networking tools, are typically associated with increased access. In this paper, we adopt an infrastructure studies perspective to explore technologically mediated forms of enabling user access to digitized collections, through which museum staff actively negotiate the institution's connective potential. We pay attention to the insider practices of staff working to overcome new complexities of the museum's infrastructure. We claim that the adoption of digital tools and practices might challenge socio-technical bases upon which infrastructures are built and growing, which we refer to as "installed base", an insightful conceptual device being used in infrastructure studies [1, 32, 34]. Through close analysis of two case studies — the Open Museum within the context of Glasgow Museums, and Swedish National History Museums — we argue that designing for user access becomes visible as a process in which staff bump up against and negotiate the boundaries of the museum's connective capacities. Our analysis exposes how staff in both cases are actively engaged in negotiating these boundaries and crafting the activities that determine what kind of access the digital can help manifest. We claim that enabling access to digital cultural heritage is intertwined with how the institutions are prepared for user's emerging needs and changing behavior. In particular, we look closely on how staff are compelled to negotiate perceptions of what constitutes an "authentic" museum object and a professional museum role.

The paper is organized as follows: First, we reflect upon multiple ways of positioning access in cultural heritage, acknowledging the complexity and interconnectedness of the sector. We highlight how access, through different digital means, could pose tensions for museums and how these tensions, and potentially their resolution, can be practically understood through an ethnography of infrastructure framework. We then discuss the methodologies used for our two case studies to delve into staff's experience, contradictions and tensions. The analysis of the two case studies is centered around three main themes: a) expanding boundaries that define professional museum roles, b) what constitutes a museum object as "authentic" and valuable for engagement, and c) enhancing the institution's connectivities. We examine how these expansions of the installed base and associated boundaries were negotiated by museum staff. Lastly, stemming from staff's negotiations we argue enabling user access to digitized collections relies on a number of staff strategies that build upon the installed base.

2 Professional roles and access to museum collections

Designing for access to cultural heritage through digital means is considered essential for today's museums to maintain relevance. Museum and media studies' scholars describe access in cultural heritage work to refer to different practices that open up the institution and the collections to potential visitor interaction and participation. Access in the museum field is frequently associated with "audience building" and "social inclusion" [28]. According to Carpentier [6], from a media studies perspective, access entails a user presence to both technology and content, which is a requirement for participation. He further suggests that access encompasses both a social and cognitive component, which aligns with its use in the museum field. On the one hand, access in museology is correlated with cognition, where concerns are centred around legibility and readability of text, the inclusion of alternative text and subtitles and further design considerations for people with disabilities [24]. On the other hand, access to cultural heritage is also considered to be not only cognitive and physical, but also social and emotional, encompassing sensory and affective qualities of cultural heritage objects and display [22, 24]. This is what Witcomb refers to as the "affective possibilities" of objects which "engage emotions and in the process produce a different kind of knowledge — one that embodies in a very material way, shared experiences, empathy, and memory" ([37], page 36). Access in our two case studies is the process of bringing together users and digitized objects which is fraught with ideas regarding the objects' affective potential and associated information.

Expanding access to digitized collections can bump up against pre-existing conceptions specific to institutional contexts and histories, regarding social and cognitive accessibility. Specifically, the materiality of objects and their ability to be "touched" is regularly idealized for their associated affective powers which can enable new forms of understanding, empathy and shared social connections [19, 30, 37]. The Open Museum (OM) for instance, is intended to fulfill a vision of an accessible museum by bringing museum objects out to communities to be safely handled, enabling "true" access. This access according to the Open Museum has to do with emotional and social affect that material objects can enable. O'Neill explains, "[t]he OM is based on the belief that opportunities to handle objects and host community-led exhibits reveal the human dimension of objects in ways that significantly enrich people's lives" ([25], page 34). Initiatives such as the ones at the OM, forefront accessibility by taking material objects to users and communities which raises critical questions regarding the affective potential of digitized museum objects.

Digitized objects can also call into question professional roles, as they are constituted by existing values and insider knowledge, including perceptions of 'access'. For instance, questions regarding affect and authenticity have often led to the de-prioritization of the digitized object and artwork, compared to its authentic and material counterpart. As a result, Meecham [20] calls for a reconsideration of museum staff's conception of authenticity and their relationships with material culture. On the other hand, digitized collections can create further tensions with professional roles due to the decentralized nature and interconnectivities between digitized collections and the web. Specifically, with various kinds of non-hierarchical and decentralized practices, institutions can no longer control definitively how their users reuse the material which has been published online. Individuals and commercial actors alike can easily manipulate the uses of objects, transforming them beyond the intent of the institution. Virtual environments can even reshape people's understanding of the object's cultural value and transcend it into other contexts to incite new experiences — from a social and participatory to a culturally immersive experience [8]. As a result, some might say that online anyone can be a curator, critically calling into question the form of professional cultural heritage roles.

