Universität Hamburg
DER FORSCHUNG | DER LEHRE | DER BILDUNG

Setting the Scene for Participation:

Socio-Technical Negotiations in Museum Work

Dissertation zur Erlangung

des Grades des Doktors der Philosophie

an der Fakultät für Geisteswissenschaften der Universität Hamburg

im Promotionsfach Volkskunde/Kulturanthropologie

vorgelegt von

Quoc-Tan Tran

Hamburg, 2022

Gutachter der Dissertation: Professor Dr. Gertraud Koch

Professor Dr. Isto Huvila

Datum der Disputation: 19.12.2022

ABSTRACT

Over the last two decades, cultural heritage institutions and museums have realigned their social role through emphasis of outreach to a broader audience, democratic dialogue with users, and engagement with previously marginalised groups. The purpose of this thesis is to investigate the conditions under which these goals can be met in a long-term and sustainable manner. Its objective is to identify infrastructural qualities of museum work that influence the potential of museum work for participation and social inclusion. This is accomplished by using an infrastructure studies approach for deconstructing the complexity and multiplicity of institutional memory-making practices, in order to show their reliance on socio-technical negotiations taking place in the background. The methodology for examining infrastructural museum practices combines multi-sited ethnography, semi-structured interviews, and grounded theory. Star's perspective of 'ethnography of infrastructure' is applied to examine circumstances of informal work arrangements, hidden layers of incompatibility that resulted in potential infrastructure failure, and structural issues in collections management activities in museum environments. The study reconsiders the role of everyday actors who perform documentation, support work, maintenance and repair, as well as their presence in the daily operations of an institution and the relational nature of their presence. The analyses of staff routines reveal that diverse distributive groups of marginalised actors collectively construct an idea of participation and inclusion within the complex back-stage settings of institutional memory work. The thesis demonstrates how an STS-oriented infrastructure studies approach can be useful for gaining a better understanding of the socio-technical underpinnings of action and implementation when diverse actors in the museum settings align the everyday work practices with their envisioned participatory prospect.

Keywords: Science and technology studies, infrastructure studies, digital heritage infrastructure, museum back-stage, background work, socio-technical negotiations

who will see the spaces in between?

– Susan Leigh Star

we can know more than we can tell

– Michael Polanyi

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS AND TABLES

Figures

Tables

ACKNOWLEDGMENTS

I would like to express my sincere appreciation to Prof Gertraud Koch and Prof Isto Huvila for their guidance throughout the research and writing process. As the manuscript developed, I was fortunate to have the intellectual comradeship of a group of PhD fellows in the POEM project to whom I owe intellectual debts that are now insurmountable. I wish to thank, in particular, Angeliki Tzouganatou, Elina Moraitopoulou, Jennifer Krueckeberg, and Susanne Boersma for their numerous rounds of comments and suggestions. Special thanks to Cassanrda Kist, whose participation in our collaborative ethnographic writing was extremely helpful during the planning and analysis stages of my research project.

This study was made possible through funding from the Horizon 2020 research and innovation program of the European Union under the Marie Skłodowska-Curie grant agreement No. 764859. Additionally, this study would not be possible without the participation of the individuals and institutions. I will be indebted to them for their generosity in sharing their thoughts and facilities with me. Throughout my field trips, I benefited from the logistical and scholarly support of the following academic institutions: Institute of Anthropological Studies in Culture and History, University of Hamburg; School of Humanities, Information Studies, University of Glasgow; and Department of ALM (Archival, Library and Information, and Museum and Cultural Heritage Studies), Uppsala University. Additionally, I benefited from being a researcher-in-residence at the Museum of European Cultures, a member of the Prussian Cultural Heritage Foundation; thanks to Prof Elisabeth Tietmeyer, the museum's director, for her warm welcome and support during my fieldwork in Berlin.

Throughout the three years, I have learned from workshops and seminars organised by doctoral research fellows at the Institute of Anthropological Studies in Culture and History, University of Hamburg. Prof Gertraud Koch brought together a remarkable group of colleagues for trimonthly colloquia. It has been a wonderful treat to talk with Anna Oechslen, Hannah Rotthaus, Lara Hansen, Roman Knipping-Sorokin, Samantha Lutz, and the others. I also thank audiences at the Department of ALM, Uppsala University, for occasions in the research seminars to discuss the arguments put forward in the research's methodology. I am especially grateful to Olle Sköld and Helena Wangefelt Ström for invaluable feedback. Thanks

also to Inge Zwart, Dydimus Zengenene, and Prof Isto Huvila for their insightful comments on my conceptual paper.

For fruitful discussions on critical approaches to knowledge classification and standardisation, and the development of my empirical chapters, I must thank Sara Perry, who provided me with immensely helpful feedback; Åsa Berggren, Nicolo Dell'Unto, James Taylor and coordinators of the Dialogues with the Past network (DIALPAST) – the Nordic Graduate School in Archaeology; fellows at the PhD course in Paris in December 2021; and Paulina Blaesild, who served as the opponent of my paper.

Finally, I would like to thank my family members for their enormous amount of support along the way. Special thanks to Dung for her continuous encouragement, and Mai-Dan 'Ginger' for brightening my days with necessary hugs, laughter, and love.

ABBREVIATIONS

API: Application programming interface

CC0: Creative Commons Zero

EAD: Encoded Archival Description

GD: Generaldirektion – the Directorate General at SMB

GLAM: Galleries, libraries, archives, and museums

MARC: MAchine-Readable Cataloging standards

METS: Metadata Encoding and Transmission Standard

MEK: Museum Europaischer Kulturen [Museum of European Cultures]

OAI-PMH: Open Archives Initiative Protocol for Metadata Harvesting

RAÄ: Riksantikvarieämbetet [Swedish National Heritage Board]

RDF: Resource Description Framework

SHM: Statens historiska museer [National Historical Museums (Sweden)]

SMB: Staatliche Museen zu Berlin [National Museums in Berlin]

SOCH: Swedish Open Cultural Heritage; K-samsök in Swedish

SPK: Stiftung Preußischer Kulturbesitz [Prussian Cultural Heritage Foundation]

STS: Science and technology studies

URI: Uniform Resource Identifier

CHAPTER 1. PARTICIPATORY POTENTIALS OF MUSEUM WORK

Museums have long been crucial institutional actors in shaping collective memory and structuring the relationship of individuals and groups to both the distant and immediate past. With the rise of digital media and technologies, a sizeable number of museums have been 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 (Benardou et al., 2018; F. R. Cameron & Kenderdine, 2007). While a substantial body of literature has emerged at the intersection of multiple disciplines – memory studies, museum studies, and critical heritage studies – devoted to the participatory and socially inclusive missions of contemporary GLAM (galleries, libraries, archives, and museums), little attention has been paid to the process in the background, unseen by museum visitors, by which institutions align their envisioned missions with the current degree of participation involved in their work practices. The purpose of this thesis is to provide deeper insights into the back-stage settings, negotiations, and local constraints that influence the potential of museum work to facilitate participation and social inclusion.

Following the tradition of STS-oriented infrastructure analysis (Bowker & Star, 1999; Star, 1999; Star & Ruhleder, 1996), the point of departure of this study was to determine which infrastructural qualities of institutional memory work influence the capacity and willingness of a museum to work toward participatory and socially inclusive missions. Institutional memory work, as suggested by this thesis, serves as a useful concept for theorising the practices of memory institutions, including libraries, archives, and museums, that seek to meet the need of the public to record, preserve and recreate artefacts. Unlike vernacular memory practices, such as popular photography, which tell the viewer a great deal about the self-reflexivity ingrained in personal memory-making (Keightley & Pickering, 2014), institutional memory work is inextricably linked to the complex history, bureaucratic and compartmentalised structure, and the authoritative intent and power of an institution. Memory institutions have used rules and constraints to replace the action of individual public members recalling something from their own past by shaping record-keeping tasks and regulating standards and processes (Bowker, 2005). Retaining something as a memory object in a museum is more than just a personal act of remembering; it requires the cooperation of various actors while adhering to pre-existing rules and constraints.

In the emerging landscape of participatory culture and openness, the role of institutional users in shaping the trajectories of participatory missions appears to have been undervalued. The procedures, rules and constraints, i.e., the infrastructural conditions that enable institutional users to incorporate the participation missions into diverse institutional memory-making activities have been insufficiently understood. Analysing the dynamics of multiple situated forms of knowledge that are played out when people embrace the new modes of openness and cultural heritage engagement, Stuedahl, Runardotter, and Mörtberg (2016) show that certain types of negotiations are imperceptible and unarticulated during the infrastructuring and design processes where the openness mindset is to be defined, and technologies developed to support it. They describe an example of an incomplete and continuing process of negotiation between local historians and the technical preferences of the wiki administrators that appears to 'end up with a question of priority of attachments and authority to find solution' (Stuedahl et al., 2016, 61). While the local historians strive to keep the wiki inclusive of diverse historical perspectives, the wiki administrators are concerned with the technical structure and functionality of the platform. The investigation of Stuedahl et al. underscores how situated sets of knowledge sometimes struggle to reconcile with radical principles of openness, resulting in the potential failure of innovative infrastructuring processes.

The tensions between diverse communities of practice and layers of incompatibility, sometimes hidden or barely noticeable, which may lead to the institution's resistance to change or take novel opportunities for information and resource sharing, have not been adequately reflected in the current body of knowledge on memory-making practices in museums. The literature on curatorial and conservation practices, which has recently concentrated on the challenges posed by digitalisation, is also sparse on how the institutions perceive the potential conflicts inherent in the transfer of knowledge between distributed agencies – both vertically along the organisational structure and horizontally within and beyond the institution's walls – and envision to resolve them. The negotiations between technical and social considerations taking place in how community engagement, participation, and social inclusion are conceptualised have received scant attention in critical heritage and museum studies. There is a relative lack of concern about actor-worlds of feelings, practices and knowledge that could have emerged from the entanglement of technical and social norms, the intersection of several lines of work performed, and the entanglement of professional goals, motives, and tacit

knowledge due to different trajectories of what participation and social inclusion could mean in the everyday practices at museums and which agents would contribute to enacting these values.

In dismantling the influence of active participation within frequently hierarchical, centralised models of organisation, such as those prevalent in museums, the Science and Technology Studies (STS) tradition has made a lot of progress in highlighting institutionalised neglect and the exclusion of specific uncomfortable types of knowledge, and addressing the material-discursive realignment of agency through the use of boundary work (Gieryn, 1999); invisible labour (Suchman, 1995), material multiplicity (Law & Mol, 1995), and infrastructure (P. N. Edwards, 2003; Star, 1999). Despite its value in identifying the fluid and unstable processes through which collisions and conflicts hidden in fixed or 'stabilised' knowledge emerge, STS-oriented research has received only a limited amount of attention in the museum studies literature. Some studies on museum participation (H. Graham, 2020a; Waterton & Dittmer, 2014), co-production (H. Graham, 2017, 2020b), and public engagement (Morris, 2003) are influenced by actor-network theory (ANT) and assemblage theory. They do highlight the potential of STS for identifying circumstances in which memory institutions understand what participation, social inclusion, and community engagement mean – critical concepts that can be incorporated into their modes of reasoning, and then into their judgments and actions. There is a noticeable lack of perspectives drawn from infrastructure studies, which, as I will demonstrate in this thesis, can shed light on how museum institutions reconcile their visions of participatory and socially inclusive futures with their current understanding of the degree of participation and social inclusion required in their work practices.

My initial interest in conducting this study is to provide deeper insights into the conditions and motivations that lead museum institutions, with their presumed authoritative intent and hierarchical structure, to adapt to contemporary demands for participation and social inclusion. It has been argued that to maintain their relevance in the contemporary age, museums must show concern for the communities in which they operate (Sandell, 2007) and for the diversity of their heritage and memory practices (Robinson, 2012), while simultaneously maintaining stewardship over cultural heritage objects (F. R. Cameron & Robinson, 2003; Clough, 2013). Certain changes and transformations are observable in the European context as memory institutions begin to take visible steps toward utilising

participatory forms of communication and engaging a broader audience in the process of knowledge production.[1]

What is less discussed in the literature is how museums can reconcile the socially inclusive futures that they envision with their current understanding of the degree of participation involved in their work practices. Institutional memory work has taken on various forms, including outreach to other communities and institutions to challenge entrenched prejudices and exclusions. The pertinent question is how the museum institutions evolve within this 'participatory condition' (Barney et al., 2016). To generate a comprehensive understanding of the institutional mechanisms that serve as sources and resources for how people participate, it is necessary to examine the growing reliance of memory institutions on digital infrastructures and their existing socio-technical components. The thesis is being conducted in tandem with twelve other investigations within the framework of the Horizon-2020 project and Innovative Training Network named POEM (Participatory Memory Practices).[2] The objective of Work Package 3, under which this study is situated, is to generate insights regarding the characteristics that enable participation, as perceived by institutions, individuals, and groups in their interaction with the present mediatised memory ecology. The specific angle of this study, within the Work Package, is to determine in which way the specific nature of digital infrastructures for collecting, archiving, displaying, and retrieving information encourages or hinders participation.

Given the background of research outlined above, this study is set out to investigate further the capacity and potential of an STS-oriented, infrastructure-based approach in diagnosing the shortcomings of current museum activity systems and the various black boxes contained within them. I wanted to explore in this study whether and how museum work possesses the infrastructural characteristics necessary to support the potential of participation and social inclusion as envisioned by the institution – a subject that has yet been appropriately addressed. In the following, I define my research problem and then explain how, through the STS-

[1] Over the last two decades in Europe, memory institutions have encouraged non-professionals to participate in the production of public memory. The European Parliament's decision to declare 2018 the European Year of Cultural Heritage has three long-term objectives: to promote people-centred, socially inclusive, cross-sectional approaches to cultural heritage; to increase access to cultural heritage; and to raise awareness of cultural heritage, particularly among underrepresented groups.

[2] See more at the project website, https://www.poem-horizon.eu

oriented lens of ethnography of infrastructure, the pursuit of museum work's infrastructure characteristics and socio-technical negotiations necessitates an examination into the back-stage of museum institutions.

1.1 RESEARCH PROBLEM AND RESEARCH QUESTION

There is vibrant literature devoted to often invisible components of institutional memory-making: everyday practices, staff routines, and support work. Museum studies and heritage scholars have applied ethnographic research to the study of heritage and its production and consumption. Macdonald (2002) delves into the mundane aspects of material culture associated with the collection and display of objects, demonstrating that curatorial and exhibition activities accomplish more than simply documenting what happens in such complex spaces as museums and art galleries. Macdonald (2002) and Witcomb (2003) look at how routine practices influence how knowledge is presented and how museums interact with their audiences. By examining assemblages of museum objects and humans, van Saaze, Wharton, and Reisman (2018) explore the unseen role of adaptive work in facilitating the infrastructural changes necessary to integrate digital art into the back-end systems, while keeping the daily practices of museum staff unaffected. Certain scholars have used assemblage theory to argue for particular critical readings of museums as an assemblage of people, things, and practices in 'a dynamic state of making' (Jones & Macleod, 2016); as open systems susceptible to new elements being introduced and existing ones being phased out (Waterton & Dittmer, 2014); or as organisations in which institutional settings, museum practices and techniques are intertwined (Morgan, 2018).

The literature on background activities and practices at museums shows that a 'refurbished museum' with its renewed social roles can be viewed as 'an emergent, uncertain, and ultimately incomplete endeavour', as Morgan (2018, p. 165) suggests. However, it has not been sufficiently explored what qualities of these minor or mundane activities contribute to the capacity and willingness of an institution to work toward its participatory missions. More importantly, under what infrastructural conditions can that process occur? There appears to be a lack of a coherent infrastructure-based understanding that addresses the marginalisation of background work in museums as an inevitable outcome of intersecting viewpoints in favour of dominant voices and situates background work within a politics of categories that embraces

an exploration of neglected entities in socio-technical networks. Given the intersecting trajectories of participatory perspectives in cultural heritage, where minor voices and narratives now have a chance to be heard and respected, there is a need for an STS-informed approach that fosters a close-in, long-term understanding of internal conflicts, ambiguities, and uncertainties in the background of museum work, gained through ethnography, which transcends traditional disciplinary and institutional boundaries and reflects the infrastructural nature and negotiated order of museum work.

This dissertation aims to shed light on the behind-the-scenes work of institutional memory production by examining the contexts and conditions under which memory institutions can work towards participatory practices despite their authoritative power and hierarchical knowledge structure. The research question is: What are socio-technical negotiations in the back-stage that influence the participatory potential of museum work? The study to address this question is done in two steps. The first step is to define and describe the scope of museum background work. As observed by Hanks, Hale, and Macleod (2012, xx), museum space and stages of its production have been 'traditionally compartmentalised'. On a normative and practical level, the daily operations of a museum institution can be loosely divided into two sides – front and back – according to departmental designations, job titles, and the official roles and responsibilities of staff. As I will demonstrate in my approach for data sampling (Ch. 3.2), this division strategy of the back-stage and front-stage is not always sensible, but it fulfilled the objective of provisional or 'open' theoretical sampling (A. Strauss & Corbin, 1990).

The second step is to reveal the intricate relationship between social and technical components of museum infrastructure. The analytical focus of this step is on determining the extent to which participation and social inclusion missions may influence that relationship. Beginning with the questions of what background work constitutes and the relationship between social and technical infrastructure components has led to the underlying task of this study: to conduct a back-stage examination of museum work. This task underpins three distinct yet directly tied facets of analysis:

(1) Infrastructural practices – processes and approaches, attributed with the characteristics of infrastructure, that constitute the back-stage of museum work

(2) Socio-technical negotiations – negotiations that take effect between the social and technical components of museum infrastructure

(3) Participatory and socially inclusive potentials – the capacity and inclination of museums to diversify voices, to include and be receptive to the perspectives of marginalised groups and actors

The role of digital media and technologies in today's institutional memory work complicates the relationship between the three facets of analysis. Digital media and technologies significantly impact how institutions present objects and how the public perceives their actions. As a result, the conditions under which socio-technical networks emerge are shaped by digital elements. The digital transformations currently being experienced by numerous GLAM (Galleries, Libraries, Archives, and Museums) institutions typically liberate institutional memory-making practices from regionally restricted and institutionalised value systems, administrative structures, and concurrent infrastructure regimes. Within these fluid, de-territorialised digital contexts, it becomes increasingly necessary to pay attention to previously overlooked materials and entities to comprehend the relationships of domination and the unequal power of contributing agencies in the contemporary memory-making landscape. The ontological difficulties posed by digital ecology are in estimating 'the range of phenomenal, embodied, affective, and lived experiences of our digital existence' (Lagerkvist, 2016, p. 190).

To address these ontological challenges, my conceptual framework in the following section draws from Star's perspective of ethnography of infrastructure (1999, 2002), which has been developed further by STS scholars. I use in this work an infrastructure studies approach to disentangle the complexity and multiplicity of institutional memory-making practices in the contemporary digital age. As infrastructures enable categorisations that, in turn, form the structure of a broader world, according to Bowker and Star (1999), socio-technical studies of infrastructure provide an analytical lens into the forces that underpin the prioritisation of some types of knowledge over others. Borrowing Bowker and Star's view, this study embraces both the examination into overlooked activities and the investigation of taken-for-granted entities and their connections with the world within the politics of categories.

The three facets of analysis (infrastructural practices, socio-technical negotiations, and participatory and socially inclusive potentials) were approached through exploratory inquiry, since infrastructure is a situational concept and becomes real when studied with organised practices (Star & Ruhleder, 1996). As Star (1999) notes, delving into the inner workings of built infrastructures and ecologically understanding the fabric of technical and information work necessitates an ethnographic sensibility in data collection and analysis. The following section will outline the conceptual apparatus I use to locate multiple components of analytic categories and facets that interact, inform, and influence one another. It serves as a strategy for establishing and maintaining alignment between the research objectives, expectations, and ideas regarding data collection and analysis, at the outset and throughout the process (Miles et al., 2020). The three working hypotheses serve as the basis to theorise about the infrastructural conditions of museum work in the back-stage and types of socio-technical negotiations, as well as for orienting and constricting this study to the observation of three facets of analysis mentioned above.

1.2 CONCEPTUAL FRAMEWORK

The conceptual framework depicted in Figure 1-1 served as the central framework for designing and engaging in the investigation of infrastructural practices that facilitate participation and social inclusion in museums. It was devised at the outset of the study to outline the primary constructs, as well as the relationships that exist between them (Miles et al., 2020). By establishing the operational foundations for this thesis, including concepts, assumptions, and working hypotheses, this framework highlights how the researcher situates this study within STS and within the areas of inquiry – infrastructure studies, institutional memory-making practices, and participatory approaches in museums.

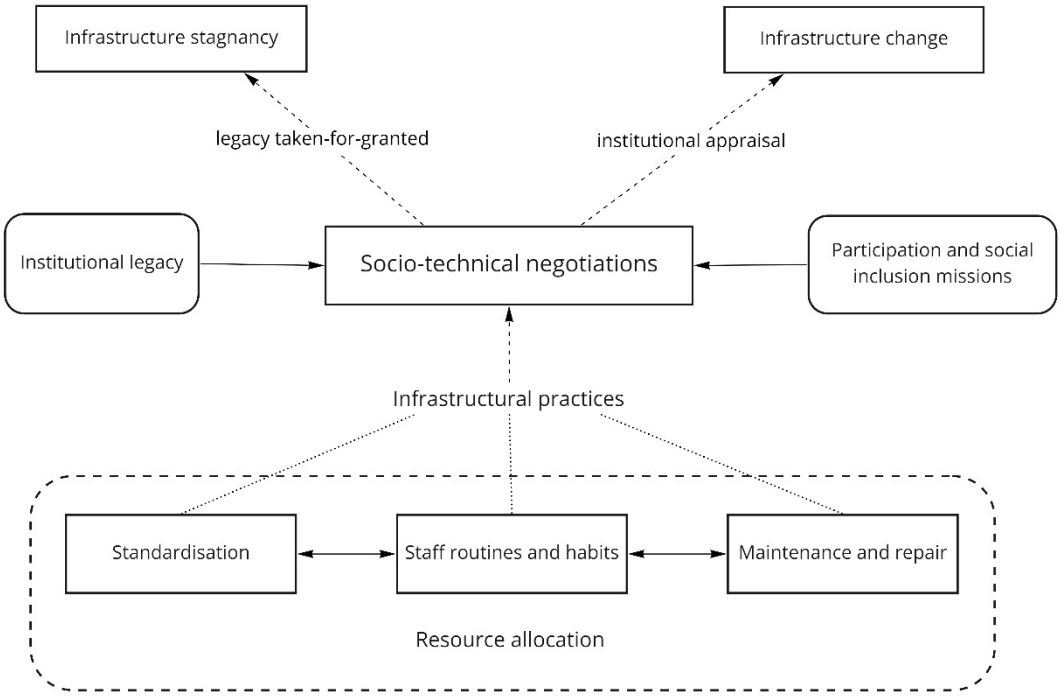


Figure 1-1 Conceptual framework of the dissertation

The conceptual framework is considered as a generative step in the research process because it helps bring the various study contexts and frames together 'in explicit and transparent ways that help tease out the interactions, tensions, and synergistic qualities of the parts and the whole' (Ravitch & Carl, 2015). It is worthwhile to identify the central working hypotheses underlying this conceptual framework:

1. The institutional legacy can function as a barrier against or an enabler of potential infrastructure changes.

2. A set of political and social forces emerges, as a result of the broader dynamics of social change, pressures institutions to adopt a participatory and socially inclusive mindset.

3. The socio-technical negotiations that occur within memory institutions are influenced not only by institutional legacy and broad social change dynamics, but also by infrastructural practices.

Two sets of forces, as I hypothesise, are constantly at work, shaping the socio-technical negotiations that take place in the background of memory-making practices in a museum. The first type of forces – organisational and technical – stem from the institutional legacies that have already existed and stay even when ordinary people are encouraged to participate in the production of public cultural memory. Given that the fundamental functions of each memory institution are to store, preserve, and disseminate the value of its collection, it is reasonable to assume that each memory institution has its own organisational structure, knowledge infrastructure (including classification and categorisation), and information architecture, all of which contribute to the tensions within the institutional infrastructure toward systematic change. In the opposite direction, another set of forces – political and social – emerges from the broad dynamics of social change. The digital transformation that is shaping the cultural heritage sector calls into question the institutional status quo, arguing for organisational changes compatible with both technological advancement and the emerging participatory-openness mindset that has gained more traction over the last two decades.

The notion of socio-technical negotiations is central to this conceptual framework. Rather than viewing technology as a tool used to complete a specific task, a socio-technical perspective sees technology as a component of a larger social system that is intertwined with social processes. In other words, the social and the technical are mutually constructed and shaped (Bijker, 1995; Bijker & Law, 1992; Srinivasan, 2017). Museum and Heritage studies scholars have discussed how memory institutions are constantly confronted with technological change, new user engagement paradigms, and emerging knowledge-infrastructural relations stemming from participatory culture and digital transformation (Black, 2021; Stuedahl et al., 2016). Research on information infrastructures shows that the evolution of infrastructures occurs gradually and requires constant negotiation (Simonsen et al., 2019). The compatibility of systems innovation and existing socio-technical arrangements, or the congeniality, is crucial to examine 'the merged parts' ability and willingness to mutually adjust and co-evolve' (Sanner et al., 2014, p. 235). Whereas the technical dimension involves technological artefacts, their material availability, productivity, and constraints, the social

dimension refers to non-technical infrastructure components, such as organisational rules, regulations, and beliefs and expectations of staff.

The relationship between infrastructural practices and socio-technical negotiations was presented in the bottom half of the diagram. Three major components to infrastructural practices – standardisation, staff routines and habits, and maintenance and repair – illustrates how I envisioned an investigation of infrastructure in the making must take into account the entanglement of technical and social norms, the intersection of several lines of work performed, and the entanglement of professional goals, motives, and tacit knowledge. The first component is about standardisation and conformity. Recent studies have demonstrated that standards, models, and protocols can perform differently in practice (Hanseth et al., 2006) and that standardised entities do not always behave as intended once implemented (J. E. Graham et al., 2021). Qualitative STS research on standardisation has revealed that standards and protocols play critical but frequently unanticipated roles in daily work practices (Bowker & Star, 1996; Star, 1991b). As such, rather than merely providing a clear direction for action, guidelines, protocols and standards can foster dialogue between various lines of work, in ways that may invite reflection or compel those involved to discuss the issue (Mesman, 2008, p. 193). Certain guidelines or protocols may be incompatible with one another, while others may be complementary. The boundaries of the rules can be defined more precisely through interaction with other rules and everyday practices. The second component of infrastructural practices is thus staff routines and habits. Since workers frequently interpret explicit rules ambiguously and occasionally violate explicit norms, having protocols and guidelines that allow for revision in response to actual practice becomes less critical.

This is where the third component, maintenance and repair, comes into play. When standards or standardised tools that convey a set of rules that employees use in their daily work become institutionalised, human actors' ability to act independently becomes increasingly remote. It is therefore difficult, when infrastructure comes to matter, for institutions to do the reverse of the conventional practices they have employed for decades. Becker (1982), probing into the cultural contexts in which artists produce their works, observes that communities of artistic practice emerged in complying with the conventions and constraints imposed by the socio-material artistic infrastructure. According to Becker (1982, p. 307), extending the duration of a concert beyond the conventional two hours would significantly alter the aligned logistical

arrangement within which the musical concert community operates: parking lots, ticketing systems, newspaper stories, among others. Similarly, suppose the size of a painting is significantly greater than its conventional size. In that case, the design of the museum entrance, the size of canvas rolls, and the set of training skills for framers must all be changed (Star & Bowker, 2006, p. 233). From that point of view, background infrastructure components such as the doorway, canvas rolls, and painting frames inform the design and planning of the product and operations that the infrastructure supports. Bowker (1994b) refers to this perspective as 'infrastructural inversion', arguing that by emphasising the relational nature of infrastructure, we can explain how many historical changes or improvements ascribed to some astounding product of a particular era were actually a feature of an infrastructure that enabled the development of that product.

The development of this conceptual framework was inspired by the notions of infrastructure characteristics (embodiment of standards, built on an installed base, becomes visible upon breakdown) as having been outlined through infrastructure studies scholarship and Star's work on the ethnography of infrastructure (Star, 1999; Star & Bowker, 2006; Star & Ruhleder, 1996). By the top half of the diagram, I sought to conceptualise the role of background negotiations and highlight the impacts they place on the capability of infrastructure to change and, as a consequence, the ability and willingness of an institution to adopt a participatory and socially inclusive mindset. By the bottom half of the diagram, I envisioned how I will examine infrastructure characteristics concealed within the day-to-day operations of institutional memory work. This framework is used as both a generative source of data collection planning, and reflection throughout the research process. By elucidating the presumptive relationships between key concepts, it also aids in the narrative format of the emergent research design, which will be discussed in detail in Chapter 3.

1.3 SCOPE AND LIMITS OF THE DISSERTATION

Given the cross-sectoral and cross-institutional nature of the research objective, the analytical focus of this study is placed on the continual alignment of everyday practices in museums with the participatory prospect that they envision, rather than on the types of participation with which institutions engage. The study looks more specifically at the extent to which background work performed in the museum settings – encompassing activities such as

documentation, IT support, maintenance and repair – has an impact on the daily operations at the museums. The reason for examining background work is to understand what memory institutions mean, in their daily operations, by accessibility, participation, and social inclusion – critical concepts that can be incorporated into their modes of reasoning, and then their judgments and actions. As infrastructure characteristics can be concealed within the day-to-day operations of institutional memory work, this examination of everyday functioning necessitates a close-in, ethnographically informed inspection of localised situations, and then how staff practices and associated knowledge – which are deeply embedded in local settings – are maintained during transitions from analogue to digital, back-stage to front-stage, and within versus outside the walls of museum institutions.

The goal of this study is not to provide a precise picture of museum infrastructure and everyday practices that constitute it. Instead, it aims to offer an interpretative portrayal of back-stage practices that possess infrastructural qualities and diverse types of negotiations occurring between social and technical components of museum infrastructure. Since infrastructure is a relational and situational concept that becomes tangible when we study it in relation to organised practices (Star & Ruhleder, 1996), the notion of 'infrastructural practices' was not defined at the start of this study. Infrastructure studies scholars have asserted that infrastructure tends to be more than just the material base or foundation upon which the collective action of a body operates; therefore, the metaphors for the substrate material are inaccurate for describing the multi-layered relationship between everyday work practices and everyday tools and technology (Harvey et al., 2017a; Knox, 2017; Star & Ruhleder, 1996). This study, therefore, was not aimed to define this field or to answer exclusively the question of what museum infrastructure is, or what types of participatory practices exist. Rather than that, the undertaking research is exploratory in nature, focusing on the incentives and conditions that encourage memory institutions, with their presumed authoritative intent and linear structure, to engage in non-hierarchical, collective, participatory memory practices. As shown in the conceptual framework, this dissertation looks specifically at the infrastructural conditions that cultivate or constrain a participatory mindset.

As a result, this study concentrates on the internal mechanisms of memory-making practices at the museums from an institutional perspective. It does not aim to address the political and cultural dimensions of the digital transformations that many GLAM organisations are

undertaking. It thus makes no reference to the entailed technology-user relationships or changing conceptions of participatory engagement in the public spaces of museums, nor does it examine the perspective of museum visitors and the public. Rather than that, it focuses on the core activities of museum institutions – the back-stage operations. Employing an STS-oriented infrastructure studies perspective, the study delves into critical aspects of socio-technical negotiations that affect the ability and willingness of museum institutions to adopt a participatory and socially inclusive mindset: standardisation, staff routines and habits, maintenance work, and mobilisation of material and conceptual resources. It questions actors who perform documentation and support work, maintenance and repair, as well as their presence in the daily operations of an institution. By doing all this, the thesis aims to foster new perspectives on institutional memory work in the European cultural heritage sector, emphasising the role of background negotiations in guiding the institutions toward infrastructural changes associated with their envisioned participatory missions.

CHAPTER 2. MUSEUM WORK AS NEGOTIATED ORDER

This chapter summarises scholarly work addressing the complex negotiated nature of museum work and infrastructure-based strategies for incorporating diverse museum assemblages into the institutions' envisioned potential for participation and social inclusion. It has a double aim: to identify the main area under-explored and show how this thesis can fill this gap using an STS-oriented infrastructure studies perspective. The chapter serves to outline the theoretical grounds for my task of conducting a back-stage examination of museum work, a task that underpins three distinct yet directly tied facets of analysis: infrastructural practices, socio-technical negotiations, and the participatory and socially inclusive potential.

The first section lays out recent scholarly efforts in assessing how the institutional power structures in museum settings can be reshaped. It does so by reviewing relevant literature in museum and heritage studies centred around the emerging potential of participatory practices and the hindering effect of institutional infrastructure on the prospective changes that these practices are expected to bring out. Museum studies scholars have long expressed concerns about how the normative ideals of participation and social inclusion could actually work out in the institutional environments, if museums were determined to maintain their rigid, hierarchical structure while asserting social control and authoritative power.

The second section discusses prior literature related to two topics relevant to the infrastructure-based approach: the infrastructural-ecological perspective and socio-technical negotiations. By reviewing relevant literature in infrastructure studies, the second section establishes a need for further research into museum infrastructure and back-stage practices as ongoing socio-technical configurations. While the infrastructural-ecological perspective draws attention to artefacts embedded in the context, as well as their hidden meaning and constructed features, an infrastructuring approach fosters close-in, long-term understanding of internal conflicts, ambiguities, and uncertainties in the background of museum work. The section then reviews how STS-informed infrastructure research can reveal the socio-technical entanglement within organisations.

The concluding section summarises the research gap and explains how this void is to be filled. Outlining the advantages of an infrastructure-based approach, I show how examining the

sociotechnical negotiations that enable museums to be participatory and socially inclusive requires an infrastructure-based investigation of the entangled settings, activity systems, and agents that shape institutional memory at work behind the scenes. The infrastructural-ecological is chosen as it is advantageous for investigating the multiplicity of activity systems in the museum settings while remaining receptive to institutional legacies and dynamics of social change.

2.1 HIERARCHICAL KNOWLEDGE STRUCTURES

Given the heterogeneous socio-technical realities of museum work, a large body of corpus has discussed how museums, as memory institutions, have struggled to adapt to their newly redefined social roles and responsibilities in the digital age. In the European context, memory institutions have been embroiled in the struggles of values, authority, and voices for decades (Crooke, 2021; Kattago, 2010; Macdonald, 2012). Museum scholars have repeatedly demonstrated how the hierarchical structure and authoritative power of museums can impede community engagement (Onciul, 2013), co-creation (Govier, 2009), creativity and innovation (Janes & Sandell, 2007), and museums research (Gray & McCall, 2018). These detrimental effects could be due to paternalistic and patronising assumptions (Onciul, 2015), prejudice and its legacies in museum practice (B. T. Lynch & Alberti, 2010), underestimation of public participation (B. Lynch, 2013; Perry, 2019) and audience collaboration (McSweeney & Kavanagh, 2016).

A drastic re-evaluation of the museums' social relevance has long taken place. As defined by Christina Kreps (1998), museums are institutions devoted to the collection, storage, preservation, research, and display of objects for public benefit. It is both a unique Western product and sites of public culture, where members of diverse communities can debate what culture is, how it can be portrayed, and who has the authority to do so (Kreps, 1998). Besides holding and preserving objects and texts, museums are designed to broaden the boundaries of public understanding associated with these artefacts and to open up opportunities for learning in everyday life contexts (D. Carr, 2003). A recurring theme in museum research is that the museum audiences are changing. The different attitudes and expectations of new generations and communities challenge the old ideas of what museums should be and do (Black, 2021). The acknowledgement of these changing expectations re-defines the purpose

and mission of a museum (Janes & Sandell, 2019; Sandell & Janes, 2007), and repeatedly raises debates on the degree of match between the organisational complexity of a museum – including its historical legacies – and multiple modes of expression (Brusius & Singh, 2018; Golding, 2009).

Reshaping institutional power structures

Much of the research on participatory and community-based paradigm shifts in the cultural heritage sector has emphasised institutional power structures as a significant impediment to socially inclusive futures (Cook, 2013; Holdgaard & Klastrup, 2014). Museum studies scholars, in particular, have identified several parameters through which institutional power structures and relations are defined: legacies of prejudice (B. T. Lynch & Alberti, 2010), capacity and tendency to erase (Sandell, 2007), or colonial situatedness (E. Edwards et al., 2006; E. Edwards, 2016) – all of which can be vital for the possible exclusions of minor voices and forms of practice. Hierarchical knowledge and expertise can impair museum professionals' ability to sustain reflection and dialogue in participatory processes and make necessary translations for exhibition design, especially on contested topics such as belonging and identity (Stuedahl et al., 2020). As Sandell (2007, x) notes, museum representational practices have frequently been characterised as 'excluding and oppressive' due to their capacity and proclivity for erasing, marginalising, or silencing minority groups and identities.

However, perspectives on the possibility of reorienting museums' roles toward a broad agenda of social inclusion diverge. On one side of the debate, the sceptics argue that it is questionable whether museums can act themselves as agents of empowering people and facilitating social change. This minority of theorists, Marstine (2006a) comments, holds a view that as long as little attention is being paid to understanding audiences, the act of display is 'always a political process that imposes a hierarchy', and thus rhetoric of change does not ultimately result in change (Marstine, 2006a, p. 27). On the other side, the optimists hold that museums can change, and that the decolonising processes have only begun (Hudson, 1998; O'Neill et al., 2021). Museums in different social and professional contexts might respond to the post-colonial condition in separate ways, but by responding, they acknowledge the importance of initiating and moving toward a more democratic dialogue with the users (Bernhardt, 2021),

giving opportunity for people to speak for themselves (Crooke, 2021), and by doing so reaching out to a wider audience (B. Lynch, 2020).

Recent scholarship on the social role of museums has contributed significantly to our understanding of modern museums' social responsibilities: post-museum (Hooper-Greenhill, 2000), museum as 'spaces of friction' (Karp et al., 2006), co-production of meaning (Sandell, 2007), and museum activism (Janes & Sandell, 2019). Marstine (2006b) proposes four major paradigms for museum pedagogy and the relationships of museums and galleries to their audiences in the twenty-first century, while analysing key strands in the discourse of museum theory and introducing a multi-dimensional, empowering vision of museums: museum as shrine, market-driven industry, colonising space, and post-museum. These viewpoints are not mutually exclusive – as one museum can represent more than one of the categories – and thus show how the notion of the museum could be much more complex and holds contradictory meanings.

The post-museum paradigm, proposed by Hooper-Greenhill (2000), challenges the traditional position that the ideal museum should be acting as a great collector – a guardian of established encyclopedic collections.[3] This view questions the legitimacy of the canonical works, advocates careful research on object provenance, and embraces the consideration of multiple viewpoints as well as the expansive definition of non-Western material culture. The institution has to transform itself from being a shrine influenced by elitist agenda and expressing dominant narratives to a site that promotes social understanding and 'from which redress social inequalities' (Marstine, 2006a, p. 19). In analysing two paradigmatic pedagogic formations – modernist museum and post-museum – Hooper-Greenhill (2000) questions the roles played by museums in the construction of cultures and histories. The author suggests looking at the major shifts in the public dimension of museums via the potential of communication: communication no longer as transmission but as an integral part of the museum culture. Under this view, visitors are no longer regarded as a deficient, 'undifferentiated mass', or 'the general public' but active individual agents in the meaning-

[3] This traditional view of 'encyclopaedic' or 'universal' museums is constructed based on the ideal of Enlightenment institutions, or museums of humanity which offer a unique opportunity for visitors to gaze into other cultures, not just into their own.

making processes, and communicators acting as enablers and facilitators (Hooper-Greenhill, 2000, pp. 2–5).

Addressing the difficulty of the museum sector in overcoming hierarchies of value and knowledge, Mark O'Neill (2006) outlines two conflicting philosophical bases with which museums express their visions: the essentialist or internalist who encourages museums to hold to the values of 'internal' functions such as conservation, preservation and research; and the adaptive or externalist who insists that museums are a great force for social good, and that they are for people who are 'external' to the institution. The distinction of these two views sheds light on the grounds and extent to which museums should intervene in the user experience of objects and shape the needs of potential visitors, especially amongst non-attending groups. While the essentialist model aims at providing the same object experiences to everyone in all dimensions (aesthetic, cognitive, emotional), the adaptive view holds a more realistic position that museums need to consider not only individual and communal differences of their visitors but also physical/cultural/psychological barriers to visiting in order to create meaningful object experiences (O'Neill, 2006, p. 111).

The effects of bureaucratic and hierarchical features such as power centralisation, rigid functional specialisation, and hierarchical knowledge and expertise vary across models of engagement in the front-stage. Scholarly studies of museum outreach and public engagement services have shown that initiating dialogue and co-production is not always a positive experience and may have the opposite effect on institutions that are already struggling to garner public support. For some communities, the process remains akin to being a participant in the agenda of someone else (B. Lynch, 2020). Inaccurate assumptions regarding the institution's awareness of community partners' needs and interests, particularly those most marginalised, continue to be made on behalf of the public, according to Lynch (2017). In participatory encounters, these assumptions determine which side will take which role: active and passive, carer and beneficiary (B. Lynch, 2017, p. 25). Cameron (2006) contends that to stop controlling the dialogue, museums must abandon the pedagogical model in favour of viewing 'the public sphere as diverse and non-unifiable' and putting audiences at the centre of debates.

Museum professionals have struggled to examine their personal and institutional values, and rely largely on assumptions about the value of the work they do on behalf of others to make decisions (B. Lynch, 2017). The work of Lynch (2014, 2017) on collaborative projects at UK museums uncovers a predicament in which the museum is committed to social change but struggles to transform as an institution. Regardless of how progressive and well-intentioned museum practices may be, Lynch remarks, the museum frequently maintains a position of 'chairperson', displaying a relationship of 'teacher and pupil', or 'carer and cared-for' (B. Lynch, 2017, p. 23). The discourse of museum service, according to Lynch, continues to situate the public as 'supplicant', 'beneficiary' or 'learner', and the museum and its staff as 'teacher/carer'. This ingrained division explains why museum professionals have been grappling with the issue of examining their own personal values and those of their organisations.

Morse's study (2018) demonstrates that museum professionals' structuring of their perception towards community engagement work is predicated on four types of accountability: local/public, managerial, professional, and personal. Four dimensions that reflect the institutional functions of museums – civic, social, cultural, and economic – embody the 'museum frictions' described by Kratz and Karp (2006), as they represent the multiple mandates, diverse sets of forces, and conflicting aims that characterise museums (Morse, 2018, p. 175). However, as Morse notes, bureaucratic features such as 'organisational silos' and 'hierarchical authority' can get in the way of community engagement work; some community engagement activities 'do not bring about the effects that they name' (Morse, 2020, p. 84). Since this misalignment often takes place outside the museum, simple organisational lines of organising and coordinating staff and personnel can be disrupted, resulting in conflicts about professional autonomy at both the team and individual levels. Conflicts that occur outside the line of vision of upper management are an indication that staff felt a lack of trust and that their work was not understood at an upper management level (Morse, 2020, p. 89). The line of research about the politics of practice in community engagement (Morse, 2020; Morse & Munro, 2018; Munro, 2013) addresses the dimension of care in museums' daily work practices, which are largely unspoken and non-transactional but involve 'negotiating institutional arrangements and organisational structures' in order to transform the museum (Morse, 2020, p. 185).

As evidenced by previous literature, museum scholars and practitioners have expressed concern about institutions' lack of a concrete perspective on the emergence of participatory culture and how they would mobilise museum resources toward socially inclusive actions. While professional insights into contemporary approaches to participation and inclusiveness are critical for museums engaged in societal transformation processes, what matters most is how museums translate these insights into practices. Recent initiatives focused on participative activities and productive engagements have challenged established professional identities (Black, 2021). When developing creativity practices, for example, museums must balance claims of economic value with claims of public value (Drotner, 2021). Suppose museum professionals are not completely clear about their aims; in that case, the exercise of navigating between the two sorts of claims may result in less transparency for those who participate, according to Drotner (2021, p. 207). The shifting landscape of museum engagements raises questions about how staff can incorporate the participatory mindset into their interactions with community members and collaborate in novel ways within and across disciplines and institutions.

Hierarchical knowledge in the back-stage

As a type of memory institution, museums are sites for the continuous production and circulation of knowledge. Some mechanical components within the back-stage that support curatorial activities reflect the inner logic of the museums as both an institutional structure and a cultural mindset (Macchia et al., 2014). For example, their presentation of objects is derived historically from anthropological modes of classification, but also practically and empirically from the fundamental functioning of the institution, regarding how artefacts and specimens have been and should be collected, classified and stored in order (Förster, 2014). The study of Collet (2014) shows how the museum environment affects the representation of distant cultures. Collet acknowledges that part of the reason is the resilience of museum environments, as the primary mission of museums as memory institutions is to preserve, not to create knowledge.

As for preserving knowledge, museum collections have been and continue to be used in exhibits to transmit research discoveries to a wider public and thereby popularise scientific knowledge. However, presenting museum artefacts is not the only way information is

processed, and knowledge is stored and transformed. Bethany Rex demonstrates how an emphasis on exhibition-making and collection-related documents crowds out other documentary forms that circulate 'in and around museums' (Rex, 2018). Additionally, museum scholars have suggested that, while front-stage refers to the polished appearance, i.e., the public spaces (Morse, Rex, & Richardson, 2018) of a museum, the back-stage relates to the more mundane spaces and practices, which provide insight into the inner workings of an institution (Macdonald, 2002). This back-of-house, mundane, routinised and organisational forms of the museum can be viewed as 'morphomes' that create, reinforce, and transmit knowledge representations, as well as reconfigure systems of knowledge (Förster et al., 2018).

Earlier literature on GLAM practices in the back-stage pays particular attention to the convergence of IT systems, norms, and standards that reflect the diverging practices, professions, and conceptions of qualities in collecting and preserving (Marty, 2014), cataloguing (Stuedahl, 2007), producing narratives (Robinson, 2012), and establishing accessibility to cultural heritage material (Usherwood et al., 2005). The confluence of technologies such as databases and archives provides a foundation for the claim of 'seamlessness' and 'public access' of digital cultural heritage (Stuedahl, 2007). The digital convergence in knowledge management (Kirchhoff et al., 2008), knowledge sharing (Bak & Armstrong, 2008), and memory institutions' use of IT systems and standards, fostered by information in the electronic format being widely and publicly available, has created the network synergies within the broad cultural heritage sector.

Different types of memory institutions are nevertheless characterised by distinct processes of arrangement and sense-making that define how they communicate ideas to the audience through objects and collections (Kalfatovic et al., 2008; Robinson, 2012). According to Robinson (2012), museums are distinguished by their capacity to contextualise collection objects within wider thematic and narrative groupings, allowing visitors to interact with more complicated concepts about history and memory. The majority of in-person visitors interact with museum collections through this curatorial interface; thus, the challenge for museums with digital collection access is to maintain the 'interpretive scaffolding' that provides meaning to basic collection records (Robinson, 2012, p. 422). A collection is more than the sum of its parts, as museums recontextualise objects by removing them from their original contexts and placing them in the new context of a collection (Macdonald, 2006, p. 82). Museum studies

and heritage scholars have examined how collections evolve over time, revealing complex histories of acquisition (Pearce, 1995), documentation (Turner, 2020), classification and ordering (Oswald, 2020), and valuation processes in the past. Buchczyk (2022, p. 13) calls into question collection legacies and institutional habits, arguing that collection development can be reframed as an act of future-oriented, productive engagement rather than as a form of 'preventative or anticipatory action'.

In terms of the paradigm shift toward participatory practices in the museum sector (Simon, 2010), the current debate over museum participation appears to be overly focused on museums' ability to adapt and respond to the dynamics of social change. The institutional infrastructure that may hinder or foster the new modes of knowledge production, and thus critical to the long-term viability of museums, has not been fully understood. Fouseki and Vacharopoulou (2013) observe how the fluid, collaborative form of knowledge produced and consumed by non-expert Wikipedians appears to contradict the form of knowledge produced and portrayed in a museum institution, which is 'often didactic and top-down', even when engaging through a variety of educational activities (2013, p. 3).

The ambiguities of museum connectedness, and the participatory potential of information production, control, and dissemination in working towards a participatory and socially inclusive perspective, are still being explored. The uses of social media in museums can be ambiguous, causing friction between emerging social practices and established technological and institutional infrastructures. Investigating a Facebook campaign aimed to engage people in co-production around death, identity, citizenship and the public/private divide in social media, Holdgaard and Klastrup (2014) find that the campaign failed to reach out to marginalised groups of users; its content suited limited, 'elitist interest networks'. One reason could be that, according to the authors, the public image and brand of a museum may be harmed if it engages in 'frivolous, annoying, or transgressive' activities (Holdgaard & Klastrup, 2014, p. 199). While allowing for creative engagement beyond traditional institutional interactions is becoming increasingly necessary, it is not the current practice of all cultural institutions (van Passel & Rigole, 2014). The distinction between access and reuse is not just about licences but also about pursuing active engagement strategies (2014, p. 209). Van Passel and Rigole observe that the frictions associated with the growing expectation of openness and

digital engagement may result from these risk-averse attitudes in traditional institutional contexts.

Overall, the ongoing discussion about participatory approaches in museum settings has been mainly focusing on the participatory processes and agents in the front, and how the front-stage performance enables museums to fulfil their broader social mission by giving collections and users a voice, reflecting diverse experiences, and transforming users into active creators (Holdgaard & Klastrup, 2014). Prior research shows that the understanding of institutional infrastructure is critical for identifying the intellectual and political underpinnings of the institutions' participatory processes and thus revealing the cultural legacies of institutional infrastructure, which frequently impede the ability and willingness of GLAM institutions to adapt themselves to the emerging participatory culture. There is a general absence of research that looks at the institutional, organisational, and infrastructural barriers that frequently obstruct background work from actively and constructively contributing to front-stage performance and therefore keep the institution aligned in its commitment to a participatory mindset. Certain lines of research on museum work tend to converge on the point that the fundamental premise for museum participation remains that a museum has a predefined set of offerings, to which making changes needs to deal with the reshaping of the hierarchical knowledge structures.

2.2 INFRASTRUCTURE PERSPECTIVES TO MUSEUM PARTICIPATION

As the preceding section demonstrates, while participatory methodologies compel memory institutions to innovate in their approaches to caring for and working with cultural heritage, there is a general lack of concern in museum and heritage studies about the entanglement of professional roles, motives, and knowledge as a result of divergent interpretations of what participation and social inclusion mean in the daily practices at museums. There is a general lack of discussion about the role of back-stage agents and the impeding effect of institutional infrastructure on the successful enactment of normative ideals of participation and social inclusion in the front-stage. This section reviews the literature on STS-oriented infrastructure studies and shows how this scholarship on infrastructures and agency in socio-technical systems can be used systemically to both examine the participatory potential of museum work

and to assess the effects of institutional infrastructure. The section highlights strands of scholarship pertinent to the purpose of this thesis: the infrastructural-ecological perspectives, and socio-technical negotiations.

Infrastructural-ecological perspective

The use of an infrastructure lens in examining the institutional ecology of a museum can be traced back to the seminar article of Star and Griesemer (1989). They propose an ecological thinking regarding cooperation and translations among the intersecting social worlds. Through the case study of the Museum of Vertebrate Zoology (MVZ)[4] in Berkeley, Star and Griesemer demonstrate that heterogeneity and cooperation can coexist in a museum setting. In their case, the different actors – such as collectors, cooperating scientists and administrators – can coordinate their activities in ways that could accommodate the differences in their purpose, roles, and responsibility. That mutual mode of operating, or cooperation across divergent social worlds provides 'a useful "lingua franca" between amateurs and professionals' (Star & Griesemer, 1989, p. 407).

To describe how scientists at MVZ have engaged in 'standardising the interfaces between different worlds' (1989, p. 413), Star and Griesemer use the concept of boundary objects, referring to those that are flexible enough to adapt to local needs and workable in local environments, but also abstract and vigorous enough to nurture a common identity across communities. The authors mention the state of California and take it as an example of 'terrains with coincident boundaries'. While the maps of California being used by experts and amateur collectors obviously share the same geo-political boundaries, these same maps indicate different shaded areas representing 'life zones', which are more helpful to more professional users. Boundary objects as such can operate along the multiplicity of tasks, motives, and perspectives both within and across activity systems. With the assistance of boundary objects, information can be transmitted smoothly across time and space, and coherence of meaning is maintained. Their role is to manage the tension among conflicting interpretations.

[4] Founded in 1908, the MVZ houses an extensive vertebrate collection (amphibians, reptiles, birds and mammals) with a focus on North America.