The move toward museum digitization and decentralization are tearing down barriers that define the responsibilities of museum's personnel. Calling it "a changing profession", Boylan [4] claims that the traditional profession of "museologist" or "scholar-curators", i.e. those who care for and maintain the collections, is put under threat as professional training fails to keep up with the ever-increasing specialization and complexity of museum work. The shift provides a greater need to fill gaps in the specialized staffing, such as those who undertake exhibition work, education, and documentation, either by contracting out to private-sector services [4] or developing the digital literacies of the museum workforce [26]. The digital transformation and pervasive social media engagement also influence the changing profession, demanding new roles that encompass crafting access to digitized forms of cultural heritage. Geismar [11] reminds us of how digital practices in contemporary museums are shaped by institutional context, infrastructure and a legacy of practice. While digital cultural heritage is often idealized as a radical alternative to the historical form of museum artefacts, there are persisting tensions in using digital tools to make cultural heritage accessible. That is because, Geismar argues, digital components of today's museum practices provoke "a new kind of materiality, a digital poetics that can be used to unpack the politics of museum collections" ([11], page xviii). This digital poetics highlights fundamental questions about new forms of infrastructure, accessibility requirements and skill, which can challenge existing forms of museum professional

roles. In the following section, we discuss how the concept of an installed base in infrastructure studies can shed light on an institution's compatibility with online engagement practices.

3 Infrastructure and the installed base

Due to the connective turn, which has increased pervasiveness of digital technologies, GLAMs are called to change their practices and expand access to fit within new media infrastructures [16]. Many GLAMs are breaking from the old forms of social, collective memory-making, and relying more on digital infrastructures for enabling modes of support, instantaneous communication, and global interconnectivity [3, 5]. It is common to address the connective capacities of GLAM institutions not necessarily as static, but as intertwined with institutional and social contexts. There is a vibrant literature in museum studies that employs the assemblage approach to analyze how organizational settings and techniques of museum practice are intertwined. Macdonald [18] and Witcomb [36] look at how routine practices shape knowledge presentation and determine relationships between museums and audiences. Morse [23] pays attention to an expanded set of museum practices and asks how they "make up museum work-worlds". The complexity and interconnectedness of the sector indicate that the museum's infrastructure ought not to be studied as a merely isolated object; rather, it is a lively assemblage of internal institutional and, in a lesser extent, cross-institutional practices such as displaying collections, preservation, or community engagement programmes [10, 15, 17, 28].

From an infrastructure perspective, the intertwined museum work-worlds do not grow from scratch; rather, they are built upon a common set of practices and conventions. Infrastructure scholars often take the case of optical fibres that run along old railroad lines, or information systems that are designed for backward compatibility, as examples of how new developments inherit both strength and limitations from the installed base and struggle continually with the inertia of that base [21, 33]. Monteiro and Hanseth [21], discussing the relationship between information infrastructures and organizational issues, observe that when the installed base grows, it becomes more and more irreversible. The museum work-worlds can become a resistant assemblage, as their pre-existing arrangements create compatibility issues and cause organizational resistance towards change [29]. Our discussion in Section 5 will illustrate how, while introducing digital infrastructures to accommodate a broad range of users, museum staff might encounter contradictions and tensions that expose and call into question museum boundaries which shape and hinder a practice of assembling "access".

Under Susan Leigh Star's infrastructural lens [32], re-making boundaries is part of the infrastructure's ability to reach beyond one-site practice, i.e. the backbone construction or an existing installed base [32–34]. Infrastructures tend to be considered as invisible and relational, the substrate in which substance takes place [31]. Star proposes bringing an ethnographic sensibility to the hidden fabric of technical work in order to get into inner depths of the built infrastructures [32]. An ethnographic sensibility enables the researcher to observe how infrastructures are expanded, shifted and changed which is related to the concept of infrastructuring [14, 32] — a process of design in embedding new technologies into practice and existing socio-technical arrangements. However, the initiation of change or the embedding of new technologies can create tensions with the existing infrastructure, commonly referred to as the installed base. According to Edwards et al., an installed base "includes not only artifacts but human habits, norms, and roles that may prove its most intractable elements" ([9], page 366). Research on information infrastructures points out that the evolution of infrastructures happens gradually and requires negotiation [31]. To comprehend the compatibility of systems innovation and existing socio-technical arrangements, or their congeniality, it is essential to examine "the merged parts' ability and willingness to mutually adjust and co-evolve" ([29], page 235).

In the two case studies that follow, we explore how elements of the installed base merge with and bump up against the incorporation of new tools and protocols for enabling user access; how staff negotiate the boundaries of an installed base to expand access to digitized collections; and how access is shaped by the merging of parts, impacts the end-user experience. Aanestad et al. [1] outline four areas that institutions must confront to reach the stage where the use of the new infrastructure achieves momentum, or what they call an "installed base-friendly" approach: coordination across multiple actors, addressing heterogeneity, responsiveness to evolving needs, and strategies towards transformation [1]. This approach implies that infrastructural development must align with existing work practices and require minimal changes to the technological base. The following analysis, building off this perspective, identifies an additional area that staff must devote energy to in order to catalyze the momentum of new infrastructure for expanding user access to digitized collections in today's pervasive digital media ecology. We aim to trace how emerging digital initiatives are grown organically on an installed base of established structures, professional roles and practices of the organization, contributing to infrastructural development.

4 The two cases

The analysis of this paper is based on the data obtained from qualitative interviews and ethnographic fieldwork conducted at two GLAM institutions: Glasgow Museum's Open Museum (OM) and Swedish National History Museums (SHM). Through these two cases, we investigate how everyday staff negotiate user accessibility for engagement with digital cultural heritage, in the former through a year-long social media ethnography, and the latter through semi-structured interviews with SHM staff working in digital data management. The merging of these two cases is due to observed overlaps between the emergent categories stemming from our datasets and a mutual interest in infrastructure. Over the course of our fieldwork, we frequently discussed our research trajectories and even collaborated on pilot interviews with experts in digital cultural heritage during August 2019, which provided essential background on our shared field.

From its conception, the Open Museum (OM) was intended to fulfil a vision of access that would provide pathways to cultural value for individuals and groups who normally cannot or would not engage with the museum. The Open Museum is the outreach branch of Glasgow Museums, and is an institution without walls meaning it has no physical venue. Instead, it pops-up in local communities and non-profit/partner organizations bringing participants and collections together to create engagement in dynamic ways. As a result, the OM is virtual in nature, making the use of social and digital media seem complimentary to their access initiatives. Nevertheless, from a series of pilot interviews in 2019 with Glasgow Museum staff, it became evident that the OM rarely used digital and social media in everyday outreach initiatives. Thus, the OM was perceived as a pivotal case in understanding the relation between museum infrastructure from which social inclusion work takes place and social media practices.

A year-long social media ethnography [27] was undertaken to understand how infrastructure shapes staff's use of social media and lack thereof in relation to inclusion and access initiatives. Social media ethnography traverses online and offline contexts and thus, could be considered an internet-based ethnography rather than an internet ethnography. As such, it aligns with the central research question due to its emphasis on the interconnections between social media and local histories, political structures, or in this case, institutional infrastructures. During this placement, Covid-19 motivated staff to enable additional forms of user access to objects through social and digital platforms. This disruption required staff to negotiate pre-existing concepts of what constitutes a valuable or "authentic" museum object and pre-conceptions of what constitutes staff's professional role. The process of their negotiations made evident how an installed base shapes user access and important strategies that could be considered as part of an "installed-base friendly" approach to its expansion [1].

Comparatively, the Swedish National History Museums (SHM) is a central museums agency whose tasks are promoting knowledge of Sweden's history and preserving the cultural heritage that the agency administers. As a result of the Cultural Heritage Bill that the Swedish parliament adopted in 2017, the new central agency of SHM was created in January 2018 which aims to create access and pathways to cultural heritage engagement through its expansive collective digital offerings. All six museum members jointly developed a focus plan outlining starting points and development areas for the new agency to achieve this vision: "History should inspire people to be active in the present in order to shape the future" ([35], page 8, our own translation). As people's historical awareness increases, so do their opportunities to see the connection between the past, the present and the future. The data is obtained from qualitative interviews with a specific group of staff working on a daily basis with the museums' digital infrastructure and involved in the development of the agency's digital strategies.