Star and Griesemer's (1989) study also demonstrates how certain museum objects may exist concurrently in different views held by collectors, trappers, administrators, and others, while maintaining some semblance of continuity of identity. Their project is predicated on the idea of collaboration through heterogeneity, i.e., to bring heterogeneous entities together in performances of development. It is in this vein that Engeström et al. (1995), examining collaborative problem solving and learning in cross-disciplinary team environments, find out that 'polycontextuality' in a horizontal dimension is highly relevant for the understanding and acquisition of expertise. Addressing the pervasive issue of compartmentalisation in the judgements of experts, Engeström et al. acknowledge that the formulation of boundary-crossing capability by Star (1999) is beneficial to identify 'mediating artifacts that may help overcome "groupthink" and fragmentation' (Engeström et al., 1995, p. 322). They advocate the use of such 'mediating artifacts' in cross-departmental interactions: meetings and casual talks, discussion of the problems without interference from project management, pointing, bodily movement, and physical artifacts such as work-material.

Multiple contexts can refer to different realities, or different communities of practice, and infrastructures are regarded as 'frozen discourses that form avenues between social worlds and into arenas and larger structures' (A. Clarke & Star, 2008, p. 115). The infrastructural-ecological perspective by Star and Griesemer provides an appropriate epistemological framework for ecological thinking that incorporates neglected entities. Carr et al. (2012) took this concept to explore how the young children developed boundary-crossing competence and meaning-making practices through an exhibition visit, and the teachers played the role of boundary brokers. Drawing on Star and Griesemer's formulation of translation between different communities, Varutti (2014) examined how museum practices are characterised by 'unequal power relations' between museum curators (the translator) and source communities (the subjects of translation). Varutti also observes that museums provide unique viewpoints on these processes because they are places where 'notions of national identity and "otherness" are subtly shaped, validated, and disseminated' (2014, p. 103) among the community members.

There have been scattered and incoherent clusters of works in museum studies and museum anthropology that have drawn on the notions of infrastructure and boundary crossing. However, their limited extent of application is for illuminating the multiple motives and

perspectives that exist both within and across activity systems of a museum. The goal of assessing the multiplicity of museum activity systems has nonetheless been explored comprehensively and consistently in light of actor-network theory (H. Graham, 2017; Patrick, 2017; Rex, 2018) and assemblage theory-based (Bennett, 2007, 2013; Macdonald & Morgan, 2019) museum research. By and large, the museum literature has glossed over the infrastructure-ecological lens by Star and Griesemer and its value in resolving tensions between conflicting viewpoints of various participatory agents while allowing their social worlds to coexist in an institutional-ecological setting. The following section will discuss another application of infrastructure analysis: infrastructuring. The section will discuss the advantages of an infrastructuring perspective for examining the participatory potential of institutional memory work, including addressing long-term and large-scale technological and social heterogeneity in the entanglement of people and practices, as well as the possibility of infrastructural change.

Star and Ruhleder (1996) define infrastructure as a socio-technical construct; for them, designed systems should be viewed as ongoing infrastructures with emerging socio-technical processes at the local level. STS scholars have developed this perspective further, and used the notion of infrastructuring to draw attention to the way in which a designed artefact or system is not the end of the development process (Ludwig et al., 2018). Concerning the question of how to make one's own work better, Pipek and Wulf (2009) see infrastructuring as a natural part of every user activities; the authors define infrastructuring as the practice of 're-conceptualising one's own work in the context of existing, potential, or envisioned IT tools' (2009, p. 469). This viewpoint is consistent with Star and Bowker's (2006) assertion that we must look at the activities that result in infrastructure improvements to develop possible methodological and tool support for them.

Karasti and colleagues (Karasti et al., 2010; Karasti, 2014; Karasti & Baker, 2004) delve deeper into infrastructuring processes; by infrastructuring, they refer specifically to efforts of re-examining the relational nature of information infrastructure and bring its processual aspect to the forefront. The infrastructuring concept proposed by Karasti et al. (2010) seeks to understand how infrastructures evolve over time and expand beyond initial design constructs while remaining well-organised. An investigation into the processual and open-ended problem solving linked to 'shared experience gained in and through working collaboratively' (Karasti

et al., 2010, p. 399) helps to unveil the emerging interconnectedness of people, things, and activities as a result of co-creation processes. For example, Karasti and Syrjänen (2004) examine the case of participatory design (PD) communities that have incorporated technology and participatory design into their collaborative activities. The authors emphasise that these communities employ decentralised, grass-roots procedures. Their approach involves a blurring of the lines between use and design, as well as a gradual development of technology that is inextricably linked to their primary activities (Karasti & Syrjänen, 2004).

Aiming to examine the ongoing and continual processes of creating and enacting infrastructures (Karasti & Blomberg, 2018), the infrastructuring approach puts a premium on continuing design in which new technologies are embedded into practice and existing socio-technical arrangements (Karasti et al., 2010, p. 408). By continuing design, Karasti and colleagues refer to the ongoing work of 'simultaneously building and using, maintaining and redesigning the infrastructure' (2010, p. 404). This infrastructuring strategy has aided participatory design scholars in defining what entangles and intertwines activities at project time, with everyday professional activities at use time, and with further design in use (Bjögvinsson et al., 2012). Some co-design researchers have incorporated the continuing design layer of infrastructuring into discussions about strategies for probing the installed base that previous infrastructures provide in order to identify the 'gateways'[5] or shared mechanisms that enable the occurrence of continuous alignment processes (Botero et al., 2019; Marttila & Botero, 2017). In considering gateways as people, Botero et al. (2019) demonstrate how gateways frequently are overlooked in the analyses of infrastructure arrangements. That is, even as we construct these technology infrastructures, we cannot escape humans and gateways entirely. This dilemma pertains to the political issues of how to increase participation (Botero et al., 2019, p. 25). For Botero et al. (2019), gateways as people are not only a missing component; they are blind spots.

Placing infrastructuring associated with people and practices in the centre of productive reflection on the meaning of participation and social inclusion has long been the efforts of co-design researchers and open knowledge and culture activists. Björgvinsson, Ehn and Hillgren (2012) call for engagement as infrastructuring. According to the authors, establishing

[5] Jackson et al. (2007) state that gateways may take the form of technologies, institutions, or individual actors which are capable of bridging divergent systems, practices, and professional or personal worlds.

a network of actors engaged in grassroots activities that serve as a cultural and geographical link between disparate parts of the city can give a voice to those who feel marginalised and lack the opportunity to express themselves in the public sphere (Björgvinsson et al., 2012, p. 132). Marttila and Botero (2017, 2021) have employed infrastructuring as a conceptual and practical device for analysing how design can help bridge divides and develop shared digital cultural resources. By examining the relational processes of engagement, negotiation, and articulation of digital heritage knowledge production, Marttila and Botero (2021) emphasise the importance of assisting various actors in developing more shared arrangements for the maintenance, enrichment, and care of digital cultural heritage knowledge production.

Nevertheless, the degree to which infrastructuring approaches and strategies can be translated into specific institutional contexts of the museums has not been sufficiently addressed or yet brought into focus using empirical assessment. Several modest attempts thus far have emphasised the importance of sustainable infrastructuring as being based on the transparency and visibility of infrastructures. For example, Macchia and D'Andrea (2014) employ infrastructuring as the process of disentangling the interactions of various agents acting in a technologically enhanced museum environment. Macchia, Poderi, and D'Andrea (2015) explain the position of museums as cultural infrastructure as an embedded and active outcome of the activities that emerge from the curator-visitor relationship. This thread of research emphasises the capability to reproduce and reconfigure the infrastructure and action environment using standard resources (Macchia et al., 2014, p. 389). Nevertheless, the frictions between social practices of participatory agents and established technological and institutional infrastructures have not been sufficiently explored from the infrastructure point of view.

Socio-technical negotiations

The previous section has shown that infrastructures are not inert; they can be expanded, shifted, and changed according to the process of infrastructuring (Karasti & Blomberg, 2018; Simonsen et al., 2019) – a collaborative mode of infrastructural development focused on how to integrate innovative technologies into practice and existing socio-technical arrangements. Since infrastructures are constantly changing and evolving, it is critical – and possible – to trace the relationships formed between people, materials, and structures at all levels, both

backwards and forwards (Bowker, 2018; Bowker & Star, 1999). The relationships between people and things, as well as between infrastructure components and socially organised practices, are the focus of the third orientation of STS-related infrastructure research, which this section attempts to outline: the negotiations between the social and the technical components of infrastructure.

Jackson et al. (2007), addressing the infrastructural development processes in responding to policy around cyberinfrastructure, find out a critical characteristic of infrastructure: the boundaries between social and technological domains are fluid and frequently shift in either direction. Viewing cyberinfrastructure as an emergent phenomenon, Jackson et al. (2007) call for an infrastructural imagination, which they define as a way of envisioning the fulfilment of functions through the linking of 'heterogeneous systems, including human actors, institutions, and procedures, moving between the technical and the social' as necessary to achieve the goal – which is, in the case of cyberinfrastructure, to resolve problems of metadata and reuse. The authors place emphasis on the cumulative aspect of infrastructural development, as well as the breadth and depth of its connections to the technical and social worlds. They point out that the growth of infrastructure is therefore a potentially transformative process. This process is redistributive in nature; it may 'advantag[e] the work or life worlds of some', or may 'alter, threaten, or degrade those of others'(Jackson et al., 2007).

The ability of infrastructure to reach beyond one-site practice relies heavily on the backbone construction or an existing 'installed base' (Aanestad et al., 2017b; Andersen & Jansen, 2012). Not only are artefacts included in an installed base, but also human habits, norms, and roles, which may prove to be 'its most intractable elements' (P. N. Edwards et al., 2009, p. 366). Edwards (2003, 2019) described infrastructures as both robust networks and complex socio-technical adaptive systems composed of numerous interacting individuals and components. While some of these components are technological, including physical structures, equipment, software, the others are social, such as organisations, standards, budgets, rules, and policies. In addition, there are human actors who contribute to the construction and maintenance of the infrastructure or use it simply in their everyday life (P. N. Edwards, 2019, p. 356). Socio-technical configurations refer to the constant processes of forming and informing the 'life-worlds' we inhabit, while making infrastructures work smoothly (Bowker & Star, 1999; P. N.

Edwards et al., 2007). The initiation of change or embedding innovative technologies can thus create tensions with the existing installed base.

Research on information infrastructures has pointed out that infrastructure evolves gradually. This evolution requires a dynamic negotiation process among multiple information systems, diverse work practices, and routines (Ciborra & Hanseth, 1998; Cordella, 2010; Simonsen et al., 2019). The compatibility of system innovation with existing socio-technical arrangements, or congeniality, is relevant for assessing 'the merged parts' ability and willingness to mutually adjust and co-evolve' (Sanner et al., 2014, p. 235). Aanestad et al. (2017c), in their analysis of patient-centred eHealth platforms, identify four areas that institutions must address in order to achieve what they refer to as an 'installed base-friendly' approach: coordination across multiple actors, addressing heterogeneity, responsiveness to evolving needs, and transformation strategies. This 'installed base-friendly' approach implies that infrastructure development should be compatible with current work practices and require minimal changes to the technological base.

The two-axis model of infrastructural negotiation, suggested by Edwards, Jackson et al. (Figure 2-1), can be useful in distinguishing between technical and social tensions in the museum environment. As defined by this model, the socio-technical nature of infrastructures can be viewed as an axis with two poles: one pole is about the technical standards that have been incorporated, and another is concerned with social practices and conventions. The operation of infrastructure requires the new members to be familiar with and adhere to its technical standards. Technical tensions can arise if the users of infrastructure lack the prerequisite knowledge of working with existing protocols and standards. On the other side, the non-technical aspects such as rules, regulations, norms, and conventions are referred to as the social dimension. Work conventions and the organisational hierarchy as part of the broader disciplinary, sectoral, and cross-sectoral structures can influence socially and locally organised practices within each memory institution. Meanwhile, various social conventions being developed around the use of infrastructure can shape the feeling, intention, and expectations of museum staff.

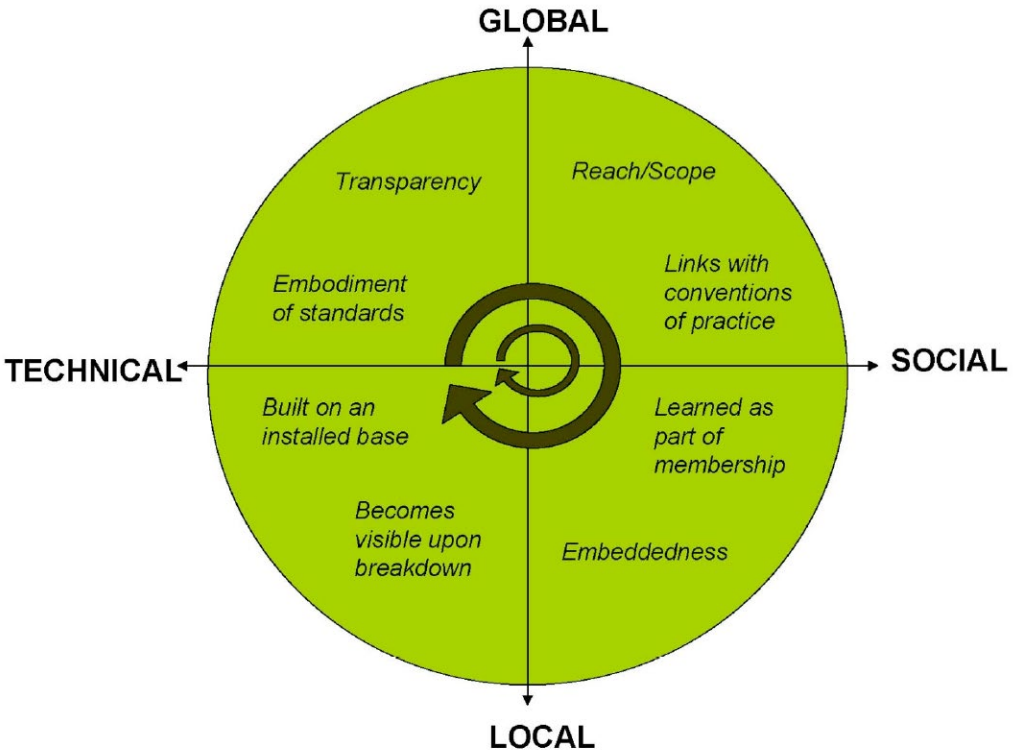


Figure 2-1 Two axes of infrastructural negotiations, from Edwards, Jackson et al. (2007)

The way human actors interact with both technological and social components of infrastructure in forms of actions, norms, routines, and habits can strengthen the mechanics of invisibility: infrastructure becomes invisible as users deliberately hide it (P. N. Edwards, 2019, pp. 358–361). Non-human components, sometimes playing the crucial role of 'steering', guiding', 'forcing', tend to be taken for granted that their involvement is almost unnoticed (Pinch, 2010, p. 85).

Even though technical protocols and standards may be hidden away in everyday practices and interactions among staff, museum infrastructure could fail to function if new components incorporated onto the installed base do not adhere to existing protocols and standards. The way museums approach emerging forms of contemporary art vividly illustrates the socio-technical negotiations taking place to incorporate new components. Scholars have shown that the proliferation of new forms of art over the last three decades has rendered many components of technical infrastructure and skills of the staff obsolete (Engel & Wharton, 2014, 2015; Rinehart & Ippolito, 2014). As new art forms have gradually become part of the

mainstream in contemporary artistic practice, many museums find difficulties acquiring, displaying, and preserving works such as technology-based and time-based installation art. Engel and Wharton (2017) explain how complex contemporary artworks complicate the documentation process by frequently defying traditional schemes of classification of arts, such as classifications of medium and style. That is why emerging uses for museum objects can upend established classification schemes for collections management.

Van Saaze's (2013) in-depth examination of the treatment of installation artworks demonstrates that new forms of artwork have prompted conservators to consider whether conventional conservation ethics, which dictate that authentic materials and techniques should not be altered or replaced, can be applied to these relatively new art forms, or whether they require a different approach (2013, p. 15). Because museum working practices and related organisational structures shape how artwork is installed in gallery spaces and appears to the viewer, van Saaze's (2013) case study shows, technical and social tensions are inextricably linked. The lines between the front-stage, where presentation and display take place, and back-stage, where conservation and administration take place, are becoming increasingly blurred. With the emergence of diverse technology-based art forms, van Saaze (2013) observes, it can be challenging to draw precise distinctions between artworks and museum collecting and conservation activities, as they co-shape and co-constitute one another.

Scholars in museum anthropology have addressed these tensions between contemporary social practices and the traditional institutional infrastructure, as part of the historical underpinnings of museum knowledge work (Krmpotich & Somerville, 2016; Macdonald & Morgan, 2019; Oswald & Tinius, 2020). Merriman (2008) considers museums as 'historically contingent assemblages' that reflect the tastes and interests of both the times and the people who created them. Turner (2017) examines the legacy of earlier cataloguing systems and organisational models and evaluates the socio-technical aspects of a long history of working with knowledge organisation systems in museums (Turner, 2017). In Turner's accounts at the National Museum of Natural History, the markings on the catalogue cards are traces of decision making affected by strict bureaucratic procedures, and these bureaucratic practices, in turn, were a key part of the institutional functioning (Turner, 2020). Being influenced by Bowker and Star's work on classificatory principles in the late nineteenth century as both a political force and 'an organizing rubrics for complex bureaucracies' (Bowker & Star, 1999,

p. 3), Turner emphasises how categorisation may be used to discriminate and demonstrates how the notions of evidence are historically situated.

From an infrastructure perspective, as staff who work with knowledge infrastructure in their everyday routine cannot avoid 'the inescapable inertia of terms or categories already in use' (Bowker & Star, 1999, p. 117), the information attributed to any new objects would be 'read backwards' into existing technical systems – such as index cards, ledger books, and databases – and entities unknown at the time of data collection would be marginalised or simply removed out of the data. The continuing design aspect of infrastructuring, highlighted by STS and PD scholars outlined in the previous section, has also brought to light hidden layers of knowledge while being 'read backwards' (ibid. p. 117).

Thus far, the infrastructure analysis perspective has demonstrated its advantage in the capacity to trace back and forth the relationships between people, things, and structures at various stages and levels of the infrastructural development process (Star & Ruhleder, 1996), thereby revealing the infrastructural dynamics and tensions (Jackson et al., 2007). However, there has been a general lack of attempts to integrate and align heterogeneous social and technical elements within the specificity of the museum settings, as well as to focus analytical attention on the incremental, continuous, and frequently dyssynchronous nature of infrastructural change. The following section will identify the research gap that this study seeks to address through the lens of STS-oriented infrastructure studies.

2.3 SUMMARY OR RESEARCH GAP

The outline of relevant infrastructure studies literature in the preceding sections shows how an infrastructure studies perspective can aid in disentangling the materiality, organised practices, and social implications inherent in envisioning the museums as sites and sources of participation and social inclusion. Given the advantage of infrastructuring strategies in revealing shared mechanisms that enable the occurrence of continuous alignment processes between different communities of practice and between ways of doing things (Björgvinsson et al., 2012; Marttila & Botero, 2017), there is a general lack of attention in museum studies paid to the extent to which institutions can align their envisioned futures with present understanding of what participation and inclusion could be involved in their work practice. I

will demonstrate how an STS-oriented infrastructure perspective can be used to examine the museums' entangled settings and local constraints that shape museum work's potential to facilitate participation and social inclusion.

First, the infrastructure-based approach can situate the investigation of neglected entities of socio-technical networks and their relationships to the world within a politics of categories that embraces an exploration into the less visible, back staged part of museum work, as a contrast to the public space of the museums. As Star (1999) points out, organisations are underpinned by unstudied infrastructure that encompasses all their operations and carries along with it the effects of values and ethical principles. Given the diversity of socio-technical arrangements that underpin institutional memory work, particularly under the influence of hierarchical knowledge structures in museums (Ch. 2.1), the prior literature indicates that the dynamic interaction between visible and invisible, formal and informal work in museum settings has not been adequately addressed from an infrastructure point of view. The actors who actively engage in memory-making activities tend to have a strong voice, and to contribute discursively to the social world they work in or inhabit. The focus of museum and heritage studies on visitor participation and public engagement associated with memory-making obscures other participatory forms and participatory agents. The roles of workers involved in less visible activities of museum work, such as documentation, IT support, maintenance and repair, have been examined from various museum research perspectives[6] but not directly from the infrastructure point of view.

Second, the infrastructuring strategies developed by STS scholars (Karasti et al., 2010; Karasti & Blomberg, 2018; Marttila & Botero, 2017) provide a long-term perspective on the process of infrastructural development and change. Certain applications of the STS-oriented infrastructure perspective have demonstrated – though to a limited extent – the lens's advantage in revealing the ongoing, hybrid, and complex nature of museum activities. However, the sustainable infrastructuring perspective has not been applied to examining the potential for participation and social inclusion of museum work. Within the scope of the current thesis, this line of thought provides a practical framework for inspecting the major forms of alignment between the participatory futures envisioned by museums and their

[6] For example, museum information Bearman (2008), knowledge representation Canning (2019), museum information work Huvila (2013).

operational realities. These alignments are constantly influenced by the entangled institutional settings and local constraints that shape institutional memory work in the background. While alignment and continuous match-making processes have been extensively discussed in participatory design, they are rarely addressed in research related to museum participation.

Thirdly, in probing into this continuous alignment of participatory memory work in museums, this thesis attempts to reveal what forms of commitment the museums have for participation and social inclusion, and to what extent these local trajectories of this commitment will bring about infrastructural change. STS scholars have shown that one of the most significant obstacles in infrastructure development is the installed base and its inertia. Neumann and Star (1996) indicate how infrastructure building differs from the construction of self-contained systems in that it entails connecting a vast number of communities, all of which are already established in their own installed bases, into a broader network. Neumann and Star suggest examining commitment, as well as the paradoxes, uncertainties, and ambiguities at the local level via 'shared imaginaries':

> To design something *is* to use it; there is no global testability. For these reasons, understanding commitment, object worlds and their paradoxes, and the myriad of trajectories involved is crucial. Linking them through shared imaginaries is one way in which infrastructure projects become successful. (Neumann & Star, 1996, p. 239, emphasis in the original)

My thesis will examine how particular institutional contexts affect how museums reconcile their participatory visions with their current understanding of what level of participation entails in their work practices. The infrastructure studies approach enables a close-in, ethnographically informed examination into socio-technical components of infrastructure, as well as new-coming components and how they affect the existing installed base of memory institutions. An assessment of the installed base's capability to expand and be hospitable to new socio-technical components requires an infrastructure-based approach to investigate the day-to-day, continuous operations of the museums, the interaction between the actors who carry them out, and the conflicts and ambiguities inherent in the intersection of multiple lines of work – with shared imaginaries of the museums as sites and sources of participation and social inclusion.

Based on what has been outlined about the potentials of an infrastructure studies perspective, I assert that assessing the socio-technical negotiations that support participatory and socially inclusive museum work requires an infrastructure-based probe into the entangled settings, activity systems, and participatory agents that shape institutional memory work. This thesis will examine how 'shared imaginaries' of participation and social inclusion can link institutional commitment, museum actor-worlds, and their paradoxes. The current body of museum participation literature is preoccupied with the participatory potential of museum work without considering the actor-worlds of feelings, practices, and knowledge that might emerge from the entanglement of technical and social norms. I have argued in this section that an STS-oriented infrastructure perspective on museum work and activity systems is capable of adequately addressing the following: the marginalised participatory agents, the socio-technical heterogeneity of museum activity systems, and the ongoing alignment toward a participatory mindset.

Conclusion

The vast body of research in museum and heritage studies has shown how institutional memory work in museums is influenced by the hierarchical knowledge and organisational structures, as well as the authoritative intent and power of the institutions. However, no sustained effort has been made to elicit the infrastructural characteristics of memory-making practices at the museums and assess the capability of museum work to exert normative values of participation and social inclusion. While a small amount of museum research that engages with STS-oriented infrastructure perspectives does not directly address museum participation, tranches of museum studies literature dealing with museum participation do not account for the social and technological heterogeneity generated by specific institutional legacies and infrastructure of the museums. This chapter details the adaptability and flexibility with which STS-oriented scholarship on infrastructures can assist museum research in conceptualising the inherent negotiations in museum work and the resulting perplexities, ambiguities, and conflicts. It summarises prior scholarly work on two orientations of STS infrastructure-based approaches that are capable of adequately addressing the participatory and socially inclusive potential of museum work: the infrastructural-ecological perspective and attention to socio-technical negotiations. In doing so, the chapter identifies the gap in the literature that this thesis aims to fill: the socio-technical negotiations that take place behind the scenes of

museum work and their impact on infrastructural changes in response to emerging modes of knowledge production.

CHAPTER 3. GOING BACK-STAGE

The preceding chapter discussed the adaptability and flexibility with which STS-oriented infrastructure studies can be used to support museum research focusing on backstage activities and practices. While the current body of knowledge about museum work places a high emphasis on activities and actions in the public spaces of the museums, there has been a scarcity of research on the back-stage setting and working conditions. As previously stated, institutional memory work in museums, at any stage of production or in any department, is inextricably linked to institutional legacies and established knowledge structures. These socio-historical legacies, as well as a historically hierarchical organisational structure, influence how information and knowledge systems are designed and intended to support the work of museum staff – whether they are curators, conservators, or educators. The role of museum workers engaged in less visible duties such as documentation, information technology support, maintenance, and repair has been addressed from a variety of museum research viewpoints but not directly from infrastructure and infrastructuring standpoints.

By examining the infrastructural conditions of museum institutions, this study aims to elicit the infrastructural characteristics of institutional memory-making practices and consider the socio-technical potentials of back-stage work to exert normalised values of participation and social inclusion. This chapter will discuss why a combined framework of multi-sited ethnography and grounded theory was chosen for data collection and analysis. Additionally, it will detail the data collection and sampling strategy, divided into three phases of fieldwork.

3.1 RESEARCH METHODOLOGY

This thesis calls into question the ability of infrastructure to facilitate participatory memory work and increase the degree of social inclusion by looking at how assemblages of organisational discourses, values, and practices are established around institutional memory-making in the context of European museum institutions. Rather than broadening the scope of my investigation to include both the institution and the user or public, I focus on the institutional perspective. Data collection and analysis are qualitative because the empirical focus of this thesis is the extent to which background negotiations influence the participatory and socially inclusive potentials of museum work. The study requires a methodology that

integrates ethnographic inquiry and builds on qualitative data from multi-site fieldwork, given the heterogeneity of the museum sector and the variety of participatory approaches. This study focused on qualitative work at the ground level, on museum staff members' practices and interactions.