5 Staff as catalysts of connectivities: Critical factors for enabling access

In the following sections, we analyze staff practices that attempt to expand user access to digitized collections in different ways. In the process of expansion and the resulting tensions that arise, we identify elements of infrastructure or an "installed base" that causes uncertainty in staff practices. Specifically, two shared aspects of existing infrastructure in our case studies caused tensions in expanding digital access for users, which are here referred to as boundaries. These two boundaries include staff's perceptions of their professional role and associated responsibilities, and what constitutes a museum object as authentic and valuable for engagement. Expanding boundaries must build off of existing practices and norms that constitute the installed base allowing the infrastructures of which they are a part of, to be expanded ([2, 29]). Staff in the following analysis, build and catalyze connectivities, leveraging existing relationships across their respective networks to expand and negotiate infrastructural limits. Through these connectivities staff expose the importance of an installed base friendly approach to infrastructuring, which includes support from relevant actors and embracing the vulnerability and risk brought by digital transformation [1].

5.1 Expanding boundaries of professional roles

For outreach staff at the Open Museum, their professional role is based on working with local under-served and hard-to-reach communities and participants, often enabling access to objects in diverse ways, such as through handling kits. Handling kits are large boxes constructed in-house which contain a small collection of "real" (accessioned and not reproductions) museum objects based on a social or cultural theme. These kits are referred to by staff as the "bread and butter" of OM's outreach work, which are frequently used when meeting participants in the city and are also borrowed by partner organizations. OM's participants are groups and individuals in Glasgow often connected to by networking with other organizations. For example, the OM has collaborated with several different non-profits related to mental health, Alzheimer's, migration, and poverty. Staff's outreach role focuses on local participants, as is defined by and emphasized in contrast to that of the larger institution, Glasgow Museums.

The role of the OM's curators is unique in being based on different social portfolios with associated strategies to fill these remits, including mental health and incarceration, poverty and homelessness and ageing populations. As part of their role, Open Museum staff describe their work as going out into communities rather than relying on participants to come into the venues like other Glasgow Museums. As OM staff suggest, "[it is] our local geographic location we are engaging with", which enables staff to cater for the interests and needs of specific communities and participants. In comparison, staff occasionally critique the dual priorities of Glasgow Museums, citing a potential contradiction between its role as an international museum service and in serving locals. For instance, staff question Glasgow Museum's understanding of its communities: "I think sometimes there is a lack of reality of what is happening on the street and in the communities, we are intended to serve". This critique emphasizes and defines in contrast, OM's outreach role and responsibilities.

However, in investing in digital and social media platforms during Covid-19, OM staff suggest that their audience priority and associated outreach role was to some extent critically questioned, causing initial inertia in adopting these tools into regular outreach practices. Staff sometimes expressed a critical view of social media suggesting associated practices as potentially outside of or even contradictory to a focus on local participants and hard-to-reach audiences. For instance, it can be impossible to engage with hard-to-reach audiences through social and digital media when participants are faced by homelessness or are confined to spaces without technological access and may lack digital literacies: "Yes, thank god for social media and online resources but what about the people in hospital and prisons, and care homes and stuff who don't access the internet." One OM staff member reflecting on the digital changes from pre to mid pandemic suggested, "I suppose before you feel quite strongly what Open Museum and Learning and Access team values are and goals are, but during this [pandemic] I felt like they melted away a bit…"

When discussing the increased investment of Glasgow Museums broadly in social media work during the pandemic, an OM staff member reflected, "[w]hat I've been doing is sticking to I think local, [which] is the most important thing for me. We're outreach right, so our target is vulnerable communities and so on…" Conversely, one staff member, discussing the use of video chats in their outreach sessions in relation to a local focus reflected, "[o]f course we are still trying to keep this very sort of local, which is quite interesting in terms of, I don't know if that's a contradiction or not". During this period, a local focus for those participants who had technological access was somewhat maintained in several of the OM's online engagement projects through the privacy functions of video chats, the use of email and private Youtube video links. Such commentary and resulting digital practices suggest that in attempts to broaden access to digitized collections and engagement during the pandemic, a focus on local audiences resulted in initial uncertainty regarding staff's professional role and shaped how engagement with digitized collections was enabled.

In a similar way, staff's perception of their professional role at SHM impacted how and by whom objects are made accessible through digitization. The merging of six museum bodies has been extensive, resulting in the overconsumption of resources which strained the work environment. Due to the complexity of the change, the work of adapting systems, internal control documents, routines, working methods and IT environment will continue for several years to come. From the point of view of a staff member who is responsible for the museum documentation system, the merging work has created confusion and uncertainty related to the specific roles and responsibilities that a group of staff needs to perform: "They [the curators and conservators] have a lot to do. There is a lot of exhibitions and things that they need to be involved in and maybe also do kind of leadership, but their boss doesn't encourage them to... they're not telling them that one of the most important things to do is register and keep the information about the collections up to date in our systems. And it's hard for us, who are working with the structure of the data and the system, to go and tell their bosses, 'you have to prioritize this.'"

Due to the complexity of the change, the problem of not keeping information about the objects completed, correct and up to date in the system becomes more acute. It seems that the only one who cares about keeping information about the objects complete, correct and up to date in the system are those who work on a daily basis

with the museum documentation system. Even though these tasks seem insignificant to top management, they are very important because the whole agency is dealing with millions of objects. The staff acknowledge that but they can't transfer that knowledge to their colleagues in the collection department. The disconnect between upper management's goals and staff's everyday practices become apparent when the digital plays a definitive role. How about multimedia and digital-born objects? What shall we do with nested authorship? These issues are tackled by re-inscribing or breaking the boundaries of museum objects.

During attempts to expand user access to digitized collections, staff's roles were destabilized due to questions arising about responsibilities. At the Open Museum there was uncertainty about how digital tools maintained or broke staff's professional outreach role due to the association of digital/social media with a different audience priority. The merging work at SHM and its complexity, on the other hand, created uncertainty regarding staff's resulting responsibilities and priorities. In these two cases, existing perceptions of their roles and responsibilities hinder and shape the ability of staff to invest in expanding user access to digitized objects from the collection. Yet, as will be further discussed in Section 5.3, these instances also provide insights on how boundaries can be expanded through an installed base friendly approach.

5.2 Negotiating boundaries of authentic museum objects

The analysis above regarding professional roles in association to audience priorities and digitization responsibilities, created some hesitancy in using digital tools to enable user access to cultural heritage. However, in this section we describe how the authenticity of objects also hindered and shaped how staff enabled user access to digitized objects. The prevailing strand of discussions on what makes an object valuable for engagement has been strongly framed by the object-centered museum discourse. Within this token, the value and meaning of a digital object are bound by the established conventions derived from the material/immaterial binary and "subsequently judged from the standpoint of the 'superior' physical counterpart" ([5], page 49). However, another viewpoint suggests that "the experience and negotiation of authenticity also relate to networks of relationships between objects, people, and places" ([13], page 183). Staff at both OM and SHM expand the boundaries of what traditionally constitutes a valuable museum object by decentralizing museum practices. That is, staff in both case studies, open-up object selection to participant input, in terms of both outreach sessions and digitization, allowing the relation between people, objects and context to shape authenticity.

At the Open Museum, staff highly value the use of object handling kits for outreach sessions due to the ability to take out, hold and pass around the objects. As one OM staff member stated, they work closely with the conservation team to make this happen: "That is the point of these kits – the museum objects can be handled". The tactile nature of objects is often seen as central for participants to engage with the material and in turn, connect socially and emotionally with other participants and staff. This was reflected in a conversation amongst staff regarding the differences between an "Enigma handling kit" and "Reminiscence handling kits" in how they enable emotional and social connections in different ways. The Enigma kit for example, which is filled with strange looking objects is valued for how it can jump start conversations between participants while the Reminiscence kits enable participants to share and connect over memories. Passing around objects from each box provides not only sensory entry points such as "touch and smell" but also sets the group dynamic, as the participant who is holding an object is frequently empowered as speaker.

However, during the pandemic, staff were forced to rely more on social and digital media to create access for participants to engage with objects and each other. It is perhaps, therefore, no surprise that staff invested in creative ways to enhance sensory elements of digitized objects through social and digital media. As one OM staff reflected: "So, I suppose in some ways you can actually do a wider variety of different things because you can draw on a variety of collections but having to do it in a very different way and being very reliant, I suppose on the visual rather than more tactile elements of what we do." One example during this period included a video chat session in which a painting of a seascape was shared, and participants were encouraged to imagine how it would sound and feel to be in the scenery. During this session, participants longed for past vacations, with some sharing memories of previous visits to water landscapes, including surfing on Scotland's cold shores. In another outreach project, poetry was used in conjunction with objects as a form of interpretation, potentially engaging participants with the artist's work and emotions.