The empirical focus of this thesis is established building on the perspective of 'ethnography of infrastructure' (Star, 1999). As a result of this approach's capacity to unravel the diverse network of actors involved in infrastructure's socio-technical relationships, I felt compelled to gain insight into the intricate relationship between social and technical components of museum infrastructure. According to Star (1999), a field worker may need to dismantle the monotonous, back-stage components of infrastructure in order to grasp the fabric of technical and informational work. One may disentangle the narratives contained therein and the decisions made behind the scenes and investigate the potential 'collective multiplicity' (Star, 1991b, p. 50). Thus, ethnography is appropriate for my examination because it enables the construction of observed phenomena grounded in specific cultural and historical contexts. The purpose of using ethnography in this dissertation was to examine the formal organisational structures, back-stage systems, and the daily work and thoughts of staff within a potential 'collective multiplicity', rather than to observe the conditions of common experience observed as everyday life. As a result, multi-sited ethnography was chosen as a creative and critical method of investigating distributed knowledge systems (Marcus, 2012) within a broader digital heritage infrastructure. Furthermore, grounded theory techniques were selected to hone the analytic edge and theoretical sophistication of ethnographic study (Charmaz & Mitchell, 2001). Grounded theory appears to be a natural fit because it advocates a mixed-methods approach to data collection, which aids in elucidating the phenomenon of socio-technical negotiations in museum back-stages.

Multi-sited ethnography

The primary research question of the thesis concerns the background socio-technical factors that influence the participatory potential of institutional memory work. I considered using ethnography to compile a wide inventory of conceivable situations and possible outcomes involving negotiating the social and technical components of infrastructure. Each potentiality attends to new scenarios and thus contributes to the expansion of 'the spectrum of skills,

arrangements, and forms of action' (Baszanger & Dodier, 2004, p. 25). Throughout this dissertation, I use an expanded definition of ethnography and ethnographic fieldwork that is more concerned with establishing relationships 'between forms of heterogeneous action' (Baszanger & Dodier, 2004, p. 9), than with adhering to a strict Malinowskian tradition that takes subjects as they are found in natural units of difference such as cultures and communities. Ethnography in this study is not restricted to observing and identifying the 'ethno', i.e., culture or race, in the traditional norms of ethnographic fieldwork. While ethnographies are founded on observational work in specific social settings (Gobo & Marciniak, 2016), I was aware of the potential limitations of geographically bounded observation inherent in the traditional anthropological tenet that an intensive period of observation, i.e., focused and sustained life in distinctively different communities, was required to fully understand any population. That convention is pivotal to long-term single-sited fieldwork, which aims to develop an unusually close relationship with individuals through intensive observation and participation in their social lives.

The notion of place has always been central to ethnography in all its manifestations. I adopted a perspective of multi-locale or multi-sited ethnography (Marcus & Fischer, 1986/1999) in order to pose a reflexive question that has influenced the construction of my field sites: what is one place in a global world? That is, the 'place' in which disparate structural and systemic interests can be brought together. A goal of classical anthropological studies has been to examine how individuals organise their daily lives in manageable ways and create genuine encounter places. The tradition of intensive fieldwork – with long-term residence in 'the field' – has defined '*anthropological* research styles' (Clifford, 1997, p. 191, emphasis in the original), which are critical for disciplinary recognition. Gupta and Ferguson have nonetheless advocated for anthropology that focuses on 'shifting locations' (1997, p. 38) rather than tightly territorialised, spatially bounded fields. While rejecting the spatially limited research tradition, the ethnographer retains critical elements of the fieldwork: long-term immersion within a community (Clifford, 1997), taken-for-granted social routines and embodied practices (Gupta & Ferguson, 1997), and an attempt to be an attentive listener while acknowledging the situatedness of one's intellectual work (Haraway, 1991). Clifford (1997) argues that attention on shifting locations and tactical affiliations also helps reveal political dimensions of ethnography that can be overshadowed by presumptions of scientific neutrality and human rapport. Due to the complexity and heterogeneity of museum work in the contemporary

GLAM sector, my approach to the field began with the task of navigating a spatially and functionally ambiguous terrain: the field site will be constructed, not discovered. By adopting a multi-sited ethnographic approach, I sought to examine the local (back-stage museum work) as embedded in the global (contemporary museum world), guided by the presumption that the field site does not have to be static and bounded.

What we are witnessing now in the GLAM sector are complex social and economic processes in a globalised and interconnected world. Cultural heritage organisations operate today in a platform society in which digital technology and social worlds are co-produced (van Dijck et al., 2018). That results from, and is continually amplified, by the 'new media infrastructure' (Lievrouw & Livingstone, 2006), which has increased the pervasiveness and accessibility of digital technologies. The 'place' – central within the context of ethnographic work – is thus neither static nor homogeneous but constructed, negotiated, and contested through encounters (Appadurai, 2000). Collier and Ong (2005) have proposed the 'global assemblages' metaphor to elevate the dilemma of concrete locales and viewpoints in the tension between local and global to an explorable level. The authors suggest that as global forms are articulated or territorialised in assemblages, they define novel material, social, and discursive linkages. These assemblages are areas in which the forms and values of human and social existence are contested or undermined, in the respect that they are 'subject to technological, political, and ethical reflection and intervention' (Collier & Ong, 2005, p. 4). Under this lens, many areas of the world that previously seemed structurally insignificant can be brought into focus. In capable of adapting to new surroundings, global forms can codify varied situations and objects in controllable and productive terms. To comprehend 'global' phenomena that are constrained or defined by particular technical infrastructures, administrative apparatuses, or value systems, not by the whims of a cultural or social field (Collier & Ong, 2005, p. 11), researchers must transcend the anthropological tradition's view of cultural or social phenomena as only understandable in connection to a shared set of meanings, understandings, or societal structures.

As a result, I approached the field by viewing the contemporary museum worlds as global assemblages rather than isolated fields of development. Confronted with the heterogeneity and multiplicity of museum worlds, I wanted to connect the 'global assemblages' metaphor to the idea of multi-sited ethnography, in which, as George Marcus suggests, researchers must

be equipped with a multi-local and multi-perspective research idea and imagination in order to deal with global interdependencies:

> Multi-sited research is designed around chains, paths, threads, conjunctions, or juxtapositions of locations in which the ethnographer establishes some form of literal, physical presence, with an explicit, posited logic of association or connection among sites that in fact defines the argument of the ethnography (Marcus, 1995, 105).

Marcus proposes extending and expanding field research and participatory observation to a variety of locations in order to capture delimited localities in their complex and multi-layered relationship to the outside world. His multi-sited strategies cast doubt on the nature of relationships between activity sites and social locations, insisting that they are disjunctive in space and time, and likely also in terms of social category (Marcus, 1999, p. 7). The exploration of modern world systems is no longer an exercise of centre-periphery formulation (Marcus, 1986); rather than that, phenomena in our increasingly globalised world are entangled in spatio-temporal relationships that must be captured in an extended network model. As a result, I chose to distance myself from traditional forms of conducting fieldwork, refusing to see museum work-worlds as an integrated field with a central point from which I could reconstruct a collective whole. Instead, I chose to move between multiple sites, 'follow the people' – to be in museum workers' footsteps – and 'follow the thing' (Marcus, 1986) – to trace the shifting condition of infrastructural practices in the museum back-stage across multiple contexts.

As ethnographers were perceived to be perpetually navigating a field of varying connections, tensions, and identifications, their moral positions became increasingly difficult to maintain with certainty. To begin with, what constitutes infrastructural practices in museum back-stages, was not pre-defined. It is partly due to the complexity of the sector, which encompasses diverse types of institutional legacies and country-specific characteristics. Influenced by the technical turn and studies of materials, the infrastructure branch of STS acknowledges that the ethnographic eye is needed to bring neglected entities to the fore. Bowker and Star (1999) situate their investigation of taken-for-granted entities and their relationships to the world within a politics of categories that embraces an exploration into invisible work and neglected entities of socio-technical networks (Star, 1991b). As an embodiment of the 'middle range', multi-sited ethnographers craft field site with an aim to produce appropriate accounts for a

diverse range of audiences (Hine, 2007, p. 657). As the purpose of this dissertation is to make visible the entangled settings, local constraints, and staff practices in museum back-stages, it focuses on producing appropriate accounts for a diverse range of audiences, including practitioners and professionals, policymakers and funders, museum directors and research contacts. Thus, my approach to the ethnography of museum infrastructure is consistent with Marcus's multi-sited research imaginary, which establishes the space of possibility and discovery in ethnography and maintains this space contextually open for intensive fieldwork conducted within its constructed framing (Marcus, 1998, p. 17). In this way, the ethnographer shifts roles and relationships with subjects across sites and seeks out resonances, attempting to sustain a sense of meaning in the project through a diversity of responses and accountabilities.

The ethnographic method fits the epistemological stance of this thesis that studying infrastructural practices always entails a degree of relationality. Influenced by the social-worlds/arenas theory (A. E. Clarke, 1991; Star & Strauss, 1999; A. Strauss, 1978), Star's pragmatist-ecological framework was directed to the analysis of messy things in multiple socio-historical situations. The process of assembling observations in ethnography, correspondingly, forces the ethnographers to constantly reflect on their position. While deliberating over collective multiplicity and the everyday insider-outsider dynamic, Star (1991a, 1991b) took on her personal experience as a non-onion eater, and observed that she needed either to wait an extra-long time at a fast-food restaurant to get her meal without onion, or take an extra knife from the counter and scape off the onions herself. The reason is that the fast-food restaurants 'simply can't deal with anything out of the ordinary' and, in Star's case, there is no recognisable 'consumer demand' for people allergic to onions, unlike cases of coronary patients or vegetarians with recognisable dietary patterns (Star, 1991a, p. 85). This perspective is useful for identifying marginalised entities or individuals – those who belong and do not belong simultaneously (Star, 1991b, p. 50) and thus exist in multiple, intersecting social worlds. This perspective shaped my ethnographic procedures, which were formative and action-oriented, but also designed to be relevant in contemporary inter-professional settings. A requirement of the reflexive practice that accompanies the data collection and analysis phases was strengthened by using grounded theory discussed in the following.

Grounded theory

The fieldwork and analysis were guided by grounded theory procedures (Glaser & Strauss, 1967) based on a constructivist viewpoint (Charmaz, 2014). Grounded theory was chosen as the most appropriate approach for data collection and analysis, for the following reasons. First of all, as this research methodology is well-suited for illuminating little-known fields of study (Glaser & Strauss, 1967), its methodological strategy is ideal for my investigation into digital infrastructure of the museums. While discussions of the effect of 'the technological unconscious' brought about by software, algorithms, and other invisible infrastructural aspects of its operation have been influential to media and digital memory studies (Beer, 2009; Hoskins, 2018, p. 20), there is a dearth of interest in institutional memory practices and, more specifically, how digital infrastructure facilitates institutional memory work. Second, grounded theory is used to generate emergent theories or categories from data, rather than to validate pre-existing theories (Charmaz, 2008). The digital heritage infrastructure that shapes contemporary GLAM work practices is an almost undefined field undergoing vibrant construction.

For this reason, the goal of this study is not to provide a precise picture of museum infrastructure and everyday practices that constitute it. Instead, it aims to offer an interpretative portrayal (Charmaz, 2014) of back-stage practices that possess infrastructural qualities and diverse types of negotiations occurring between social and technical components of museum infrastructure. Therefore, a grounded-theory based methodological strategy was embedded into ethnographic fieldwork and data analysis of this study: seek data, describe observed events, answer fundamental questions about what was happening, then develop theoretical categories to understand the phenomenon (Charmaz, 2006, p. 25).

As the definitions of museum infrastructure, its back-stage, and the infrastructural characteristics of memory work remain undefined in the prior literature, this study views infrastructural practices in museums as emergent products of particular times, social settings, and interactional situations. The research design of this thesis is thus based on a constructivist position of grounded theory. Charmaz describes constructivists as those who investigate '*how* – and sometimes *why* – participants construct meanings and actions in specific situations […]

we do so from as close to the inside of the experience as we can' (Charmaz, 2006, p. 130, emphasis in the original).

My choice of this position was primarily motivated by two concerns. The first concern is about data credibility. Early advocates of grounded theory placed a greater emphasis on data analysis than on data collection techniques. The constructivist approach prioritises data collection and views both data and data collection as temporal, spatial, social, and situational in nature (Charmaz & Bryant, 2011, p. 298). This viewpoint fits my chosen 'ethnography of infrastructure' theoretical perspective and my planned ethnographic investigation into museum infrastructure and back-stage practices. As infrastructure experts have remarked that infrastructures frequently act as 'invisible backdrops to social action' (Harvey et al., 2017b, p. 3), the definition of infrastructural practices is thus fluid and not pre-defined. I was compelled to treat data collected on both infrastructural components and practices as located in situational conditions. I remain alert to how the shared roof of the 'museum sector' could become operationally and pragmatically problematic. I am constantly aware that work practices and information technology systems are highly institution-specific and vary significantly between institutions. For instance, the holdings of an ethnographic museum may be dissimilar to those of an art museum or gallery. Different segments within the collections of an encyclopaedic museum can be distinguished according to their object types, collecting apparatus, and provenance. Given the size of the robust cultural heritage sector, any attempt to use data collection to shed light on the sector's collective culture risks undermining the research's credibility.

The second point of contention is how grounded theory fits into the pragmatist-ecological tradition that STS-oriented infrastructure studies are a part of. As previously discussed (Ch 2.2), Star's pragmatist-ecological perspective acknowledges intersecting social worlds as inevitable, whereas the infrastructure perspective advocates for the investigation of neglected entities and multiple modes of working around them – such as maintenance, repair, improvisation, and translation. While the objectivist branch of grounded theory views data as indicating theoretical categories, or abstract variables unrelated to time, place, or people (Glaser, 2001), constructivists view data as nuanced and complex (Charmaz & Belgrave, 2019). The constructivist way of dealing with data is attentive to both the researcher's and participants' starting points and standpoints, and cognisant of how and when these

perspectives may shift throughout the study (Charmaz & Bryant, 2011, p. 298). Charmaz argues that a grounded theory study differs from other types of ethnographies in its format, as grounded theory ethnography 'gives priority to the studied *phenomenon* or *process* – rather than to a description of a setting' (Charmaz, 2006, p. 22, emphasis in the original).

Constructing the field about back-stage negotiations by means of 'infrastructuring' (Karasti & Blomberg, 2018) seeks a nuanced approach to examining information infrastructures, their socio-technical components, and how actors are conceptualised in relation to them. The fieldworkers must both (1) be aware of taken-for-granted notions of infrastructures and the partiality of the studied phenomenon, and (2) engage with situations and re-define the field reflexively and continually (Karasti & Blomberg, 2018). This, the constructivist approach of dealing with data, i.e., 'turning away from acontextual description' (Charmaz, 2006, p. 271), is compatible with my use of infrastructure perspectives in museum work.

Data analysis was also subjected to grounded theory procedures, which included the following:

- Coding: creating qualitative codes and categories grounded in data
- Constant comparison: comparing data with data, data with codes, codes with codes
- Memo writing: noting relationships between codes and other theoretical concepts that occurred to the researcher's mind during the coding process
- Memo sorting: comparing and sorting memos

The entwined data collection, coding, and analysis processes were guided by Giampietro Gobo's three-stage model of ethnography in conjunction with grounded theory procedures (Gobo, 2008, p. 227, 2018, p. 76). Data collection (fieldnotes and interviews) occurs during all three of these phases but serves a different purpose in each. As Gobo explains (2008, p. 227), deconstruction is the process by which the ethnographer seeks to uncover the conventions underpinning the observed interactions; construction is the process by which he constructs a narrative (or theory) about the observed phenomenon; and confirmation is the process by which the information gathered is used to precisely and systematically document the hypotheses contained in the narrative. Table 3-1 goes over the specifics of the research

timelines, the three phases, as well as how the data collection and analysis methods were used appropriately.

	Objectives	2018	2019				2020				2021			
A	**Research phases**	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct
1	**Phase I: Deconstruction**													
1.1	Research problem and research design													
1.2	Pilot interview and interview guide testing													
1.3	Interviews, open sampling and open coding													
2	**Phase II: Construction**													
2.1	Initial coding and creating preliminary results													
2.2	Axial coding													
2.3	More interviews if needed													
3	**Phase III: Confirmation**													
3.1	Constructing the story line													
3.2	Fine-tuning results and write-up													
B	**Fieldwork**													
	Research sites for an ethnography of infrastructure													
1	Glasgow Museums, Hunterian (Scotland)													
2	Alvin Collaboration (Sweden)													
3	Museum of European Cultures, Berlin													

Table 3-1 Research timeline[7]

[7] The grey shaded area spanning from November 2020 to April 2021 designates the six-month period of parental leave.

The course of my research project based on ethnography and grounded theory is sketched as follows:

Phase I (deconstruction) consists of defining the research problem, research topic, and developing an interview guide. To define the topic, I relied on the earlier literature to build the argument. In doing background research, I also observed abnormality in terms of organisational structure, and the institution's history. This observation would affect my choice of institutions to conduct fieldwork. I completed the first pilot interview and started collecting data based on background research and themes that drew my attention in the pilot interview.

Phase II (construction) entails developing an interview guide, conducting interviews, analysing the initial data, and producing preliminary findings. During this phase, I did coding based on grounded theory principles. The objective of this phase is to categorise the data regarding their properties and characteristics. Reflective memos (Mills et al., 2006) were generated throughout the research to incorporate reflexivity into the study.

Phase III (confirmation): I planned additional data collection based on the results of the previous analysis. I repeated data analysis and data collection in accordance with the theoretical sampling principle until the categories and arguments formed could be linked in a logically consistent theoretical system. Finally, I fined-tune results and wrote up the findings and discussion chapters.

3.2 DATA COLLECTION AND ANALYSIS

The main research question served as the starting point for the sampling strategy. The analytic concepts that informed my primary data sampling are the four main elements situated along the technical/social axis laid out in Bowker et al.'s conceptualisation of infrastructural negotiations (Figure 2-1): embodiments of standards, built on an installed base (related to technical norms), links with conventions of practice, and learned as part of membership (related to social norms and behaviours). This qualitative sampling aimed to generate a representative sample of museum operations and back-stage negotiations. The data collection strategy I chose served two purposes. The first objective was to assess the behind-the-scenes work of institutional memory production and reveal the infrastructural conditions of smooth everyday operations. The second objective was to gain insight into the intricate relationship between the infrastructural components and socially organised practices in museums. This section will discuss the sampling

strategies for grounded theory and how the primary data collection method – staff interviews – was implemented and the coding procedures.

Data collection strategy and fieldwork

The scholarship in CSCW and infrastructure studies has addressed a need of carrying out ethnographic research over multiple work sites, which allowed the observation scale to be extended to more dispersed work-worlds while paying attention to concrete, situated practices (Blomberg & Karasti, 2013; Star, 2002; Suchman, 1997). As discussed in the previous chapter (Ch. 2.2), Karasti's perspective on infrastructuring acknowledges the multiplicity of politically engaged and epistemically situated perspectives involved in learning and change processes (Karasti & Baker, 2004). Indeed, multi-sited workplace studies contribute to the elicitation and expression of significant elements of information and work practice 'ecologies' by focusing on the ways in which data, participants, and their networks are connected, and by integrating participants, their organised data, and collaboration practices to social and technical infrastructures (Karasti & Baker, 2004, p. 3). When the fieldworker considers the studied system as developed and existing in a variety of locales – concerning system design development and product cycles or trajectories, the multiplication of sites approach is a good fit (Karasti & Blomberg, 2018). The rationale for using multi-sited ethnography as the primary methodological framework is to provide insight into the commonalities and similarities in museum background practices. To accomplish this goal, I plan, organise, and conduct this study in *a posteriori* manner by visiting and analysing a set of single-sited studies. Multiple ethnographic studies are 'brought into a horizontal comparative arrangement' (Blomberg & Karasti, 2013, p. 394). Each of these studies establishes the field site.

While conducting this study, I endorsed the grounded theorists' position that data collection and analysis are not strictly different processes; instead, they are linked processes that interact in a circular fashion (Charmaz, 2000; Glaser & Strauss, 1967; A. Strauss & Corbin, 1990). Data analysis motivates focused sampling and information collection, similarly to how the sampling and information collection strategy motivates systematic analytic strategies that combine explicitness and flexibility to data analysis (Charmaz, 2008). I followed Strauss and Corbin's (1990) theoretical sampling guidelines, which advocate for a sampling strategy based on concepts that have shown theoretical relevance to the evolving theory. According to these grounded theorists, these concepts are deemed significant because they are 'repeatedly present or notably

absent when comparing incident after incident' (A. Strauss & Corbin, 1990, p. 176) and they are important enough to be given the status of categories. The data were collected over one and a half years (April 2019 to October 2020) through on-site fieldwork, semi-structured interviews, and analysis of documents. Throughout this period, I alternated between data collection and analysis guided by theoretical sampling, which Glaser and Strauss describe as:

> the process of data collection for generating theory whereby the analyst jointly collects, codes and analyses his data and then decides what data to collect next and where to find them, in order to develop his theory as it emerges (Glaser & Strauss, 1967, p. 45).

My strategy for collecting data for analysis was developed during the first and second phases of this study and was influenced by the implementation and outcomes of my three fieldwork trips. The trips lasted one month each and took place in Scotland (August 2019), Sweden (December 2019) and Berlin, Germany (October 2020). While the first two trips focused on conducting background research on cultural heritage infrastructure and getting to know field professionals, the third one was structured as ethnographic fieldwork inside a museum institution.

The objective of the first fieldwork trip was to conduct background research and carry out 'open' and 'provisional' sampling (A. Strauss & Corbin, 1990, p. 193). According to Strauss and Corbin, in this type of sampling, '[o]penness rather than specificity guides the sampling choices' (1990, p. 176). Open sampling in this stage was done systematically. To gain a better knowledge of the back end of memory institutions, I conducted interviews with staff members from a variety of cultural heritage organisations in Scotland, where I was based. The following are the diverse types of memory institutions that represent the preliminary population:

- Academic: Hunterian Museum [HUN]
- Municipal: Glasgow Museums - Glasgow Life [GM]
- National: National Museum of Scotland [NMS], National Library of Scotland [NLS]

The selection of organisations GLAM institutions of varied sizes and types was due to the scope and diversity of the phenomena under examination – infrastructural practices, socio-technical negotiations, and participatory and socially inclusive potentials. As I used a grounded theory-based method, which included a flexible sampling approach to gather and analyse the data, museum institutions were investigated alongside other types of GLAM to elicit information

about the inward and outward connectivities of the museums and the intertwined relationship between the technical and social components of infrastructure. This investigation in conjunction was aimed to 'sample types of actions and events' (Gobo, 2007, p. 417). Informants were recruited informally through the various social networks of the POEM Consortium, which provided the financial and logistical support for this study. In general, what was important to collect during this open sampling stage were '**incidents** and not persons per se' (A. Strauss & Corbin, 1990, p. 177, bold in the original).

During this open sampling phase, I examined how information infrastructure functions within memory institutions, specifically how it serves as a link between various stakeholders, including internal and external actors, museum employees, museum users, and communities. As stated in the study's scope and limitations (Ch. 1.3), I was interested in gathering observations about how GLAM institutions operate, particularly the settings and conditions for participatory practices. I attempted to examine this central theme through the perspective of the institutions. That is why I was not motivated to investigate how digital infrastructure functions from the perspective of users or the public. Since every employee I spoke with during this fieldwork trip worked in the Scottish cultural heritage sector, I was able to delve deeper into the potential and limitations of a geographically defined sector with a distinct code of ethics, work conventions, and institutional practices. All interviews conducted during this stage were recorded and coded following open coding procedures.

In December 2019, I took another fieldwork trip in Uppsala, Sweden and was based at the Department of ALM (Archival, Library and Information, and Museum and Cultural Heritage Studies) at Uppsala University. I conducted semi-structured interviews with three members of Uppsala University Library. The participants oversaw the Alvin, the University Library's platform for digital collections and digitised cultural heritage. Following the fieldwork phase, I was convinced to conduct additional interviews with staff members of Swedish institutions. These institutions included the National Historical Museums in Stockholm, the Swedish National Heritage Board (RAA), and DIGISAM,[8] a national platform that brings together 22 Swedish institutions in the cultural heritage field to coordinate their work on digital cultural heritage. During and following the second trip, I chose my interview partners using the 'snowball sampling' technique (Gobo, 2008, p. 104; Patton, 2015, p. 298). This strategy begins with the

[8] The secretariat of DIGISAM secretariat is located as a unit at RAA.

selection of several key participants who possess the necessary characteristics or meet the participation criteria of the study. Then the researcher will seek out additional subjects who exhibited the same characteristics by requesting referrals from the initial participant (Merriam & Tisdell, 2016, p. 98). At the end of each interview, I asked for recommendations or requested introductions from my interview partners, to invite their co-workers and acquaintances in the same sector to participate in the study.

Preliminary findings from initial coding (see the 'Coding' sub-section) would inform more targeted questions, which would be condensed at the end of the second phase (construction). At this point, I was able to define the two components of museum infrastructure:

- Back-stage: includes the physical and digital architecture, information systems, team interaction and communication methods, data standards and protocols, and personnel responsible for systems maintenance.

- Front-stage: encompasses all agents interacting with the user – exhibition spaces, textual and visual interpretation, websites and social media channels, user interfaces for cataloguing systems, and open access platforms.

After defining the back-stage, I spent my third trip in Berlin (October 2020), examining how back-stage activities possessed infrastructural characteristics that facilitated professional collaboration and established a strong connection between the museum institution and its audience. The Museum of European Cultures was chosen as the field site for my investigation into the role of documentation work, which I envisioned as the informational backbone of museum infrastructure based on preliminary findings. Data collection included semi-structured interviews with museum staff members and document analysis. For the latter, I gathered and analysed a variety of documents, including the collection concept, systematic catalogues, collection development statement, and digital strategies. The purpose was to ascertain the compatibility of the museum's missions and daily operations. If institutional missions and everyday practices were coherent, I wanted to investigate the types of socio-technical negotiations that occur. By comparing institutional documents to staff interviews, I was able to identify inconsistencies in value and intent hierarchies, revealing the prioritisation of certain behaviours over others.

Between February 2019 and January 2021, I collected data on memory institutions of various sizes and types (Figure 3-1).

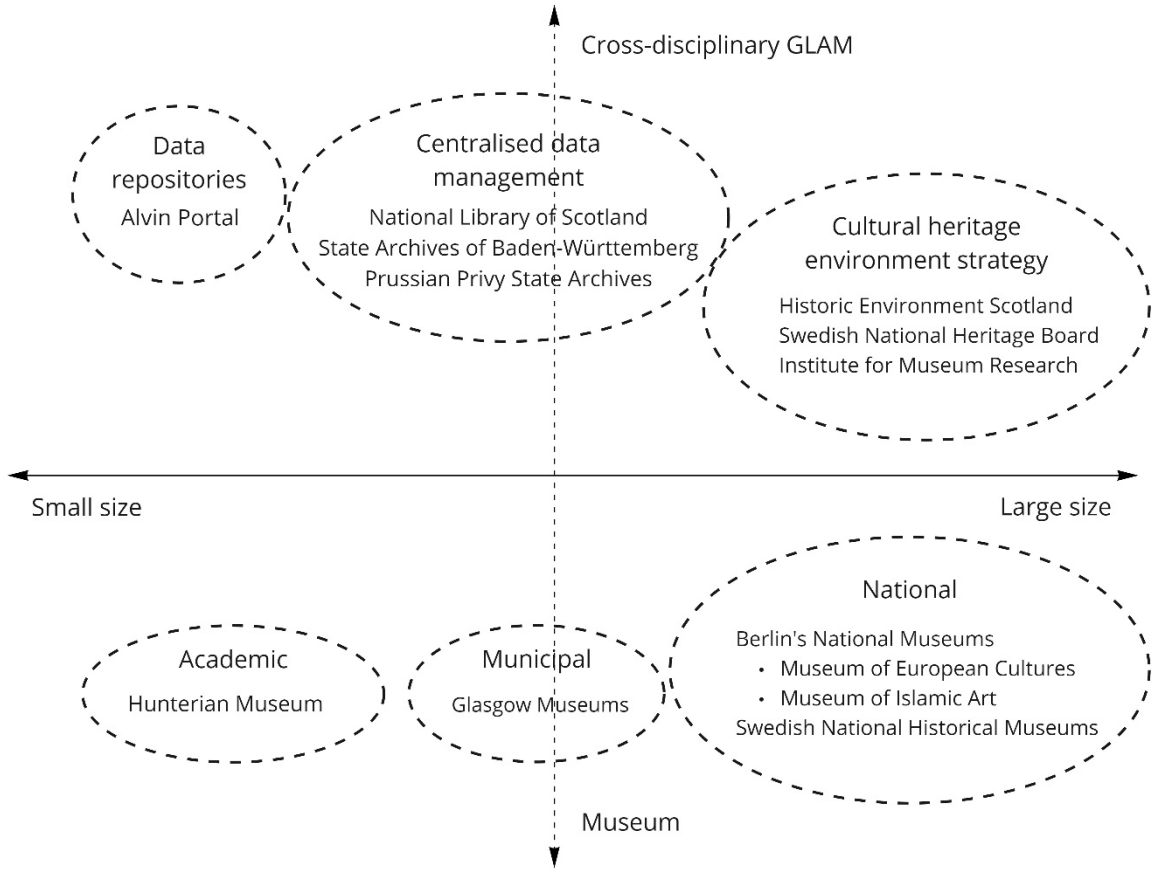


Figure 3-1 Sample of GLAM institutions in this study

My plan to achieve theoretical saturation was carried out through a three-phase study – deconstruction, construction, and confirmation.[9] At each stage, I assessed whether additional data were needed. Data gathered during the first phase influenced the direction of phase II (construction) and the focus of phase III (confirmation). The diverse degree to which these institutions are representative demonstrates how the theoretical sampling was conducted during the first two phases of my research. I conducted background research on various types of memory institutions during phase I (deconstruction). At the conclusion of phase I, I developed an interest in specifically museum organisations. These institutions are represented in the bottom half of the diagram (Figure 3-1). Following the definition of the memory back-stage, I examined more specifically in phase III (confirmation) the background practices and

[9] See the research timeline in Table 3-1.

infrastructure requirements for ensuring smooth operation, informing decision-making processes, and coordinating multiple teams within the institution. The iteration between data and concepts was complete at the conclusion of my third fieldwork trip when sufficient categories and associated concepts were defined to adequately explain what had been observed in the back-stage of museum work. At that point, I also noted that no additional data from staff interviews contributed to developing or expanding the set of concepts and categories.

Staff interviews

While ethnographic studies that engage beyond single-site infrastructures are needed to investigate how practices are shaped and used across many different locales (Blomberg & Karasti, 2013), studying local imaginaries must also be taken seriously (Karasti & Blomberg, 2018). This task necessitated in-depth interviews with staff members of GLAM institutions. The overall objective was to obtain personal and detailed responses from participants about their work lives and daily experiences as professionals who work directly with museum infrastructure. The interviews were semi-structured in the sense that the inquiry's major themes were organised sequentially. This semi-structured interviewing style allows me to cover all the issues in each site that grabbed my attention as a researcher while maintaining a constant balance between what I found intriguing and what the respondents found engaging. As a result, the interviewer–interviewee connection fluctuated between impersonality and rapport (D. Silverman, 2013).

During the construction phase, two pilot interviews were conducted. The first pilot interview [Pilot-LVR] took place in person in February 2019 in Hamburg with a documentalist from the LVR-Institut für Landeskunde und Regionalgeschichte (Germany). The second was held with two digital officers from the National Museum of Scotland in its Balcony Café at the start of my fieldwork phase in Scotland. The pilot interviews used the interview guide with actual respondents to assess the effectiveness of the questions and propose potential changes (Maxwell, 2018, p. 27). The goal of pilot-interview testing was to anticipate how queries about specific topics would work in practice. That is, how the interview partners would interpret them and respond in the actual circumstances of the interview. Table 3-2 summarises the major themes and questions from the interview guide that were used during phase I (deconstruction) and phase II (construction).

Topics and questions of the interview guide
A. Professional roles How did you end up working at your current institution? What do you hope to accomplish in your position? What is the scope of the project on which you are working?
B. Information architecture, governance How should information systems for digitised cultural assets be designed? Do you believe that X is the best system for your unique needs? What problems are the employees complaining about? What are the most time-consuming tasks?
C. Connective capacities How are your systems interoperable with those of other museums? What kinds of guidelines are you following? What about inter-institutional and inter-disciplinary compatibility? What are the requirements for a GLAM institution to establish a knowledge base in order to make its collection more visible?
D. Public engagement In what ways might people be encouraged to reuse digitised resources? How do you communicate the value of your collection? What about the social aspect of providing access: What could be done to reach out to disadvantaged populations or marginalised user groups?
E. Digital strategy, evaluation Given that you have no control over how people utilise and reuse data, how do you define the success of a project or initiative? How would you evaluate the 'offering services' work? What are the challenges for your local/regional/alliance-like/transnational organisation? What would you have done differently?

Table 3-2 Interview guide used in phase I and phase II

Following the pilot testing of the interview guide, certain revisions were necessary. First, the job titles of the participants can be misleading, which impacts how I categorise my participants. The work that museum employees conduct on a daily basis may be very different from their official job title. Curator is a vivid example from the museum sector. Depending on the kind and scale of the institution, a curator can play a variety of functions. Even though they both have the professional title of 'curator', an oral history curator who sits next to a medical history and scientific curator has a separate set of responsibilities. Oral history curators may work on oral history preservation and digitisation initiatives, making them more likely to fall into the 'Digital services' category. The scientific curators deal mostly with physical items, and object handling differs significantly from the preceding case. In addition to cataloguing and recording objects, other responsibilities may include assessing storage space and deaccessioning unfitted objects.

'Collections management' is more likely to be assigned to this group of curators. In terms of everyday responsibilities, today's curators in small and medium-sized museums are more likely to take on other project management activities, such as object selection, funding-bidding, and digital content development. One of the staff members I interviewed at SMB was an 'education curator' ([MEK2]), which places them squarely in the category of 'Digital Content, education, and outreach'.

Overall, collections management and digital services were represented by a larger proportion of the participants than those from digital strategy, digital content, education, and outreach. Figure 3-2 illustrates the number of participants by profession, classified according to their tasks and responsibilities rather than their job titles (by the reason stated above).

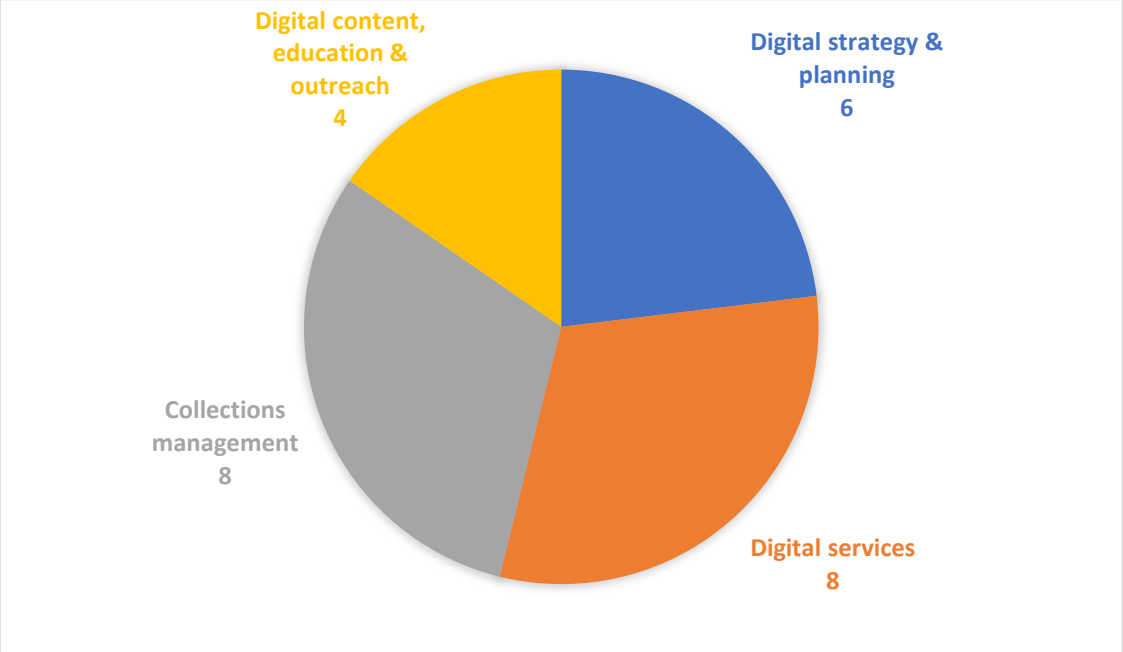


Figure 3-2 Participants by profession

During my fieldwork trip in Glasgow, I conducted additional five semi-structured interviews with museum staff members. These museum employees were responsible for collections management, project coordination, and digital and new media management. I followed the lead of Lucy Suchman in redefining and expanding the technological, organisational, and institutional boundaries of the field site. Suchman's (1997) foundational research on coordination centres revealed aspects of a more distributed workplace in which hot-spot centres are connected to remote locations via technologies. Therefore, the countries and regions in which my

interviewees resided were unspecified at the start of my project. The sets of locations evolved as I became acquainted with the field and its connections to other places. In other words, I developed my sampling strategy in response to the conduct and outcome of my three fieldwork phases. While the first five interviews took place in Scotland, the final representation of participants was more distributed and open-ended field sites. Figure 3-3 illustrates the number of participants by country of their primary professional activities.

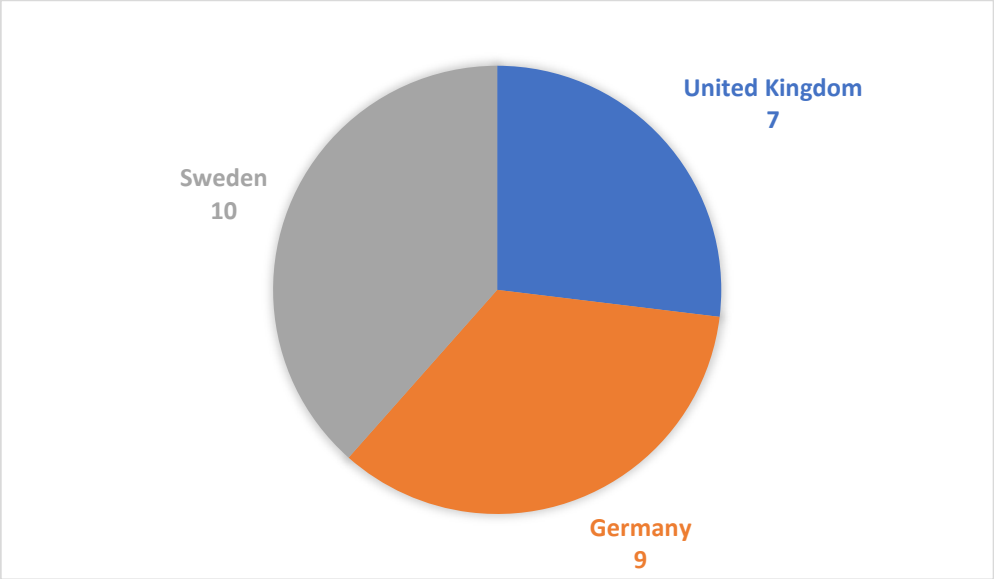


Figure 3-3 Participants according to the country in which they are based

As a result, during Phase II (Construction), 16 interviews were conducted with GLAM professionals working in Sweden and Germany in total. Following the first interview guide (Table 3-2), interviewees were questioned about their professional role and team; the IT systems and subsystems they used and the problems they encountered; their attitude toward adhering to standards, protocols, and guidelines; the procedures and infrastructures that supported their work on data management or collections management; and the challenges and controversies they encountered at work. Thus, the questions were organised around pre-defined sub-themes, the priority and order of which may vary slightly: (1) organisational characteristics and professional roles; (2) digital strategies and planning; (3) infrastructure, standards, and standardisation; (4) knowledge transfer and sustainability; and (5) evaluation and review process. It was not necessary, however, to include all the sub-themes.

Twelve of the twenty-seven interviewees were officially employed by a museum institution. Six of the fifteen other participants worked in libraries, five in data management services, three in

archives, and one in a museum research institute. Participants who were not museum staff were all employed in the cultural heritage sector and were involved in the administration of digital infrastructure. They were either involved in delivering or maintaining digital services for museums (such as digitisation, imaging, and metadata management), and indirectly influenced collections management and digital content management activities within the museum. As previously stated, because the interviewees came from diverse backgrounds and occupied a range of positions within museum institutions, I prepared a series of questions with pre-defined sub-themes for each interview in advance, based on the official duties and responsibilities of the respondents, and the type of museum institution for which they worked. As a result, some sub-themes were condensed or eliminated entirely.

To be more specific, the interviews began by gathering information about the daily work of the interviewees and their attitudes toward existing digital infrastructure. I inquired about the influence of technology adoption – new systems, as well as new standards and protocols – with interviewees whose main duties were more technical in nature. I asked my participants to identify the most challenging daily activities they face and what they would do differently. I also questioned them about the relative importance of digital technology to more traditional methods of managing museum collections, as well as their practical justifications for digital transformation. Following hints about similarities across settings, the interviewer may elicit the participant's personal and professional perspectives on the significance of access to museum collections. The in-depth analysis of the first five interviews in Glasgow, plus the second pilot one ([Pilot-NMS]), influenced subsequent data collection (Clarke, 2005; Glaser & Strauss, 1967), which would have placed a greater emphasis on daily practices in the back-stage of museum institutions, with more specific questions about staff skills and routines, and the local work arrangements.

The semi-structured interviews lasted between 60 and 90 minutes, and the average length was 70 minutes. The interviews were conducted entirely in English and tape-recorded with the consent of the respondents.[10] The first five interviews were conducted in person in Glasgow (August 2019) and Uppsala (December 2019). Due to the lockdown imposed during the Coronavirus outbreak, the following eight interviews took place between April and September 2020 via Skype, Zoom, or Cisco Webex. In Berlin (October 2020), I performed seven additional

[10] See the information sheet given to respondents and the consent form in Appendix C.

interviews, one of which ([MIK]) was conducted digitally due to the social distancing policies. The final two ([SHM4], [LBW]) were completed via Zoom while I was back in Hamburg. Three of the twenty-four interviews, plus a test-pilot one, were conducted concurrently with two participants ([Pilot-NMS], [NLS], [ALV1], [SPK1]). The participants requested this because they felt it would be more convenient to meet with another co-worker. As a result, I took advantage of the opportunity to conduct paired interviews, which comprises one researcher interviewing two persons simultaneously (Houssart & Evens, 2011) to ascertain how the pair perceives the same activity or phenomenon of interest. Overall, as all the interviews revolved around the behinds-the-scenes work of institutional memory production, descriptions provided by the interviewees are centred on the GLAM work-worlds as they experienced. The emphasis of the interview questions on the 'what' component of communication steered the conversation toward lived experience (Brinkmann, 2014, p. 294); in doing so, they attempted to elicit as precise a description of GLAM workers' experiences as possible.[11]

MaxQDA 2020 was used for audio transcription and analysis of the data obtained through semi-structured interviews. The interviews were coded in accordance with grounded theory principles (see the previous section). In contrast to Miles and Huberman's (1994) recommendation for qualitative researchers to create a set of codes in advance, grounded theorists adhere to the core principle of developing codes directly from data through an emergent process. Activated codes define data and perform operations on it, such as classifying, sorting, and synthesising it (Charmaz & Mitchell, 2001, p. 165).

The coding process was divided into two stages – initial codes and axial codes, following the constructivist version of grounded theory (Charmaz, 2014). The first cycle was based on initial coding. This type of coding was aimed to compare parts for similarities and differences in the data, while remaining receptive to any theoretical possibilities revealed by the data. This first cycle alerts the researcher to the need for additional data to support and build an emerging theory. I created codes by comparing data to data, data to codes, and codes to codes. The second cycle incorporated axial coding (Charmaz, 2014). I used the most significant and common initial codes to sort through the vast volumes of data. During this phase, I began to construct a dense network of relationships around the category's 'axis'. I followed Strauss's (1987) axial coding strategy, which consists of two steps: (1) outlining the category's properties; and (2)

[11] See the interview guide in Table 3-2.

hypothesising about these properties by gradually specifying a variety of conditions, interactions, strategies, and outcomes associated with the category's emergence. The generated axial codes, as a result, were more selective and conceptual in nature than the initial codes.

Conclusion

My methodology for examining museum infrastructure combines multi-sited ethnography, semi-structured interviews, and grounded theory. A flexible sampling strategy aided in the development of abstract concepts of the 'museum back-stage' and 'infrastructural practices'. The entwined processes of data collection, coding, and analysis were guided by a three-stage model of ethnography in conjunction with grounded theory procedures. As the study sought to compile a wide inventory of conceivable situations and possible outcomes involving the negotiation of infrastructure's social and technical components, I chose multi-sited ethnography as the primary methodological framework. An adaptable data collection and analysis strategy offered by grounded theory allowed me to conduct efficient multi-sited fieldwork, divided into three phases: deconstruction, construction, and confirmation. I conducted 23 semi-structured interviews, three of which were paired, with 26 professionals involved in managing digital infrastructure. They worked in collections management, curation, digital services, education, and outreach. All the participants worked in the cultural heritage sector, with twelve directly employed by museums. Other types of GLAM were studied alongside museum institutions to elicit information about the connective capabilities of museum infrastructure and the intermingling of its technical components and socially organised practices in museums.

CHAPTER 4. INSTITUTIONAL BARRIERS TO BACK-STAGE VOICES

The museum as a cultural infrastructure capable of organising collaborations and empowering users in participatory cultural practices has been recognised by heritage and museum studies scholars (Bernhardt, 2021; Macchia et al., 2015). Prior research has nevertheless indicated that museum environments can be a source of institutional resistance to change (Ch. 2.1), which is discussed in the context of the complex negotiated nature of museum work and the reintroduction of museum institutions as agents of social change. The conceptual framework of this thesis (Ch. 1.2) hypothesises that the socio-technical negotiations that occur within memory institutions are influenced not only by the institutional legacies and broad social change dynamics, but also by infrastructural practices. The necessity of returning to the back-stage (Ch. 3) to examine the friction between traditional norms and standards on the one hand, and modern work arrangements on the other, is where I make the case that an infrastructure-based approach can be particularly effective at elucidating the entangled background of museum everyday practices. I described in the previous chapter how a dual methodological framework consisting of multi-sited ethnography and constructivist grounded theory is chosen to investigate the components of museum infrastructure, which can be layered, complex, and modular on a local level. This methodology also enables me to move between multiple locations and anticipate the emergence of new categories or dimensions throughout the analysis of each case.

Chapters 4–8 present the major themes that emerge from the data analysis: institutional barriers, invisible tasks, craftwork, connectivities, and resource allocation. This chapter focuses particularly on organisational and technical forces of institutional legacies, such as departmental systems, operational authority, and object management mechanisms, that can influence the negotiation process in the back-stage and thus impede the readiness of museums to pursue their desired digital strategies. The chapter discusses two factors that can hinder an institution from achieving responsive and adaptive change: boundaries of responsibility and hierarchies of value. Section 4.1 examines the hierarchical structure of the museums that results in ambiguous boundaries of responsibility concerning the expansion of the institutions' connective capabilities. Section 4.2 looks at the taking-for-granted mindset related to the use of long-standing standardised tools and systems. The second section suggests that a tendency to take things for granted may be bred from a proclivity for operational stability. The chapter demonstrates how boundaries of responsibility and the taking-for-granted mindset can work against the goals of participation and inclusiveness. The chapter lays the groundwork for the

discussion in the subsequent chapter on the back-stage activities as a matter of negotiating organisational structures and institutional arrangements on the way to transforming the museum.

4.1. BOUNDARIES OF RESPONSIBILITY

As stated in the preceding chapter, since grounded theory-based methods motivate a flexible sampling approach for data collection and analysis, I was incentivised to conduct a multi-sited ethnography involving a variety of GLAM, with an emphasis on museum institutions – national museums, municipal museums, and university museums. The study includes large-scale institutions such as the Swedish National Historical Museums (SHM) and the National Museums in Berlin (SMB). Small-to-medium-sized institutions include the data repository platform Alvin, the Hunterian Museum and individual museum members within the SMB, one of which is the Museum of European Cultures (MEK), where I spent my first fieldwork trip in October 2020. To gain insight into the back-stage connectivity and the entwined relationship between infrastructure's technical components and social practices within these institutions, the first objective for the interview guide is to elicit information about the organisational structure and the localised situation in which the interviewees find themselves working. This objective is reflected in the first theme of the interview guide (A. Professional roles).[12]

The data analysis reveals that interviewees' responses to the third theme (C. Connective capacities), which concerns institutions' connectivity both inward and outward, are inextricably linked to their implied views on professional roles, which include the types of institutions and lines of work in which they work, the goals they wish to accomplish in their positions, and the scope of the team or project on which they work. The more hierarchical and multi-layered organisational structure appears, the more ambiguity exists regarding the boundaries of professional roles and responsibilities of staff members. In some instances, this type of uncertainty reduces staff willingness to participate actively in change processes that can result in institutional transformation. To demonstrate the extent to which this uncertainty about responsibility boundaries exists, the first section of this chapter looks at the cases of two national museum organisations (SHM and SMB), where this link between institutional connectivity and staff perceptions of professional roles is most evident.

[12] See the interview guide in Table 3-2, Chapter 3.

Digitisation and IT support at SHM

SHM is a central museum agency tasked with promoting knowledge of Swedish history and safeguarding cultural heritage. Previously this agency included three museums: the Swedish History Museum, the Royal Coin Cabinet, and the Tumba Papermill Museum. It was merged with another agency, LSH,[13] in January 2019 to form an overarching structure for six cultural heritage organisations. Due to the extensive consolidation of six museum members, this process resulted in the overconsumption of resources and strain on the work environment. Wilhelm Lagercrantz, the chief digital officer in charge of developing digital strategies, articulated what he perceived to be the end of the transitory phase and the beginning of institutional transformations:

> There's actually a lot of work in progress for us. We are new in this merged organisation so what we've done in the last 2 or 3 years, we've built from the bottom with the infrastructure, new organisation and new ways of working. We hope and I think that the payback period is starting now actually (Interview [SHM1], 2020).

According to Wilhelm, the merger can be viewed as a necessary and lock-in process – what the SHM members have done 'in the last two or three years', in which established practices are embedded into more overarching technological structures. Changes and improvements to existing practices are believed to begin from the bottom ('from the bottom with the infrastructure'). As a new organisational structure takes shape, the installed base of infrastructure continues to expand, and this organisational and technical expansion is accompanied by a reshaping of socially organised practices, or what are hoped to be 'new ways of working'. The services provided by the SHM have progressed from developing, personalising, and navigating cultural heritage to curating collections in digital formats and collaborating with users on knowledge production.

Vera's[14] team is part of the Department of Digitisation and IT, responsible for the operation and development of three principal areas: digitisation, photography, and IT support and management. On the one hand, as implied by its name ('digitisation and IT'), the department as a whole establishes a clear and fixed line of responsibility, which various working groups within

[13] LSH is the abbreviation of *Livrustkammaren, Skoklosters slott, Hallwyllska museet*, which means the Royal Armory, Skokloster Castle, and the Hallwyl Museum Foundation.

[14] Anonymised name

it appear to follow. On the other, this official boundary imposed on professional roles may reveal some operational setbacks, as the activities of some teams span multiple lines of work and necessitate cross-departmental communication. The main duties of the team are mixed among digitisation, and administration of collection management systems and other databases. The primary responsibilities of the team on a daily basis include digitisation and administration of collection management systems and other databases. When asked what the most difficult aspects of her daily work are, she identified digitisation and documentation as key activities that create complications.

First, regarding digitisation, as a project manager for a variety of digitisation projects, she received a 'steady stream' of requests from colleagues across all six museum members. According to Vera, the pressure from various actors within the organisation to increase access to as many objects as possible nearly drove the digitalisation team to the point of 'digitising everything'. She alluded to the extent to which her institution would have overinvested in digitisation at the expense of documentation.

> They want to digitise this, they want to have this archived, maybe digitised so they can read it on their computers, instead of going to the place where all the books are. They want to digitise 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' (Interview [SHM4], 2020).

This dynamic is frequently overlooked: digital transformation consumes a great deal of energy and resources. Both employees and managers are consumed by the paradox of organising change without enough resources. At SHM, this resource allocation problem occurs at the intersection of different lines of work. Everyday staff indicated on the numerous requests of digitisation placed upon their shoulders.

The second set of problems concerns documentation. The merger of six institutions complicated vertical integration, consolidating all data from the museum members into a single system. From the point of view of a staff member 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. Due to the complexity of the change, the process of adapting IT solutions, routines, and working methods altered the identity and lines of work of each department. The problem of not keeping complete, accurate, and up-to-date information about completed, correct, and updated objects in the system becomes more acute.

Vera expressed her concern that information about the collections had not been kept consistent and up to date:

> They [other colleagues] 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 prioritise this' (Interview [SHM4], 2020).