In the process of creating online engagement sessions, participants and non-profit partners were involved in iterative feedback, influencing which digitized objects were chosen for sessions and the structure of different activities. The resulting interactions and engagement of users, for some staff resulted in a new value attributed to digitized objects. Notably, objects were perceived by staff as similarly enacting emotional and social connections: "It's that idea that these objects are catalysts of discussion and conversation and you know us being there gives people something to talk about…" Another staff member reflecting on the use of digitized art suggested, "If you

can engage with other people through that art, it's like an infection it makes you feel something, and it makes other people feel the same things and you're sharing in that feeling". On the other hand, despite catering to participants' interests and needs, digitized collections were still sometimes expressed as not as good as the real thing. For the OM's particular audiences, this was often related to restrictions of social and digital media that hinder the level of sociality and the ability according to one staff to "share emotions" around museum objects.

As in the case of the SHM, their digital strategies endorse the view that digital objects can exist in their own right and perform roles that might go beyond reproduction and interpretation. This view is complemented by a decentralized approach on who performs the process of selection, who decides what is significant, and, to some extent, who has the authority to dictate what should be remembered and forgotten. The SHM's architecture allows the community to be involved in this process and these decisions. The publication of 3D models to promote the value of the collection is one successful example. Let us examine the case of the Royal Armoury in Stockholm, one SHM member that holds many artefacts of Swedish military history and Swedish royalty.

Among the Royal Armoury's valuable collections, there is a set of armour that was made in the 16th century and may have been worn by King Erik XIV when he returned to Stockholm from a campaign. The museum made 3D models of different objects in the collection and put them online on Sketchfab, a platform where users can upload digital scans, and the others can download, use and reuse them for free. One staff member working in the communication and digitization department describes the ecosystem where this museum puts the digital copies of its objects online: the 3D models are uploaded to Sketchfab, other versions of the images on Imgur, audios and videos on Youtube and SoundCloud, and articles about the objects on Wikipedia. There is still much work to be done to encourage more sustainable research practices, if the museum aims to communicate the need for long-term preservation of physical artefacts and intangible heritage [7]; yet, these above-mentioned practices are simple mechanisms to increase public access to 3D digital models.

Museum professionals have begun to notice that accessibility aimed at social inclusion might fail to serve marginal users or under-served social groups, if the idea of "accessible spaces" focuses more on objects than people. These above decentralized practices show that there are different ways of giving access to the collection, and that instead of developing a standalone platform on their own and giving access through one family of platforms, museums can promote connections to objects through diverse platforms and media. As one SHM staff said, "we place our digital resources on suitable platforms that are already well established among the public and that have many users," so the institution can choose different platforms for different types of digital resources to reach as many users as possible. Making their 3D models available for reuse, the SHM invites their users to enhance the use via other platforms. The Swedish case highlights the strength of the agency's information architecture, which allows each member institution to facilitate the engagement of external actors with its ongoing extended installed base.

5.3 Enhancing internal and external connectivities

Expanding access is a continual form of craftwork which builds off of and expands the installed base, including as previously discussed, the boundaries of authentic objects and professional roles. As further outlined below, staff at SHM and OM negotiate the limits of infrastructure by facilitating internal connectivities and enhancing the connective capacities of digital infrastructures outwards. Enhancing connectivities outwards entailed shifting how staff accommodate or focus on users, on one hand at SHM, through staff's digitization efforts and on the other hand, at the OM, through iterative feedback and communication with its stakeholders.

The SHM's services have changed from creating, personalizing and navigating cultural heritage to curating their collections in digital formats and accommodating users in co-knowledge production. A SHM's documentation staff member recalls the process of organizing information in their day-to-day work situations: "The four of us that work with this have good knowledge about the museum. We have worked for these museums for a long time, so we could understand that this information in this field is going here, but still, it's not perfect. And we are discovering things. Now, when we have worked with the system for a few years, we [realize that we] didn't do it correctly. Sometimes we have to do it again, the [data] migration task."