Vera's concerns about misplaced priorities regarding what to do first and what critical tasks to prioritise are directly related to the typically overwhelming number of tasks that museum staff face on a daily basis. The curator and conservator colleagues have a lot of things to do concerning the exhibitions, which are central to their official duties. However, while the task of maintaining current information about the collections may appear insignificant to staff and upper-level managers in other lines of work, the state of data integrity, as determined by factors such as consistency, accuracy, and whether it is up to date, is consequential given the agency's handling of millions of objects and the fact that 'we have a new system and new work, everything is new' as a result of the recent merger, according to Vera.

There is no effortless way to resolve this overabundance of daily tasks without the 'leadership' knowing what needs to be solved. She asserted that upper management must understand and appreciate that maintaining records about objects and collections is one of the most critical tasks 'we have to do as a museum'. Vera's insight shows how the institution's hierarchical structure makes difficult explicit recommendations to address data integrity problems, such as streamlining data handling tasks to increase productivity and optimise the workflow. The fixed boundaries imposed by official job duties and hierarchical organisational structure led to Vera's reluctance to inform other supervisors about critical aspects of data handling. After all, she could not raise the issue of data management in other departments. This inability to raise one's voice can imply a lack of cross-departmental communication regarding technical bottlenecks and data mishandling issues.

That Vera was aware of the importance of data integrity but unable to communicate it to colleagues in the collection department also indicates a lack of a strong voice on the part of staff responsible for documentation, as there were no effective ways to maintain data consistency and accuracy without resorting to 'telling the [other's] bosses'. The case of digitisation and IT support

at SHM can hint at the extent to which museum employees who provide IT support, maintenance, and repair can be discursively absent from the museum work-worlds in which they operate. The following subsection will discuss the impediment that organisational structure or an overarching museum body, SMB, imposes on participatory voices concerning social media practices from one of its small-sized institutional members. As was the case with Vera, museum employees temporarily responsible for social media at MEK serve as a critical node in the work routines of the museum. However, their voices are drowned out or diminished by institutional barriers, leaving them with little say over which long-term strategy should be implemented and, more immediately, how a daily recurring problem should be framed.

Social media duties at MEK/SMB

As of July 2020, the Prussian Cultural Heritage Foundation (Stiftung Preußischer Kulturbesitz or SPK) was the most prominent cultural employer in Germany, with approximately 2,000 employees. During the time of the data collection phase, this organisation was overwhelmed by a 'multi-layered hierarchy and unclear decision-making structures that mask responsibilities and make processes drawn-out and non-transparent', as suggested by a government-commissioned report by a panel of academic advisors (Wissenschaftsrat, 2020, p. 16, my translation). The Foundation's five major institutions include the National Museums in Berlin (Staatliche Museen zu Berlin, or SMB), Berlin State Library, Prussian Secret State Archives, Ibero-American Institute, and State Institute for Music Research. As stated on the SPK website,[15] the Directorate General at SMB (Generaldirektion, or GD) is responsible for 17 distinct museums and four research institutes. SMB is divided into three divisions: museum services (GD I), education and communication (GD II), and technology, security, and internal services (GD III). Under this system, rather than each museum having its own education and communication department, the GD II coordinates and administers all education and communication activities carried out by museum members (Figure 4-1).

[15] See https://www.preussischer-kulturbesitz.de/en/about-us/spk-institutions.html

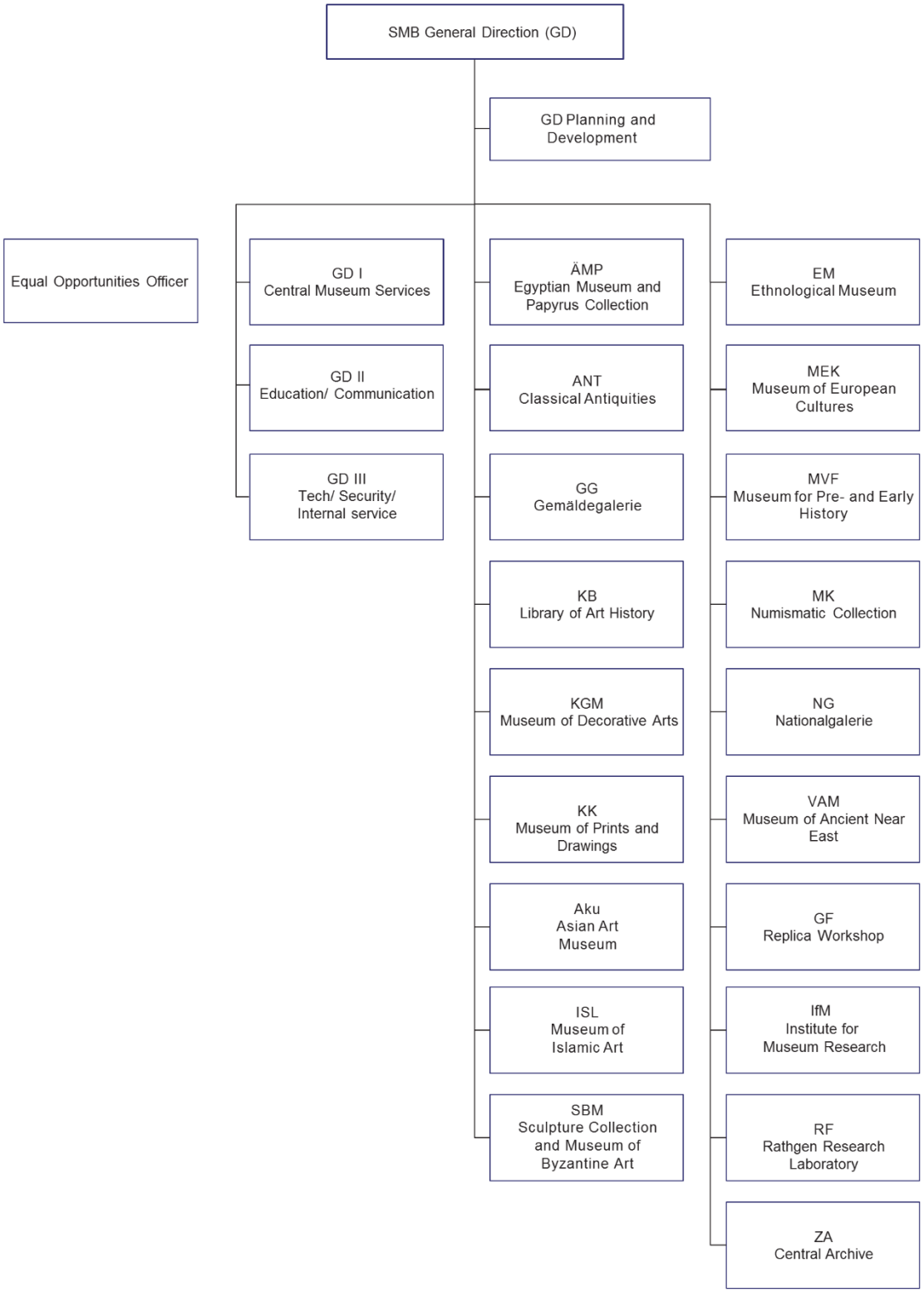


Figure 4-1 Organigram of the SMB, October 2020, from the SPK website

As stated in the Wissenschaftsrat (2020, p. 193) report, while individual museums and institutes are managed independently by their directors, the General Director has the 'right to take the initiative and make museum-related decisions' in all administrative areas pertaining to the SMB. This General Director is in charge of supervising the SMB and carrying out central functions, and the Directorate-General reports directly to this individual. Additionally, the collaboration between institutions and the GD occurs between individual institutions and the pertinent GD departments/units/staff units (Wissenschaftsrat, 2020, p. 195). As indicated by the organisational chart, the GD II will oversee the SMB's educational and communication activities at all levels – the National Museums as a whole and each member.

According to their mission statement,[16] the National Museums group attempts to 'respond to societal, social, and demographic developments such as migration and diversification' through their educational and participation offerings. Aside from that, SMB makes an effort to 'provide intuitive access to our content to as diverse a target group as possible in the digital space'.[17] While the GD's upper-level position and voice on communication are intended to leverage opportunities to position SMB as an open and connected national museum group, there is no clear evidence that this organisational structure will effectively enable SMB members to leverage their resources and connectivity in such a way that not every museum or institute is required to devote resources to the areas that fall into the responsibility of the GDs. In contrast, the analyses of this study's interviews with SMB and MEK staff show that this centralised authority and control of operations can overlook the vast and diverse communities served by each of its museum members.

In terms of outreach activities, the communication messages at SMB can be diluted as a result of the multi-layered organisational structure. Each SMB member does not have separate Twitter, YouTube, or Instagram accounts. The Museum of European Cultures (Museum Europäischer Kulturen, or MEK) has only a separate Facebook channel, through which it promotes upcoming events and new exhibitions. MEK had someone in charge of Facebook as of October 2020 and a research assistant responsible for editing a plan and writing the posts. However, it is indicated that, from the perspective of the staff, the visibility of the museum and its willingness to engage directly with its audience in the digital sphere can be harmed because of ambiguous role

[16] The version adopted on March 13, 2019 is available at https://www.smb.museum/ueber-uns/leitbild/, my translation.

[17] Also from the SMB's mission statement.

assignments and the limited decision-making authority. A MEK employee discussed online community engagement and the importance of being visible:

> as a museum, if you're not present in social media, you might as well close your doors, because our life is so entangled between the online and the offline world … even if it's just liking their [the museums'] posts or their story, it shows that there is some reaction. It's just very responsive, because museums are, unfortunately, not as responsive as they should be. (Interview [MEK2], October 2020)[18]

For this employee, the MEK is 'not as responsive' as it should have been. The museum has not been able to publish social media content independently, except for Facebook. For content to be posted on SMB social media channels, such as Instagram or YouTube, the MEK staff needs to provide material to the upper GD level. This is why the interviewed employees feel discontent as they have been deprived of autonomy to do what they think would be appropriate for them to do.

Moreover, the responsiveness of the museum on the digital sphere can be hindered by the possibility that the centralised task of undertaking social media communication for all 17 museum members can be under-resourced.[19] A MEK staff member recalled: 'they [the GD] had one person who did all the Facebook pages of different collections and institutes within SMB, but it's just impossible to do that as one person'. The same employee suggested that MEK should have at least one, if not two, full-time employees who deal with social media. Even that, according to Prof Elizabeth Tietmeyer, the museum director, is insufficient; Elizabeth suggested that the museum needed 'a digital curator who should also be responsible for social media'.

Curators and educators at MEK are aware of this cause for the museum's low responsiveness and visibility on social media. Even though the museum has its appropriate motive to do social media in house, the SPK's multi-layered hierarchical structure makes this goal of delegation a multiple-year-long negotiation. One curator explained: 'When I first came to work at MEK, we were in the pilot project that let the houses [SMB museums] do social media individually. And ever since then, MEK has done their Facebook page in house'. The same employee suggested that MEK should have at least one, if not two, social media specialists, or a digital curator in

[18] See Appendix D for the list of interviews and interview codes.

[19] The Wissenschaftsrat (2020, p. 22) report points out that the human resources of the SMB in areas such as education and mediation, exhibition management, public relations, marketing, fundraising and sponsoring do not meet the requirements of modern museum operations and are clearly too few.

charge of social media. The other staff members, this curator suggested, could then meet with that person on a regular basis to make object suggestions or recommendations on the narrative. That person would oversee 'all the nitty-gritty work of writing the posts, and so on'. The highly hierarchical structure of SPK/SMB makes this wish for delegation a problematic negotiation because it sets a boundary onto both the official roles and responsibilities, and who has the authority to change this.

The rigid boundaries of social media responsibility at SMB rendered social media work irrelevant to the perceptions of the employees at MEK of what the digital sphere requires of their museum. One of the staff members who was temporarily responsible for MEK social media felt that each museum must be seen by its appropriate audiences and engage with them through its own channels ('if you don't appear on the online world, and you just stop existing'). Additionally, staff at MEK perceived online engagement with users as a curatorial process, which is facilitated by staff being engaged with the museum objects and collections. For a MEK curator, this is something that a centralised, GD-level 'marketing office' cannot provide:

> There was a time when we had a marketing office who did that for us, but we stopped that again, because the way I understand social media and museums is that you basically stage one object or exhibition with every post. You have to curate your decision. What am I showing? Next week, you have to think of another object. You have to think of, how these fit into either a historical context or contemporary context. You have to make it interesting for the people to see and read the post. So basically all requirements that you also have when you do an exhibition. (Interview [MEK3], October 2020)

Since museum staff knows their collection better than 'the marketing office', they argue that social media should be done either by curators themselves or in close connection with curators. As the MEK curator suggests ('you have to curate your decision'), staff needs both: (1) a proper and formal assignment to be responsible for social media, and (2) the acknowledgement of their everyday job, which is to engage with the museum's objects, and which cannot be relegated to someone who does not have a full understanding of 'how these [objects] fit into either a historical context or contemporary context'. Apart from excluding diverse perspectives from decision-making and collaboration processes, the centralised operational authority and decision-making structure as observed in the SPK case may have a detrimental effect on participatory formats associated with outreach, education, and public engagement, which are critical components of museums' mission to increase their publicness, visibility, and collection scope.

4.2 LEGACY OF STANDARDISATION

In this section, I present another category of institutional barriers that is related to the legacy of museum infrastructure: the historical weighting of standardised tools and systems, as concretized by a complex institutional history. The section will shift the analytical focus away from human actors and toward non-human entities engaged in backstage activities, most notably collection cataloguing and categorisation. It demonstrates how artificial boundaries imposed by non-human actors and reinforced by institutional history can impede new digital adoption and member participation. The section illustrates this phenomenon by delving into the MEK's existing classification systems. This case is significant because, in comparison to other SMB members, MEK can be considered a small-scale museum institution. MEK's holdings are disproportionate to the size of the institution; the museum had only 22 employees at the time I conducted the third fieldwork trip in Berlin.

Amongst the SMB members, MEK is the only museum dedicated to 'lifeworlds in Europe' (Tietmeyer, 2013, p. 61) – in particular, the living situations and cultural exchanges in and around Europe from the 18th century to the present day. As of December 2021, it houses around 287,000 ethnographic objects and testimonies about cultural history. Officially formed in 1999, this museum was the result of a merger between the former Museum of German Folklore (Museum für Deutsche Volkskunde) and the European collection of the Ethnological Museum (Museum für Völkerkunde). The Museum of German Folklore was itself the result of the unification of two institutions in 1992: the Museum of Folklore in East Berlin and the Museum of German Folklore in West Berlin.[20] During the 1980s, these organisations expanded their collecting beyond pre-industrial country life and craft culture by focusing on industrial-era cultural transformation and urban life (Museum of European Cultures, 2019, p. 5). Due to its collection's 150-year dynamic history, which attests to profound historical, scientific, and political shifts, MEK carries along with its development a complex institutional history with a collection cosmos that has evolved over time (Figure 4-2).

[20] For more on the institution's history from 1873, when the Museum of Folklore was founded, until 1992 when the two folklore museums in East and West Berlin were reunited, see https://www.smb.museum/en/museums-institutions/museum-europaeischer-kulturen/about-us/history/

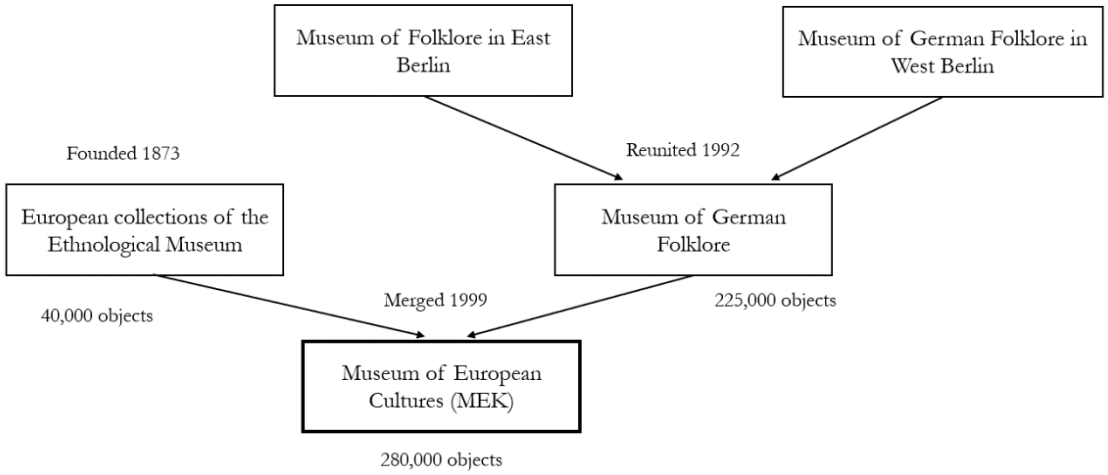


Figure 4-2 Institutional history of MEK

The current holdings of MEK include approximately 225,000 objects from the former Museum of German Folklore and 40,000 objects from the former European collections (Department Europe) of the Ethnological Museum in Berlin. These two major groups of objects are catalogued in two distinct ways. The first group of 40,000 objects was categorised according to geographical location. Its catalogue numbers began with the location's code.[21] The second group was organised by subject, such as children's toys, ritual objects, and women's clothing; the catalogue numbers assigned began with the broad subject's numeric grouping. According to the collection concept at MEK (Museum of European Cultures, 2019, p. 9), its current category system inherited some parts from the index cards for the pre-1945 holdings. In October 2020, this cataloguing style was still being used at MEK and was being applied to all new objects.

Among 287,000 objects in the MEK's holdings, the former Museum of German Folklore contributed around 225,000 objects. These objects were categorised following the second format, i.e., a numerical category system (Table 4-1).[22] Each main subject has sub-divisions for sub-themes. This category system, being introduced in 1935, is still used for upcoming objects

[21] This system was used to catalogue the objects of the early Museum of German Folklore (which resembled to those of the Ethnological Museum). Later, the Museum of German Folklore changed the entire system, whereas the Ethnological Museum (with its Department Europe) maintained its geographical documentation.

[22] To be precise, this is an object classification system, which refers to a systematic and controlled list of object terms organised according to a classification scheme that forms the basis for indexing and cataloguing museum objects. However, because these systems at MEK do not exactly adhere to a classification scheme, I refer to them as 'category systems' for the purposes of clarity.

until the current day[23] and concerns the majority of the museum's holdings. Another category system applies to the approximately 40,000 objects of the former European collections of the Ethnological Museum in Berlin, which were classified according to the traditional ethnographic approach based on so-called regions and ethnic groups (Karasek & Tietmeyer, 1999, p. 18).[24]

[23] As of October 2020

[24] For example, 'III d' means that the object came from the state of Thuringia. In Chapter 6, I will examine the index card of a lost object whose category number followed this grouping system.

1 Settlement and house types	36 Playground equipment
2 House and yard parts	37 Music and noise instruments
3 Apartment and room parts	38 Model and shapes
4 Heating and fireplace	39 Pastries and sugar confectionery
5 Lighting devices	40 Tools
6 Furniture	41 Professional tools and utensils
7 Containers	42 Professional devices
8 Vessels	43 Weapons
9 Small devices	44 Guild and commercial equipment
10 Kitchen utensils	45 Law and administration
11 Farm and livestock equipment	46 Trade and transport
12 Field and garden equipment	47 Time and weather meters
13 Laundry devices	48 Dimensions and weights
14 Hand tools	49 Medicine
15 Flax and hemp device	50 Popular belief
16 Spinning and weaving	51 Church objects
17 Home textiles	52 Ritual objects
18 Textile samples	53 Courses of the year
19 Cloths	54 Life cycle
20 Lace and insets	55 Death and burial
21 Trims and ribbons	56 Field crops and garden products
22 Rope, knotting and braiding work	57 Material samples
23 Laundry	58 Illustrative material
24 Baby equipment	60 Museum history
25 Men's clothing	61 Operations
26 Women's clothing	62 Writing and books
27 Children's clothing	63 Pictures from German museums
28 Fur clothing	64 Pictures from foreign museums
29 Clothing accessories and footwear	65 Visual folk creation (East Germany)
30 Jewellry	66 Commercial graphics
31 Plastic folk art	67 Documents
32 Painted folk art	68 Entertainment devices
33 Graphic folk art	69 Electrical devices and accessories
34 Handicrafts	70 Sport
35 Toys	74 Photographs

Table 4-1 The numerical category system being used at MEK

Table 4-1 summarises the broad categories of this category system, which were created to encompass the uniqueness, variability, and usefulness of the life worlds represented by the MEK's collections. The descriptors of broad categories are highly detailed. These descriptors, composed of concrete nouns, denote the world and sub-worlds in which the MEK's objects exist. This rigorous naming method implies that each newly registered object must find a home within one of these broad categories. When the explanatory terms used as narrower descriptors

express a priori categorical information about a subset of objects belonging to a larger group, as they do here, the system employs an a priori classification scheme.

There are subdivisions following alphabetical order, corresponding to different themes of the photograph. The sub-groups within category 74 (Table 4-2) get down into a remarkably elevated level of detail. This naming convention was created to increase the specificity of the themes or subjects to which the object relates; for example, 74 F is for portrait photographs, H is for children's photographs, and W is for animal photographs. However, this method of identifying sub-categories does not appear to be adaptable to new types or shared characteristics of new object families. Additionally, it cannot integrate well with other knowledge systems, even those using comparable classification schemes. While the system is extendable at any time when additional numbers or characters are added, the method by which new categories are created depending on local applications precludes this system from being interoperable. I will explain this issue in greater detail below.

74 Photographs			
A	Aerial photography	P	Collections / Bequests
B	Cityscapes		*Official letters*
	Tourist attractions		*Picture sheets*
C	Architectual photography		*Projection equipment*
	House types		*Documents*
D	Family photos		*Drafts/ drawings*
	Wedding		*Flags*
	Christmas		*Commercial graphics*
	Birthday		*Graphics*
E	Group photos		*Peepshow images*
F	Portrait photos		*Paintings*
	Studio shooting		*Measuring device*
G	Individuals		*Morality sign*
H	Children photos		*Musical equipment*
	School		*Paronamic pictures*
	Children's birthday		*Posters*
I	Job operations		*Collections*
	Factory photos		*Signs*
	Farm work		*Carvings*
	Work clothes		*Cupboards*
J	Labor movement		*Toys*
	Union work		*Carpets*
K	Public life		*Costumes*
	Railway station		*Doors*
	Commerce		*Event programs*
	Pub / Restaurant	Q	Landscape photography
	Showmen, circus	R	Military / War
	Social facilities		*Fascism*
	Street		*War postcards*
	Theater	S	Leisure
L	Folk festivals		*Club*
	Customs		*Holiday*
M	Youth movement / Youth culture	T	Genre photos
	Youth groups	U	Reproductions
N	Way of living		*Maps / Papers*
	House interiors		*Catalogs*
O	Technology		*Price lists*
			Newspaper clippings
		V	Exhibitions
			State Museums
			State Museum for Prehistory
			Photo exhibition
		W	Animals
		X	Photo and film material
		Y	Transparencies
		Z	Photo albums

Table 4-2 Groups and sub-groups within the category 74

Infrastructure studies scholars have already pointed out that what is considered a standard in one locale may be a source of confusion and disarray in another (Gasser, 1986; Star, 1991b). MEK's tangled institutional history becomes the cause of a confusing organisation of subject terms that, while appropriate at one point in time, is now insufficient or out of fashion. One

major disadvantage of this a priori classification system is that, although it is designed to meet specific user requirements, it cannot identify all possible significant properties of a primary group since some are unobservable at the time the system is constructed. New categories or subcategories must be introduced if a new object cannot be classified using existing broad and narrow terms. The objects observable at the time belonged to a 'totally different world', as museum director Prof Elisabeth Tietmeyer put it. She asked me and expected no answer, 'How would you classify the Sami people's shaman drums in Northern Europe using this classification system?'

The current classification system has drawbacks. The museum classifies its objects into 70 broad categories. The final category ('photographs') is numbered 74, and four categories are missing: 59, 71, 72, and 73. This void shows that category 74 was introduced later to allow the museum to catch up with completely new sorts of artifacts, which were then classed under the heading 'photographs'. Indeed, staff noted that all newly born-digital material and digitised items had been put under the predefined category 74. Jana Wittenzellner, a MEK museologist, recognised the problem and identified it as a common issue of the German museum sector:

> We struggle a lot with born-digital and digitised materials, because there is no adequate place for them in the current system. Not only MEK does. A lot of German museums are trying to deal with this. (Email correspondence, 15.03.2021)

By relegating category 74 to the end of the system and isolating it from the other categories, this system marginalises an entire new generation of born-digital objects and digitised materials and jeopardise their authenticity. These objects are grouped together in this final category, which does not reflect their intrinsic characteristics accurately. Classifying born-digital content as 'photographs' is incorrect, and there are no other appropriate categories. While international standards and guidelines for indexing and developing classification systems were not considered, additional efforts to design online search tools for museum collections would be unnecessarily time-consuming and labour-intensive. Scholars specialising in cultural heritage information retrieval have noted that subject searching can be the most difficult and yet most common type of search through online web services (Golub et al., 2022). In an era of digital catalogues and digitised collections, this antiquated and imprecise method of classifying objects can impede the efficiency of online search services, thereby limiting the extent to which museums make their collections available online.

Additionally, this unequal weighting of digitally created and digitised artefacts reminds us of the long-running debate over the value of born-digital and what constitutes a 'real' and 'authentic' museum object. The object-focused discourses of material culture posit that the value and meaning of a digital object are constrained by established rules originating from the material/immaterial binary (Crimp, 1993; Fyfe, 2004). As a result, the status of digital-born and, to a lesser extent, newly digitised material – as merely the 'visual surrogate' – is determined by the physical object standpoint's assertion that its digital counterparts are less valuable, as observes Cameron (2007). Some scholars of digital cultural heritage have criticised this position and advocated for the view that digital artefacts can exist independently of reproduction and interpretation and serve additional functions (F. R. Cameron, 2007). They believe that curatorial selection processes uphold the authority on the objects and enact a set of social relations that define what 'real' and 'authentic' is.