The above reflection underlines the importance of non-engineered activities, which is unplanned and emergent, in generating effects and structuring social relations [12]. The documentalist refers to the task of making information consistent in every field as a crucial problem derived from the struggle of the new infrastructure to support and align with existing work practices. In terms of engineered activities that are purposefully crafted, digitalization efforts at the SHM provide a useful account. Pressure of crafting access to as many objects as possible from multiple internal actors thrust the digitalization team into nearly a point of digitizing everything. The infrastructure in this case can fail not because of internal disruption but of "a breakdown in the relations between the infrastructure and the domain of activity it is expected to sustain" ([12], page 5). One staff's response

sheds light on why an extended installed base might make an already existed engineered activity, that is digitization of digital resources, fail to deliver as intended:

> "I get a steady stream [of demands] from our colleagues they want to digitize this, they want to have this archived, maybe digitized so they can read it on their computers, instead of going to the place where all the books are. They want to digitize everything in this specific storage and make a nice digital exhibition and we are struggling with the infrastructure. We are telling them that, 'we can't do this, we need somewhere to keep all their digital resources.' So, we need a process for how to manage all the data that we are producing in such a project, and we are not there yet in this new government agency."

Similarly, at the Open Museum, the importance of not only internal but also external connectivities in enabling access to digital cultural heritage became apparent. While the use of digital and social media may seem at points contradictory to the OM's professional role and the role of tangible objects in outreach sessions, they overcame these boundaries to meet participant needs. Staff were highly motivated to adopt new platforms and digital tools in the midst of the pandemic to sustain relationships with community groups and continue to fulfill emotional and social needs. Staff reflecting on their activities suggested, "So you know, the role that museum engagement played for those people in their lives was maybe more around fulfilling basic emotional, mental, physical needs in terms of museum wellbeing type things. I think that Covid has heightened that". In keeping up connections and access to digitized collections, there was increasing recognition that these tools could be used to focus on specific local communities and non-profit partners—enabling their joint access to digital cultural heritage. As discussed in the previous sections, staff used the affordances of social and digital media to create private spaces, focusing on local groups and leveraged the social and emotional connective capacities of digitized objects by emphasizing different sensory elements.

Integral to this expansion was the feedback of participants and non-profit partners which emphasizes the importance of external connectivities but also the emergent digital practices of staff in expanding the installed base. Through back-and-forth discussion with non-profits and participants on their experiences and what could be improved in online engagement sessions, staff were able to continuously tweak their approach to the content used, the sensory elements leveraged and even the type of platform. For instance, staff explain that for digital outreach sessions, "[i]t's a collaborative, co-creation or whatever you want to call it or co-participation whatever terminology you want to use. It's not us developing stuff and putting it out there and hoping people will engage it is about talking to people asking what do you want from us, what can we do for you?" As a result of positive participant responses, some staff are accepting that online and social media tools can be used to continue their outreach work.

For example, an OM curator reflected that from the online projects: "… actually I suppose one of the things out of this, is that you can work with groups and respond to their needs and then put things out digitally working with groups in the same way you develop a face-to-face community engagement session". Consequently, the OM curator acknowledged, "I think I always separated out digital engagement with community engagement and always had them as two separate things in my head. I guess one thing I've learned from doing all this is that they can be one and the same". This suggests that while authenticity and credibility can hinder digital adoption, they can also be reconfigured in online spaces to expand user access. Central to this process as indicated in the above quote is through partnering and discussions with other organizations and community groups, their feedback and the ability of staff to respond through emergent or crafted practices.

6 Designing for user access

In attempting to expand access to digital cultural heritage, it became evident that museum staff in both cases are actively engaged in designing and crafting the activities that determine what kind of access the digital can help manifest. However, our central question does not directly interrogate the value of this extended access. Instead, we focus on the role of museum staff in opening-up infrastructures by increasing access to digitized forms of the collection. Here it is useful to understand infrastructures as "doubly relational" ([12], page 5), which recognizes not only their internal connectivities but also their capacities to reach outwards. Our ethnographic focus on staff practices interrogates the ways in which breaking boundaries and creating connectivities become a process of negotiations that is legitimized, and somewhat routinized, through user interaction and through the institution's respective networks. The case studies reveal the importance of listening and centering the viewpoint of users and being part of cross-institutional networks, which emerge around specific concerns and interests about enabling access to digital cultural heritage.