The high-level detail of terminology employed by the category system indicates the importance and relevancy of expert knowledge at the time this system was developed and widely used. Staff requires a special range of expertise – learning about the materials, artistic traditions, architectural sites, for example – to assign appropriate categories and sub-categories to museum objects. This range of expertise draws a distinct boundary between knowledgeable and skilled staff. While analysing old laboratory settings derived from seventeenth-century arrangements, Shapin acknowledges a distinction between a scientist (knowledgeable agent) and a technician (skilled agent): the scientist possesses the acknowledged authority and is 'in a position to define the nature, scope, and meaning of technicians' labour' (1989, p. 562). Similarly, the numerical category system used at MEK was designed in a *a priori* way that it is only museum workers with specialised expertise on pre-industrial country life and craft culture who know which category would fit an object. Given that at MEK, several types of staff members can share the similar responsibility concerning documentation work, it is understandable that a photographer specialised in digitisation, for example, would be confused by such a craft culture-based category system. The participation and engagement of such staff members with everyday work in the museum settings can be impeded by those static knowledge representation methods.

What happened to this classification system can be considered an irreversible situation. As with the technical interrelatedness of typewriter manufacturers to QWERTY (David, 1985), the category systems at MEK were entangled in a complex institutional setting, and the costs of switching to a different system became increasingly prohibitively high, impeding the

incorporation of an entirely new generation of objects. The current established cataloguing practices at this museum, which are difficult to reverse, can also be considered permanent, as they have been in place for decades. Most objects (around 225,000) covered would tip the scales even further in favour of the currently used category system. Even if a system change is necessary, it would require considerable amount of time and human resources and would be a considerable setback for the efforts of the museum to make the majority of its holdings publicly accessible online. When asked why no one had attempted to modify or replace the current system, Jana suggested that a change across 287,000 objects could not be done without some automated supporting processes, such as a barcode system:

> And with inventing a new system: every object has its number written on to identify it. If we invented a new system, we would have to change it for each of the 287.000 objects, it would be a mess. Our numbering system is already one of the most complicated in SPK because of the two museums reunited in 1990 and the different kinds of systems we already had before. I think, we'll have to wait until every object has a barcode or something similar, before trying to invent another system. (Email correspondence, 15.03.2021)

'Category 74' shows how standardised tools and procedures at the core of knowledge representation relegate essential entities to the periphery. Being added as the final item of the long-used category system, category 74 was initially used for photographs and titled ever since as the 'photograph' category, but it in fact covered everything from born-digital to newly digitised materials. The category's 'on the fringe' location undermined the authenticity of the whole new generation of digital objects being added to it ('there is no adequate place for them').

Documentation work in a museum is shaped by working conventions of multiple lines of work: conservation, preservation, photography, and curation. The category system as a whole and the category 74, in particular, were not developed by isolation. They emerged as a product in use through and by constant collective reworking and accommodation (Bowker & Star, 1999). The numerical category system has persisted over time and has been used until the current day. The taken-for-grantedness of category 74 becomes a source of uncertainty and ambiguity for MEK personnel. A museum's category system establishes a standard that all staff must adhere to. However, they found doubts in classifying born-digital materials using the same category system for traditional forms of content. Employees who have knowledge on the materiality of objects were not involved directly in the negotiation of object authenticity and invited to have a voice

on how this knowledge should be represented. Museum staff who deal with documentation are individuals who carry out the selection process and determine what is significant, but they do not have the ability to command what should be remembered and how. With the exclusion of both (1) the everyday knowledge of staff and (2) the boundaries of professional roles set by the organisational structure, the existing standards become over time quasi-standards: norms and rules are taken for granted.

While unclassified and non-standard entities, such as born-digital materials and digitised museum objects, are not treated the same as their physical counterparts. They may eventually become even more marginalised. When certain standard tools or procedures have been taken for granted for an extended period, as in the case of Category 74, marginalisation becomes natural. This problem resembles what David (1985) refers to as an 'irreversible situation' when he discusses how the quasi-irreversibility of investment occurs when the costs of switching from one widely used tool or standard to another are so high. At MEK, creating a new category system would require changing the category of each of 287.000 objects, including all incorrectly added born-digital and digitised materials. According to a curator, this would be a 'mess'. This 'mess' is the result of the marginalisation process, which involves taking ineffective standards for granted and pushing essential entities to the periphery. The direct cause of the mess in the case of Category 74 is that non-standard but ubiquitous entities were not properly classified.

Classification appears to be a spatial and temporal segmentation of the world (Bowker & Star, 1999). The numerical category system being used at MEK has defined the boundaries of what constitutes authentic objects. All digital material and digitised resources are classified as 'photographs'. The improper grouping and forced displacement of category 74 have created ambiguity for staff members in their daily activities. When an infrastructure system 'learns' to recruit new members, this process always occurs in the background, where the spatio-temporal boundaries are re-created and negotiated. Any technical or social solution aimed at integrating these neglected entities – i.e., a systems approach to participation – will not change their qualities. A new bar code system would aid MEK staff in verifying the object's details more quickly. It would save staff considerable time sorting through the museum's convoluted numbering system. (Two numbering systems must be reconciled if the museum's holdings are to be reorganised.) However, bar codes or 'something similar' is a temporary fix; the long-term solution, as suggested by a MEK museologist, would be to 'invent another [category] system'. The qualities

of the neglected things remain thus unchanged as long as the pervasiveness of standards is still tolerated.

In this section, category 74 at MEK is used as an example of a taken-for-granted component of infrastructure. The case highlights two reasons why replacing the existing system with an alternative is difficult: its embeddedness in a complicated socio-technical arrangement and its on-the-fringe placement. Initially reserved for photographs, this category evolved into a catch-all for all things digital, including born-digital and newly digitised materials. The analysis of standardised category systems at MEK shows that the expansion of infrastructure or phases of infrastructural development should be compatible with current work practices and require minimal changes to the technological base. Bringing neglected categories to light, the analysis shows how the meaning and construction of object categories and subcategories are entangled, as they interact to form a 'flat set of compatibilities' (Bowker & Star, 2000, p. 158). This set of compatibilities enables the construction of rich and nuanced narratives about what occurred prior to the scaling up of infrastructure, narratives that are not determined by dominant entities and voices within the organisation. The chapter details how less prevalent human and non-human actors can be prevented from actively participating in the construction of the museum worlds they inhabit.

Conclusion

This chapter examined a common set of issues that stem from the hierarchical organisational structure and impair the ability and willingness of museums to initiate change. It identified two primary areas of institutional legacy – the hierarchical organisation structure and standardisation – that can influence the capability of infrastructure to be hospitable to new technical and social components. In the first section, the discussions of complex organisational structures at SHM and SPK demonstrated how museum staff might encounter contradictions and tensions that expose and call into question museum boundaries, thereby shaping and impeding professional roles within concerted efforts toward digital transformation. The case of SMB exemplified the breadth of the challenges that museums can face in re-aligning themselves as places of dialogue and participatory interaction. The analysis of standardised category systems in the second section showed that the expansion of infrastructure or phases of infrastructural development at MEK should be compatible with current work practices and require minimal changes to the technological base.

The following chapter delves into the contribution of less dominant actors in the museum settings: everyday staff, as well as their goals and intentions. Its objective is to highlight how employees performing laborious tasks can disengage from the discursive construction of the social world they inhabit. Concentrating on everyday practices at the background of museum work, especially where information architecture is maintained, the next chapter also looks at the role of background work and people who perform it in enabling information to flow freely throughout the organisation, informing decision-making processes and coordinating diverse teams.

CHAPTER 5. BACKGROUND NATURE OF DOCUMENTATION WORK

This chapter is set out to clarify an important facet of what constitutes the background work of memory-making practices in museums: the maintenance of infrastructure. It highlights that maintaining order and providing proper care becomes a part of background work routines. It also shows that while documentation work at MEK and SMB constitutes the backbone of the informational fabric, various groups of everyday museum workers carry this type of background work. These workers can be curators, photographers, and museologists. They conduct tasks beyond their formal roles and responsibilities to avoid any detriment to the daily operations of the museum and its objects. By examining the background nature of documentation work in museum environments and how mostly 'implicated actors' carry it out, this chapter continues to use an infrastructure-based approach for disentangling the complexity and multiplicity of museum work in the back-stage. This approach is found helpful in analysing cases at MEK/SMB, involving informal work arrangements, hidden layers of incompatibility that result in structural issues in object management and uncertainties of everyday staff. By examining the interconnected issues of control of data quality, standardisation, and intuitive shop-floor decision-making processes, the chapter points out how a variety of data management issues can contribute to staff disengagement with new technological adoption at MEK/SMB.

This chapter presents the case of background work at MEK/SMB, drawing on ethnographic material from my fieldwork at MEK, an SMB museum member. It has three core parts. Section 5.1 presents how rules and constraints are embedded in the local setting, and their enforcement is entangled with the intersections of multiple lines of work. These two factors influence the scope of background work at MEK: where it happens, and who performs it. Section 5.2 delves into the ambiguities and uncertainties from the museum staff who carry out back-stage activities, particularly support and maintenance work. It demonstrates how these activities and the uncertainties alongside them are intertwined with hidden assumptions, biases, and shifting value hierarchies in museum institutions. In Section 5.3, I show how minor, repetitive tasks performed by the back-stage actors have a significant impact on the local practices of the museum. These activities have decisive effects on the smooth functioning of institutional memory making, in that they ensure that decision-making processes are well-informed and that different teams work cooperatively and are well-coordinated.

5.1 WHAT IS BACKGROUND WORK AT MEK?

The prevailing misapprehension suggesting that the museum profession primarily revolves around exhibition spaces underscores a tendency to unequally attribute importance to various facets of museum work, often contingent upon their degree of public visibility or 'publicness'.[25] This misconception may reinforce the long-standing division in the museum sector between curator-museologists, whose job it is to ensure that objects are well displayed, and other segments of the museum profession, who are responsible for ensuring that the collections and museum's functioning are in good care. Boylan (2006) finds that the latter group, i.e., museum employees who do support work or technical work, have been increasingly contracted out to private-sector services due to the sector's rapid move toward decentralisation and privatisation in many countries that break down the traditional structures. This trend contributes to further entrenching local work practices rather than nationwide efforts to transform the museum sector, such as upskilling digital literacy of the museum workforce.[26]

The emphasis on publicness rather than task, as well as the trend toward decentralisation and privatisation, help draw a dividing line between the type of work that is visible and considered vital, and the type that is invisible and thus rendered on the margin and unimportant. The second group is increasingly regulated and penetrated by the first, and more dominant, group in the age of social media, remote audience, and 'citizen curators' (Proctor, 2010). The invisible type of work, embedded in localised relationships, becomes more likely to be influenced by the larger political effects of infrastructure. The actors who perform it, as well as objects and relationships that it organises, are thus more 'easily relegated to the marginalia' (Slota & Bowker, 2017, p. 545). That is why certain infrastructure scholars focus on the politics of categories, placing such an emphasis on neglected entities, both human and non-human. These scholars contend that it is those invisible work and peripheral visions that lay substantive effects on organisational realities (Bowker et al., 2015; Bowker & Star, 1999; Puig de la Bellacasa, María, 2011). In this section, I build on this line of work about infrastructure invisibility to demonstrate that once an action is inscribed in infrastructure, not only does the background work – documentation-related

[25] The notion of 'publicness' of memory institutions mentioned here is in line with the modern forms of being exposed in public space, observed by José van Dijck. In addressing the transformation of public space in the age of social media, van Dijck (2015, 5) emphasises the current 'reorganisation of publicness', in which social and cultural activity becomes inextricably linked to the 'techno-commercial infrastructures of social media platforms'.

[26] This is also true at MEK. Later in this chapter, I discuss the 'train the trainers' program, an informal training procedure used by SMB to familiarise employees with the new documentation system.

activities and support work such as repair and maintenance – become invisible, but it also expands the scope of importance for the actors who perform it, who are likely to have been forgotten previously.

Consider the case of Theo,[27] a photographer at Berlin's National Museums (SMB). His daily responsibilities, according to Theo, included photographing larger objects such as paintings, statues, and manuscripts. Following that, his colleagues would enter the data into the museum's documentation system. 'Now we just don't have enough people to do all the stuff [of data entry]', he suggested. Theo was not assigned to work with the museum documentation system (MDS) on a daily basis, but in order for his job to run smoothly, he must manage the data input process and sort the files and folders himself. These documentation-related tasks were part of his daily routine. Theo explained the implicit rules he established for the small photography team, which consisted of himself and another colleague:

> I only take pictures of objects that do have a number and basic information in a basic data sheet in the database. So I don't take pictures of, say new objects, and then in two or three months, someone will ask, oh, did you link the files with the data sheet? I didn't know there was a data sheet. So I just want to know beforehand that the data is there, and then I get the object and take a picture immediately. And for me, it's finished. I don't have to remember. Everything is consistent. And I don't have to remember in three, five months, that there is still one thing waiting for me to be linked. So that keeps everything a little bit easier and cleaner and easier to be controlled. (Interview [SMB1], 2020)

At MEK, the curators, museologists, and conservators are considered the core staff members responsible for the physical care of objects. These employees can be considered, in the traditional sense of the museum profession, as employee-curators who model their work primarily on the activities of the 'traditional connoisseur private collector or a specialist academic researcher in their chosen academic discipline, whether this be art history, archaeology, ethnography, geology, or whatever' (Boylan, 2006, p. 418). A lack of an important node in museum work in the back-stage – an official documentalist, shows how documentation got disproportionally little attention and was allocated fewer resources than other front-stage activities.

[27] Anonymised name

One of the foundational missions of any museum institution is to care for its holdings. Documentation plays a crucial role in accomplishing this mission. Documentation work consists of straightforward tasks such as identifying the object, photographing it, inputting object details, and storing them in an organised manner in the system. Documentation-related activities can include cataloguing, classifying, object management and representation. These activities and the tools and systems that support them constitute the informational backbone of museum infrastructure. Proper upkeep of this backbone enables the institution to avoid damage to its holdings and bottlenecked collections management concerns. However, MEK lacks official documentalists and specialised staff dedicated to tasks related to cataloguing and object data management, such as transferring information from index cards to the digital catalogue or verifying data consistency. This shortage of trained workers explains why museum staff members from a variety of professions – curators, educators, textile restorers, and photographers – must perform a variety of documentation-related tasks on the side.

These tasks are unavoidable in the back-stage of museum institutions, where various lines of work intersect but frequently no single line is responsible for the informational fabric's upkeep. Through cross-social world interaction, each line of work gains instructive experiences in object and metadata management, and these experiences collectively guide staff members to do things better together. For example, taking the very details of each object requires close-up attention from intersecting groups of staff. Theo describes a typical procedure of taking photographs of museum objects:

> **Interviewer**: Normally, how many people do you need?
>
> **Theo**: I have to coordinate with [name of colleague], a museologist. Many requests start with her. She talks to me, hi, we have been given that, do you have time to do it, we need it in two weeks. Often she can bring me things. But sometimes we have to talk to the conservators. They have to take a look at the object. Is it possible to transport it? Do they have to do something before I can take the pictures? So these are the two parts. One person starts getting the request and talks to me about the time schedule. And secondly, optional, the conservator will say okay, I have to do something with it, or not okay, I just have to clean it a little bit, or you can have it in this time slot and do we have to bring it, etc. It's a team of two to three people, including me, who are in charge of a little project. (Interview [SMB1], 2020)

The interactional processes required to make sense of each actor's actions are essential in institutional memory making. Stefan referred to photographing objects as a 'small project' that he collaborates with museologists and occasionally conservators. The division of labour in the SMB case of photographing objects is based on the nature of the job: photography, museology, conservation, and preservation. The photographers are responsible for the photographs, the museologists for the workflow and sending the photo request, and the conservators for keeping the object physically safe. Taking care of objects is not the responsibility of a single staff member or a single team. It unfolds as a space for negotiation and constant attempts at 'working things out' – interactional activities by which 'arrangements are established, kept going, and revised' (Strauss 1993, p. 88). These 'working things out' activities necessitate negotiation between departments and working groups and settlement between human and non-human entities, such as between everyday workers and IT systems, data management protocols, and object data sheets.

By performing additional duties not specified in their job title, such as documentation-related activities, everyday workers prevent the museum's institutional fabric from becoming fragmented. The tasks that go along with these responsibilities are part of the background work that museum workers need to perform on a routine basis. These are routine tasks that staff must perform in order to avoid breaching the museum's operation and any detriment to its objects. When asked what tasks consume the most time during her workday, Tanja, as a scientific staff member, responded:

> I think when you add an object to the collection, that's the most time-consuming task, because you have to give an inventory number to the object, then you have to fill out all these different fields. And if you do this properly, it can take up to two hours, I would say, for one object. You have to measure it, to describe it. You have to give the background information, the context and all that because the better you do this, the more useful the object will be for future generations. And because what we currently suffer from is poor documentation in the past, and so whenever I add an object to the collection, I try to be very thorough, and really take the time to document it very well but that does really take up a lot of time. (Interview [MEK3], 2020)

The need for background work is motivated by 'poor documentation in the past'. As there had not been sufficient protocols on how to measure each type of object, and standards on how to document that sort of information in appropriate data fields, adding a new object to the digital

catalogue became very time-consuming. The meticulous and burdensome task of adding a new object and entering its metadata, which according to Sophia 'can take up to nearly two hours', turned itself to be a standard or a cascade of standards: give the material an inventory number, measure the object (now as the material becomes an object), describe the object, give the background information, and fill out many different fields (where the object comes from, for example). This cascade of standards is there for staff to fulfil the requirement of the formal organisation – filling in the object's information was always part of a museum worker's job. [28] The task of entering object information is considered to be complete as long as every field is completed. The metadata fields should be filled out carefully and meticulously, and ready for use by other staff members. Maintaining metadata becomes a collective responsibility so that other staff members are not burdened by the redundant work of filling in various fields of object entry.

Meticulous and laborious tasks such as those discussed above are examples of aggravating the materiality of intersecting social worlds. The background work discussed in this section contributes to the construction of museum work-worlds. As a social world exists 'only in and through communication' (Cefaï, 2017, p. 178), a museum work-world exists in and through back-stage negotiation, interaction and the intervention of good hands. Filling out object details and taking the time to document it 'very well' constitute a fundamental unit of communication required to produce the right pieces of knowledge that are at the heart of information work in any GLAM institution. As long as each field is completed in its entirety, in whatever manner that is accomplished, the task of entering object information is considered complete. The metadata fields – a useful piece of knowledge production – should be meticulously filled out and ready for use by other staff members. Maintaining order in metadata is a collective commitment in that it entails a responsibility to professional identity on the part of other staff members. I will attempt to pinpoint the source of that responsibility in the following section by examining data management issues at SMB, the National Museums in Berlin, of which MEK is a member.

[28] Standardisation can also set the boundary and exemplify the power dynamics embedded in the marginalisation of entities on the periphery. This will be discussed in greater detail in Chapter 8.

5.2 BACK-STAGE UNCERTAINTIES

A set of organisational barriers concerning documentation work could implicitly result in moments where the infrastructure face possibilities of failure. Redundant data, for example, can cause irritation, when a staff member corrects incomplete information in the same fields for a group of object entries in the system and then other staff members find it inconsistent with information for the majority of objects, which had been input manually in a wrong way. The informational backbone of museum infrastructure becomes fragile and fragmented in ways that could discourage the engagement of both staff members who do essential object-related tasks and those who only 'walk by' the system, i.e., they add or modify an item field because they simply do not want a messy order.

The Museum of European Cultures (MEK) and other members within the National Museums in Berlin (SMB) were in the transition phase. They were migrating the catalogue data from MuseumPlus Classic to MuseumPlus RIA and underestimated the complexity of data migration. The data migration was a surprisingly large undertaking and caused many problems for staff. Some curators and museologists had to carry out, in addition to their primary responsibilities, extra data-related tasks: to oversee the data transfer from the old to the new system and to ensure the quality and consistency of data. Keeping old and new data consistent was extremely time-consuming because the staff had to do it manually. They must check data consistency in most of the fields necessary for curating activities, such as the giver/donator of an object, keywords, and tags for the object. There were no explicit rules on data patterns and degree of completeness. There were also no tools to automate this process to ensure the quality of incoming data is checked the moment it comes in. The same set of organisational obstacles is derived from the lack of IT-specialised human resources as discussed in the previous section, leading to the tendency of the core staff at MEK, i.e., curators and museologists, to be overwhelmed with the informal yet important tasks.

At the end of my third fieldwork phase (late October 2020), both versions MuseumPlus Classic and MuseumPlus RIA were being used simultaneously within SMB. As Frank von Hagel, documentation expert working at the Institute for Museum Research, one SMB member, observed: 'we are just in front of a change of our system' (Frank, Interview [IMF], 2020). As mentioned, there were seventeen museum members within SMB. All these museums use the same documentation systems, provided by the same company called 'zetcom', but input data in

different ways. Even though all SMB members use the same documentation system, many data-related issues are not about the system in individual museums; the new RIA version can import large databases and is backward compatible. Rather, the robust structure of SMB causes data-related issues. Without strict procedures of quality control, data-related problems such as incomplete or inconsistent data can easily happen. This collection of issues demonstrates an unwillingness to address data and metadata-related issues.

Inconsistent data

Consider the basic information panel for an object entry in the SMB's old MuseumPlus 6.0 digital catalogue system (Figure 5-1). Most fields are text-based. In comparison to drop-down lists, the free text format enables the user to freely enter data. While the free text format allows for greater flexibility in terms of input content, it severely restricts quality control in a systematic manner. If the system administrator wishes to display an error alert when invalid data is entered, they must establish explicit rules for what constitutes invalid data. It is challenging to create rules that apply to all seventeen museum members. Thus, the free text format acts as an implicit writing rule: it specifies how information should be written in a data field, but also that the information is free text. It is not technically possible to ensure that the user always uses the

correct terms. There is no centralised editorial that oversees, for example, the vocabularies and writing rules for person names or the object's history.

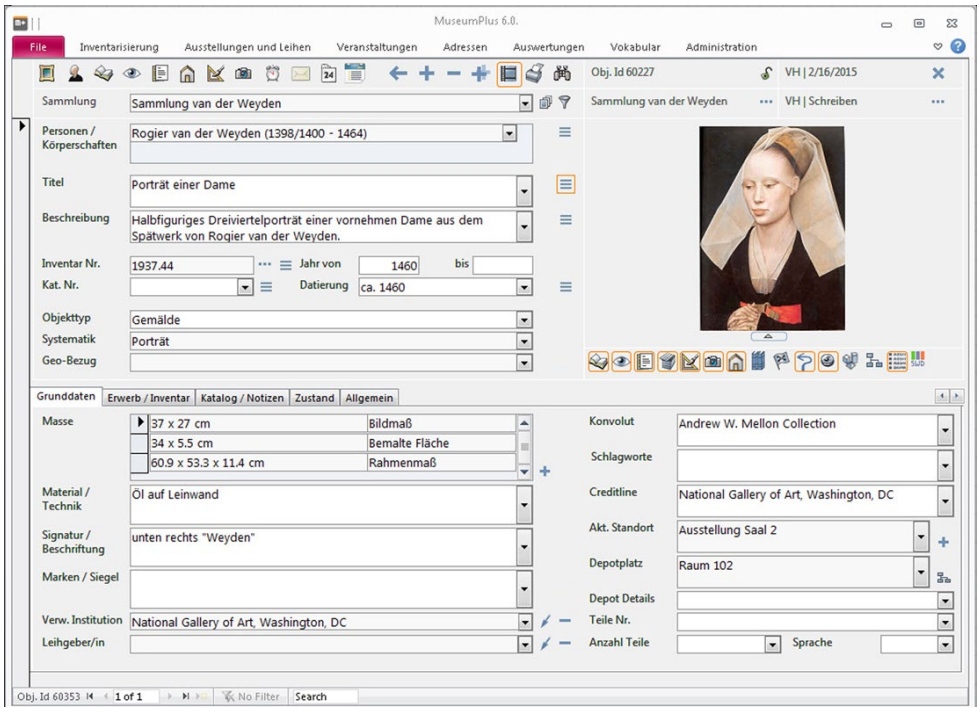


Figure 5-1 Object overview panel in MuseumPlus 6.0, zetcom website

That each SMB museum member has its individual local needs prevents any effort of data synchronisation. The provenance information of the object locates in the tab 'Erwerb/Inventar'. To provide information about where they got the object, staff at MEK used to put in the name of the person, whether it be a photographer, a collector, or a private donor. Other SMB museums nevertheless answer this question in another way; they want to put in 'the means of acquisition' such as purchasing, receiving as donation, receiving from an auction or a private person. According to Tanja, the Directorate General team at SMB, who was responsible for the MDS of all 19 museums and institutes, once decided to have in this field a drop-down list of three options. This decision received complaints from some museum members, and finally it had to change this field's format in the software. Tanja,[29] a MEK curator, expresses her impatience in dealing with the field indicating where the object comes from:

> We [at MEK] always filled out the name of the person that we received the object from. We have, say, 50,000 different entries, depending on the fact that we got objects from

[29] Anonymised name

> 50,000 different people. But then there are other collections who use this same field as a list field. Then all the different museums have to agree on how the field is being used in the new system. And if the majority says, we only want these four options in the field, then we have a problem, because as I said, we have 50,000 different entries in this field. (Interview [MEK3], 2020)

As Tanja mentioned, the most prevalent issue was inconsistent data. Since each SMB museum members enter data into MuseumPlus in their unique way, it was challenging to get all 17 institutions to agree on 'the parameters for each field'. While they were unable to come to an agreement, the centralised, integrated documentation system became unmanageable on an individual level. The second set of structural problems discussed below exacerbated this recurrent loop of data inconsistency and an overall lack of agreement.

Incomplete data

Incomplete data is a similar issue to inconsistent data. This issue is common in almost all sectors of cultural heritage that deal with collections management on a daily basis. An illustration of this is provided in the catalogue entry for the object designated 'II A 3763 ,a-c' (sic) (Figure 5-2). This object was discovered in the basement of the museum by a curator who thought it might be helpful for her preparation concerning the upcoming exhibition on the Spanish region and city of Murcia.[30] According to the museum's website, the exhibition aimed to connect 'Murcia's past and present'. The exhibition's primary source of material was '[d]ocumentary photographs of European and non-European immigrants shed light on the subject of migration in Murcia'.[31]

[30] At the time of writing, the exhibition 'Murcia: In Europe's Garden' was scheduled to run from 6 August 2021 to 27 February 2022. Interviews with MEK staff members took place in October 2020.

[31] See on the SMB website, https://www.smb.museum/en/exhibitions/detail/murcia/


Museum
Europäischer Kulturen
Staatliche Museen zu Berlin

Objektbezeichnung
Kapuzenmänner (3) der Karprozession
Titel

Identifikations-Nr.
II A 3763 ,a-c

Datierung

Geographischer Bezug
Spanier (Ethnie); Herkunft (Allgemein): Murcia, Spanien
Personen/Körperschaften
kein Eintrag
Maßangaben

Material/Technik
Ausgabe: Pappe
Zustand

Kurze Beschreibung
Kapuzenmänner (3) der Karprozession in verschiedenen Größen und Farben. Festzugsgabe.