SHM's and OM's strategies of designing for user access show a kind of infrastructural development that starts from what was already there. Their engagement in ongoing processes of extension — breaking boundaries and creating connectivities — is a clear illustration of considering the installed base as a facilitator for user-driven

innovation [1, 2]. The coordination across multiple actors and responsiveness to evolving needs is evident in SHM's efforts to develop a digital teaching resource called *Sveriges historia* (Sweden's history), in collaboration with 17 other museums around Sweden and the National Heritage Board's archives. With the goal of providing an immersive and more inclusive learning environment, the project illustrates how museums can acknowledge the position of underrepresented groups of users — in this case, children and students who need support with reading and understanding the historical information on the website. This new development reveals that staff are able to both align infrastructures with existing work practices as well as the potential to expand them to a nation-wide scale. As shared by a project leader at the SHM,

> "I believe that what we are best at is to be a reliable source, 'a friend to talk to'. We need to add on content, interesting content. So right now, we have a tight dialogue with schools. All lessons that are created around Sweden and different museums must be tested with teachers and students before it's published. We also test the entire web structure and the functions with schools. We will have 'ambassadors' who will be telling us what we miss and what we should develop, of course, but right now, we will not make it interactive for co-creation. Maybe that could be next step."

The discussion above also exemplifies that in order to design for digital access and reach out to communities, GLAM institutions need to be part of a cross-disciplinary and cross-institutional digital heritage network that shares a set of central activities and collective action. The OM, despite being fairly analogue prior to the pandemic, has always been "networked" [19]. They are integrated into several local communities in Glasgow and connected to a number of diverse partner organizations. As a result, this ecosystem of organizations and people has allowed the OM to collaborate and co-create projects that suit participants' interests and needs. This was also enacted in online spaces during Covid-19 which enabled staff to overcome some hesitancy in adopting digital tools that initially brought into question their outreach role and the value of museum objects.

Our cases also challenge the self-image of the museum profession primarily as traditional scholar-curators and outreach staff and emphasize their ability to catalyze new connectivities. Museums in some European countries, such as the Netherlands and the UK, have experienced new types of governance and staff structure in the face of increased technical work related to curatorial and collections management duties which impacts user accessibility [4]. In relation to the digital transformation within the two institutions, the SHM and OM show that to be present and relevant in the digital age means opening up oneself to the vulnerability of digital infrastructures and the risks of failure. In creating connectivities staff build on an existing base by centering user perspectives and leveraging existing networks for support which help legitimize and routinize new forms of user access to digitized collections.

7 Conclusion

Digital aspects of today's museum practices imply a digital poetics that not only foretells the changing paradigms of collecting, sharing and digitizing, but also indicates the challenges museum professionals must face. In this contribution, we call for a greater internal reflection on factors that shape how staff design and enable access to cultural heritage through digital means. Through case studies of two GLAM institutions—Glasgow's Open Museum in the United Kingdom and National History Museums in Sweden, we discuss staff's efforts to overcome organizational resistance towards change. Adopting an infrastructure studies perspective, we use the concept of "installed base" as an analytical lens for studying incremental innovation of infrastructures. Our analysis reveals how, in the two cases, the installed base shapes the practices of museum staff and gives rise to emergent effects at the junction of creating and designing for user access to digitized forms of cultural heritage.

Actively creating spaces for user engagement, staff in both cases are expanding the institutional boundaries of what user engagement could mean and expose hierarchies of value in relation to their professional role in the era of participation and openness. It is evident in the two cases that the prioritization of user's needs and changing behavior has directed the organization's efforts towards effective coordination across multiple actors within the large agencies (Glasgow Museums and Swedish National History Museums) and better integration with other segments of the cultural heritage sector. Without broad support from relevant actors and agreement concerning what should be offered to each group of stakeholders, the engineered activities might break down and cease to work.

Throughout this chapter, we have analyzed how attempting to expand access to digital cultural heritage becomes a continual form of museum craftwork. Indeed, the ongoing process of expansion requires negotiating a pre-existing set of expectations specific to institutional contexts and histories, including perceptions of staff's role and responsibilities, and what constitutes an authentic museums object which is valuable for engagement. While continuing with efforts of "opening up" themselves to the new connective potentials, different museum bodies within the SHM engage with the existing elements of their infrastructure in an informed and conscious manner. That approach allows them to enhance responsiveness to evolving user needs and ensure the institution's

compatibility with online engagement practices. At the OM, staff are beginning to recognize and embrace with a critical eye the use of social and digital media to widen user access and leverage their position as networked with local communities to incorporate their feedback and input on staff's digital practices. In expanding pre-conceptions of their professional roles and authentic museum objects, staff expose the importance of an institution's networks and centering user perspectives in order to not only craft new forms of access but also legitimize and routinize associated practices.

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