Figure 5-2 Catalogue entry of the object 'II A 3763 ,a-c' which staff exported to a text file.

Two colleagues of Tanja found this object by accident because the keyword 'Murcia' was indicated in the geographical information field. In fact, Tanja could not find this object in the first place: 'I was looking for every object from the Spanish region I could find, and I didn't find this. I don't know how they found them by accident. And I don't know why I couldn't find them […] we just don't know' ([MEK3]). Moreover, when Tanja looked for the catalogue entry of this object in the digital system, she could not find any information about where the object exactly came. It was this hole of information that irritated her:

> Like yesterday [when she looked for the information], I was so shocked because there's nothing. Nothing. But I had to find it. Okay. Yeah. I know. I know where it is. Ah, okay, it's already here. Let's see, it says 'Spanier (Ethnie)'. And that they took the photo this week [in October 2020] in the basement. It wasn't there before. And it says nothing about when does it come? Where does it come from? How did it come in? Is there any information? Kapuzenmänner is like men with high hoods … in different sizes and colours. What kind of information is this? Nothing? No date. (Interview [MEK3], 2020)

As illustrated in Figure 5-2, the geographical reference field contains the phrase 'Spanier (Ethnie)', which is incorrect on any level because 'Spanish (Ethnic)' cannot be used as a geographical reference. The brief description field indicates 'Kapuzenmänner', which are men

wearing high hoods – as we see in the picture, in various sizes and colours. 'Karwoche' translates as 'Holy week', and thus 'Karprozession' refers to the public march held during the final week of Lent, the week preceding Easter. The object's sole input data provided little, if any, assistance to the staff responsible for its care. This lack of basic information was discovered by accident by staff, but it does not necessarily mean that the majority of MuseumPlus's 130,000 objects at MEK have similar issues.

It is true that unsupervised and unclean data input are frequently encountered in the museum world. Data that is not usable is frequently the result of a lack of a data manager who verifies the information, or the failure to adhere to established rules and conventions for putting data into the system in the first place (Turner, 2020, p. 169). The label 'Spanish (Ethnic)' suggests that the indexer followed a specific standard regarding geographical or ethnic information. However, the fact that it was placed in the wrong field indicates that this method of entering data was out of date or inappropriate at the time. Furthermore, this issue could potentially apply to a large number of object entries that already existed in the MDS, in the tens of thousands. That explains why the unseen work of verifying object data and making it usable has become so important in the modern museum world. Performing this task required not only a significant amount of manual labour, but also an elevated level of specialised knowledge concerning cataloguing and art-object classification.

Mistake cycles and staff disengagement

When I heard Tanja's story about the Kapuzenmänner, it was plausible that many of her colleagues who dealt with object information daily shared a similar concern about inconsistent object data. These issues became obstacles in the way, causing bottlenecked problems in collections management, as the launch of the new cloud-based, SMB-wide system was further delayed. Was there any concerted effort from the centralised agency, SMB, to facilitate the data migration phase? Three SMB employees I spoke with mentioned the motto 'train the trainers' in reference to the informal training procedure for the new documentation system at SMB. Each SMB museum was assigned two staff members to attend a monthly meeting convened by the GD to raise any concerns or point out errors. One member of the GD gathered these concerns and devised solutions. However, the staff is concerned that the 'fixing' will affect other software components.

The two allocated members would then train and supervise other museum staff members in the data migration process. They would be required to respond to questions about MDS posed by their colleagues. According to two staff members I spoke with, this approach was called 'learning by doing'. At MEK, the 'trainers' were formally assigned to a curator and a conservator. They simply did not understand what individuals required in order to be trained. As one conservator observed, 'how can you train if you only just have gotten familiar with the new system by yourself'.[32] There are still things that staff who look after the objects must 'learn by doing'. The trainers could not impart their method of 'learning by doing' to others, and it was equally difficult for them to absorb in a systematic manner what their other colleagues had learned through their own approach of 'learning by doing'. The SMB photographer described what he felt about the training procedure:

> **Interviewer:** And [Theo's colleague] was trained for the MDS?
>
> **Theo:** The problem is like you get training in Photoshop. And then they say, okay, here's the rest of your class, tell them how to do it. Then you're like, Okay, but no, it's so complex. You have so many different people, someone working in this task, another in another task. You get an overview in this training. But actually, you have to know all the special questions and possibilities. In this case, it's called 'train the trainer'.
>
> **Interviewer:** Do you have the expression in German?
>
> **Theo:** No, it's just 'train the trainer'. (Interview [SMB1], 2020)

With such structural issues discussed above, it was inevitable that the new system launch would be delayed. However, as Tanja noted, they cannot simply delay because the fixing will never be completed. Sometimes, staff became exhausted and desired a break from these extra meticulous tasks, as Tanja remarked later in the conversation:

> You don't care much about it [the detailed mistakes]. You have the system on top of everything. So you spend your time to get yourself familiar with the system rather than to find small mistakes. It's just impossible to deliver a version free of mistake. (Fieldwork notes, from an unrecorded conversation with Tanja, MEK, October 2020)

There will always be metadata issues if there are structural ways to make errors. Occasionally, a structural mistake results in the emergence of a new set problem. Numerous objects acquire incorrect information in a specific field, necessitating correction. The staff must return to that

[32] Unrecorded conversation with Tanja, MEK, October 2020.

field in the old system and modify it. Then, there are novel issues with the newly corrected field in relation to other objects' metadata in the new system because many objects had previously been entered incorrectly.

This mistake circle makes the staff reluctant to see the new system being launched, and afraid of object data and information publicly available. They could only determine which fields in the new system were inaccurate – data was entered in the incorrect field, or there was insufficient information – by manually going through. As demonstrated by the case of the Kapuzenmänner (Figure 5-2), it was a random test and check procedure, as the staff needed to understand what they were looking for in order to locate the specific object via the search function. Even if they discover an incorrect field, staff members can only modify one entry at a time. And this could also result in a new cycle of mistakes. Staff was irritated by the combination of additional, labour-intensive tasks, and never-ending concern about data quality. As a result, the new system, entangled in data handling issues and cycles of mistake, became a source of staff disengagement. The staff members feared that if someone made drastic changes to multiple fields in the system, they would simply create a new cycle of data inconsistency. The traditional methods of data entry to which some of them were accustomed would vanish with the beginning of a new system.

When I first met Tanja and she showed me how the documentation systems worked, Tanja expressed such a concern: that once SMB officially launches the new system, no one will remember how the old documentation system looked, and anything lost in the new database will be 'lost forever'. The fear that everything the staff does, on a daily basis, is about to get lost – in a cloud-based, cross-institutional environment – is also an indication that the ambiguities and uncertainties mentioned earlier are the realms of the invisible workers. I will refer to these workers as implicated actors in the concluding section, as they lack a strong voice to influence the discursive construction of the museum work-world they inhabit. I will demonstrate that the emerging habits resulting from back-stage ambiguities and uncertainties constitute the practice of 'keep things in order', [33] and over time develop into 'rehearsed skills', or the habits that infrastructure instils in its users over time.

[33] This phrase is borrowed from Tanja ([MEK3]). In response to a question about the most difficult tasks associated with the transition of the documentation system at MEK/SMB, she stated: 'We have over 285,000 objects, and we have only one person to keep the database in order.' This 'one person' refers to the museum employee who is responsible for the new documentation system on a rotational basis.

5.3 IMPLICATED ACTORS PERFORMING BACKGROUND WORK

The sections above present the invisible aspect of behind-the-scenes, documentation-related tasks that are conducted by staff in their daily routines. On the surface, these tasks are not formally recognised in the official titles of the employees who perform them: curator, photographer, museologist – but not, for example, documentalist, or archivist. Within a well-established organisational structure such as that observed at SPK, documentation work tends to be less conspicuous as everyone contributes to a significant portion of it, without recognising it as a formal aspect of their role.

At SPK, there are instances where staff members are doing some parts related to maintenance and support work and doing them daily but tend to consider those parts as informal tasks. A digital officer at SPK explained the difference between what other people should expect of their role ('the short description') and what they are really doing ('my main position'*)*:

> the short description that we usually give to our job is to coordinate the development of digital strategy, and to initiate separate activities to implement a digital strategy even if it isn't finished yet. But my main position and [name of colleague]'s – not really side job, but additional responsibility – is to coordinate a project. There are individual decisions. Within IT governance, decision process is designed for the IT-resource part of the project. Nearly every project today has some IT components. (Interview [SPK1], 2020)

The digital officer indicates that some of their responsibilities are not the same or at least in line with the formal job description they would give if anybody asked them. Also, these activities they engage with on a daily basis cannot be described as a supplementary source of income ('not really a side job'); rather, they are understood as extra or implicated tasks ('additional responsibility'). Being excluded in the job description and being not valid as 'side job' make these tasks informal.

Nonetheless, staff must perform these tasks with care – in a mindful and elaborate manner – because they are either requested to do so informally or are required to do so to improve their workflow in the future. I discussed in the previous two sections why these tasks are performed invisibly and informally by shopfloor, back-staged museum workers. These tasks and duties are implicated in the sense that they are physically present but made invisible by other, more formal tasks, such as those indicated in the official job titles of the employees; however, these tasks and

duties add value to the daily operations of the museum by helping preserve its informational fabric and improve existing staff practices. It has been shown in the previous chapter that in a robust cultural organisation such as SMB, the multi-layered hierarchy and a centralised form of authority control can cause the tendency of shop-floor staff to do multiple tasks. In Theo's case, his official title is SMB photographer, but one of his primary informal responsibilities is to oversee the documentation system of the museum where he is based. (Two curator colleagues share with Theo the work, which is also an informal responsibility for them.)

The key role of Tanja, as a curator at MEK, is to prepare for new exhibitions. There are conservators at MEK whose primary task is about collection care. When I did my fieldwork at MEK, Tanja was searching through the current holdings of the museum for relevant objects to prepare for future exhibitions. The discoveries made by chance could intrigue a new line of ideas. As she described her work routine, the primary role of this curator is entwined with incidental tasks such as arranging for restoration, enlisting colleagues to take photographs, and identifying and recording items. For identifying and recording items, staff members are frequently required to 'double check' the information in the digital catalogue with the information on the index cards. In Tanja's case, daily care of museum objects entails paying close attention to details such as the physical condition of museum objects and how object information is stored and managed digitally. The coordination aspect of these caring responsibilities emphasises the need of the curator to 'work through' multiple contexts and various museum work-worlds – those of museologists, conservation and restoration specialists, photographers, and documentalists.

A particular aspect of these informal duties in the back-stage is that they are considered by museum staff as part of the job. By calling these duties 'background work', I refer to everyday doings that staff need to perform to avoid detriment to the institution's functioning and its objects. The MEK staff members I talked with were caring for the museum objects. What irritated Tanja the most was not the overwhelming list of 'extra' tasks and back-stage duties. She was dissatisfied with the information concerning 'II A 3763 ,a-c' and other objects in the same grouping, which was disorganised and carelessly managed:

> **Interviewer:** Maybe if we have a few minutes, you can show me the index cards.
>
> **Tanja:** Yes, sure. Actually, I love the whole [pause] I love the index cards. And I love the whole process of trying to get the information better and stuff. It's just so much work and so little time. But if I could, I would be very happy with, for example,

> [verifying] the geographical names and trying to make the data better. I don't know. I think it's because I love it when everything is in order. (Interview [MEK3], 2020)

Tanja was not explicitly asked as part of her job to validate 'the geographical name' or to simply improve the data; this would have been the responsibility of a specialised employee such as an archivist or documentalist. Tanja develops a habit of caring for details and obtaining additional knowledge because she views these tasks as an expected part of her curator job. This habit exemplifies the type of activities to which Star and Strauss consider as 'an act of love' or 'an expression of a natural role' rather than work activities in rationalised models of work (Star & Strauss, 1999, p. 10). The blurred boundaries between visible and invisible, formal and informal, are made possible because the curator's professional role and associated responsibilities, as a form of industrial labour, are difficult to define in the museum's entangled back-stage setting. At MEK, the job of collections management is hardly describable and rationalised, as it is difficult to break this work down into component tasks.

The practice of caring for object details is implicitly acquired in the back-stage setting, which is entangled with multiple lines of work and, increasingly, layers of incompatibility between the existing installed base and the new components of infrastructure. In modern-day GLAMs, databases and support systems have replaced manual labour in performing substantial portions of tasks. The new rules and constraints, brought by the 'replacement of memory by procedures [extending] to a formal information processing', lead to an obscure and incomplete knowledge of what stays inside the system and how it processes things (Bowker, 2005, p. 8). Without confronting the infrastructure's failure, staff would not see which steps are about to be broken in the chain of daily operations. Nobody would need to teach any other colleague always to double-check the details of an object when they come across it in an electronic catalogue. Tanja simply tried to improve the data quality as she observed that the fields in cataloguing entries were disorganised.

As evidenced by the responses to the question about the most challenging aspect of daily work, MEK staff regularly deals with data inconsistency. The practice of 'keep things in order' becomes a 'rehearsed skill', i.e., a habit that infrastructure instils in its user through time. Edwards (2019) illustrates this type of ability with the example of the 'Dutch reach' (2019, p. 360), a practice for drivers and passengers in Dutch driving schools instructing that, instead of using the hand closest to the handle to open the door, they must use their far hand. By observing how drivers have gradually noticed the practice and continue to do so daily, Edwards

argues that these automobile users embody their assigned roles (as drivers) and perceive the world through these lenses. Tanja has mastered her role and honed her duties within the museum institution's structures: she always double-checks the object's details to ensure they are accurate. If they are not, she tries to correct them as soon as possible even if it takes a long time.

Although the index-card method and the MDS method of documenting objects differ from each other, both involve the act of caring for objects. The active commitment of MEK staff with 'trying to get the information better and stuff' reveals a hidden layer of background work: infrastructure is relative to working conditions. It was precisely *not* because the object information was incomplete that staff members lost interest in keeping object information in neat order and, as a consequence, were disengaged with the launch of the new museum documentation system. It was the accumulative and repetitive nature of the tasks that discouraged them. Infrastructure, according to Star and Bowker, never exists in a vacuum, separate from 'the people who design, maintain and use it' (2006, p. 230). Various forms of background work are carried out routinely and silently by everyday employees at the intersection of teams and museum work-worlds. Because there is no effective coordination mechanism for cataloguing quality, the background work involved in keeping things in order becomes invisible. In the case of the MEK, documentation as well as technical and maintenance work can be conducted by various types of everyday workers. It is not a question of who is doing what or who is assigned to what. It is a process in which employees care about what they do, articulate different lines of work, stances, and perspectives, and shape the work-related arrangements in which they participate.

Conclusion

Exploring cross-social world contexts in documentation work shows how staff daily practices shape work-related arrangements that support institutional memory making. I began the chapter by discussing the relationship between background work and culturally dominant conceptions of back-staged types of museum work and the employees who perform them. Section 5.2 showed that the duties of 'keeping things in order' at MEK, while decoupled from dominant organisational actors, consist in managing the intersection between different lines of work, which is why they become seed of ambiguities and uncertainties on the part of everyday museum workers. In Section 5.3, I used Clarke's notion of 'implicated actors' to refer to the staff members who carry out back-stage duties, on top of their primary roles. They are entangled in the complex back-stage setting of an institution where the collective ideas of participation and inclusion are

constructed by multiple, distributive groups of everyday actors. Overall, the chapter demonstrates how documentation-related activities in the back-stage of a museum, however regularly regarded as boring, unimportant, and allocated tiny amounts of resources, are vitally embedded in every corner of the compartmentalised organisation.

By examining documentation work as a set of often overlooked activities but become concrete over time, this chapter investigated the relationship between various forms of background work and people who perform them. It outlined the process by which collective, socially inclusive ideas can be constructed outside the bounds of formal organisations. By focusing the analytical lens on background work that occurs behind the scenes of institutional memory work, the chapter highlighted the critical nature of routinised labour performed by everyday workers to avoid jeopardising the everyday functioning of a museum and its objects.

CHAPTER 6. CRAFTWORK OF BUILDING MUSEUM CONNECTIVITIES

While examining the contexts and conditions under which museum work can facilitate perspectives from less dominant actors, the preceding analytical chapters have shown that these conditions are embedded in and shaped by specific value systems, institutional and knowledge infrastructures upon which the museums operate. Chapter 4 and 5 address a recurrent set of issues that arise from hierarchical organisational structures and authority control, which can impede the capability and willingness of the museums to initiate change. The central question regarding the role of background negotiations in initiating infrastructural change, is how staff practices and associated knowledge, closely embedded in the local settings, are maintained while being transferred from one setting to another: analogue/ digital, back-stage/ front-stage, inside/ outside the walls of museum institutions. This is why this chapter and the subsequent focus on how initiating digital transformation or implementing innovative technologies can result in conflicts with the installed base of infrastructure, which includes not only artefacts but also human norms, staff roles, routines, and habits. The analysis in this chapter highlights the social dimension of the installed base, i.e., the human backbone of infrastructure, and the existing practices and norms from which museum work takes place.

Building on the notion of background work outlined in Chapter 5, this chapter considers craftwork as a core human contribution to what lies in the background of institutional memory work. It presents how craftwork helps shape the back-stage nature of routinised labour performed by everyday workers. As a reminder, the last chapter has demonstrated that the back-stage nature refers to a tendency of staff to perform extra, meticulous tasks, out of their formal responsibilities, to avoid jeopardising the everyday functioning of memory institutions and the objects that they hold. This chapter shows how crafting documentation at various institutions becomes a core human contribution to the stability of the installed base of their infrastructure. While I pointed out previously that standardised tools and procedures can cause resistance and uncertainties from everyday staff, in this chapter, I use instances of craftwork in documentation activities to show how local adaptations can emerge from standardised tools and procedures. The crafting processes contribute to the stabilisation of back-stage practices, as they require a prominent level of technical competency and strict attention to detail.

The chapter is divided into two sections for the purpose of clarity in presenting cases of varied sizes. Both sections marry data from staff interviews with fieldwork notes. Section 6.1, in

presenting three mini-cases at SHM, HES, and MEK, analyses how collections management and cataloguing activities, and the supporting systems as components of infrastructure in the making, are results of continual craftwork. The objective of the mini cases is to elicit information about the connective capabilities of infrastructure and the intermingling of its technical components and socially organised practices. Section 6.2 looks at various forms of collections management systems being used at MEK/SMB and their shortcomings as standardised tools. Emphasising the social construction of the catalogue and object entry formats, the section indicates that these standardised tools or systems are not only in constant need of repair and maintenance on a technical level; they also reflect the human contribution in tool design and in enhancing the reliability of infrastructure. The chapter lays out the fundamental reasons for how craftwork characteristics have evolved over the course of complex institutional history of the museums. Through an examination of documentation activities in both physical and digital contexts, this chapter shows how these back-stage activities constitute a distinct type of craftwork toward which staff members are constantly striving to improve their practices.

6.1 CRAFTING MUSEUM DOCUMENTATION

Crafting in the context of institutional memory work encompasses a broader range of activities that involve a high level of learned competence. This section presents the craftwork quality of documentation work through mini cases from three GLAM institutions: Swedish National Historical Museums (SHM), Historic Environment Scotland (HES), and Museum of European Cultures (MEK). The SHM case demonstrates that the inevitable transition from paper-based methods of object management to digital processes and systems necessitates the 'working through' multiple lines of work of everyday workers and shows the tensions that this process involves. The HES case highlights how everyday cultural heritage workers, by scanning and digitising both sites and artefacts, contribute to an organisation's long-term mission of informing both the public and conservation and professional audiences about the long-term value of cultural artefacts and the sustainable use of their 3D, digitised models. The traces left by invisible workers, in the MEK case, suggest that there are unmet requirements for technical knowledge being translated across teams and departments. The section emphasises that the background work of digital transformation and building connectivity requires a high degree of craft – particularly attention to detail and technical proficiency.

System integration at SHM

The 'Digitisation and IT' department at SHM is responsible for three primary areas: digitisation and digital transmission (strategic and operational); information technology support (strategy, support, and management); and photography and image management.[34] As presented in Chapter 4, since January 2018, the merger has resulted in ongoing changes and adaptation processes not only in organisational and administrative aspects (internal control documents, work routines, working methods, and IT environment), but also in forcing staff to rebuild from the ground up with 'new infrastructure, new organisation, and new ways of working', according to Wilhelm, a chief digital officer. Indeed, this merger resulted in the implementation of a new collection management system and the launch of new websites for each museum. While construction of new infrastructure will 'continue for several years to come', as stated in its annual report in 2019, the SHM's collections and environments must be managed long-term and sustainably, and made available for research, knowledge, and experiences (Statens Historiska Museer [SHM], 2019, p. 8).

The agency's annual report also asserts that the focus of SHM's development from the merger onwards has been on 'efficient resource utilisation, a strong economy, and appropriate routines, working methods, and system support' (SHM, 2019, p. 8). The core duties of Vera's team within the 'Digitisation and IT' department include oversight of the integrated documentation system of the merged organisation. A substantial portion of this responsibility involves supervising and maintaining museum documentation and collection management systems. She explained that one of the difficulties she and her colleagues encountered was becoming acquainted with the data models of each of the museum's six members. As a result of the merger, the team was occasionally required to perform an extremely time-consuming task: migrating multiple fields containing the same information from separate museum member systems to a single field in the new system.

Vera acknowledged that their team of four was able to accomplish this task since the team members all had 'good knowledge about the museums' and worked for the member institutions for a long time. Then something unexpected occurred, involving the migration tasks:

[34] According to the SHM website, https://shm.se/en/contact/department-of-digitization-and-it/

> So we could understand that this information in this field are 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 [realise that we] didn't do it correctly. Sometimes we have to do it again, the migration task – this one shouldn't be in this field and now we have to do it again for one museum or so. It happens. It's impossible make it all right the first time. It's a hard work. (Interview [SHM4], 2020)

A planned and engineered activity ('the migration task') can quickly devolve into an unplanned and emergent one ('we are discovering things'), resulting in duplication of effort that can be both time-consuming and tedious. Assuming the role of IT support, Vera and her colleagues must also ensure data consistency across various data fields, a major challenge originating from the struggle of the newly merged infrastructure to support and conform with established work practices. This communication gap of how to work with data becomes a daily struggle for Vera and her colleagues, in part because they oversee the system, and their job is to ensure that it is operating properly and to assist their colleagues in determining which fields they should fill in.

And yet, working carefully with data and maintaining consistency and accuracy is also a struggle for colleagues in other departments – collection experts, conservators, and everyone else who uses the system. According to Vera, there is a need to change the pre-existed mindset of colleagues in other departments, which is about replacing established paper functions with digital documentation. With a centralised MDS and database system being planned to integrate all sub-systems of the six museum members, all different lines of work will need to move from paper-based to digital document management. For large organisations such as SHM, managing paperwork can be a hassle:

> Every museum struggles with that because the people who were in charge of those systems, they often say, 'well, just do it like this', and they [people who are in charge of the collection] are more like, 'No, I want to do it on paper because that's what I have always done'. (Interview [SHM4], 2020)

Articulating the digital processes of daily work is what Vera and her team members struggle with. They attempt to make the process much easier for curators and conservators. They view it as part of their mission to make collection information available online. Naturally, this is impossible if their colleagues 'write on a piece of paper and leave it on their desk'. When problems recur, team members make every effort to instruct their colleagues. They have organised days during which museum employees participate and gain familiarity with the

systems. Overall, in their capacity as IT support, the SHM team in study is attempting to convince other colleagues of the critical nature of structuring data and registering it in systems. Without widespread support from key actors in the organisation, such as upper management and heads of departments, engineered activities might break down. This mini case shows that the background work of articulating digital documentation is considered craftwork since it is predicated on grounded agreement on which tasks should be assigned to each related line of work in the shared mission of digital transformation.

Creating 3D datasets at HES

This case details the day-to-day activities of a single staff member at HES. By describing work routines, feelings at work, and beliefs of this employee, it illustrates how she came to believe that digital reconstruction is an excellent way for the general public to interrogate and interact with objects, as well as to imagine and feel empathy for these people and objects from the past in ways that simply looking at something static in a museum cannot. The case strengthens the line of argument within this chapter, that the craftwork of obtaining accurate data and maintaining adequate documentation is a necessary infrastructural condition for cultural heritage institutions to engage with users in digital and virtual spaces.

Sophia joined Historic Environment Scotland (HES) as an intern and was working as a digital project officer at the time we met. Jointly employed by HES and the National Trust for Scotland, her primary project in July 2020 was to digitise Charles Mackintosh's Hill House, built in the early twentieth century and had been severely damaged for a century. She described her primary responsibilities at the moment as 'scanning the entire house' and collaborating with a conservation science team to combine thermography and moisture mapping into a 3D dataset to inform how to care for the house. She was a part of the larger Rae project, which aims to 3D scan all 336 of HES's in-care properties and the objects ('it's a huge endeavour'). Sophia expressed how fortunate her team is to have such a large arsenal of hardware and software to deploy whenever they go to digitise the site: 'we have multiple laser scanners', ' photogrammetry DSLRs', and 'handheld laser scanners for structured light scanning'. The team can use these scanners and photogrammetry devices to capture multiple stories about the site while they are there and then combine them to create the best possible model and supplement the digital documentation team.

Sophie explains that they have so much equipment because her team has been working in digital heritage for decades. These years of experience and 'really cutting edge' technologies not only contribute to the smooth and efficient daily operation of Sophia and her colleagues. They also aid in future applications for two reasons. Firstly, these technical elements improve the efficiency of the capture process, resulting in more reliable and accurate models. Consider the model of Edinburgh Castle, which has been scanned by HES teams over the course of seven years. As the first step is 'always scan to the highest accuracy as possible and future-proofing as much as possible', the team can keep as much data at the base level as possible. Thank to submillimeter accuracy and high resolution during the initial scan, the team can create a highly accurate 3D space that is connected in such a way that each facet of the site is accurately captured. According to Sophia, the type of information is helpful for conservation.

Second, it is the creation of 3D datasets and their online publication that enables others to reuse them. The export of 3D data requires extensive optimisation. What is incorporated in this stage is, as Sophia said, similar to what has been used in the gaming industry. All the assets in the entire model should have the fewest possible polygons and faces, so that any computer can render them quickly. That is why, to make it easier for a computer or a phone to load the model, the team must also project photorealistic textures of the site and different maps that 'make it look bumpy', without actually loading in each of the various facets. The model can then be uploaded to Sketchfab after being enhanced with 3D modelling software.

Fine-tuning that type of output and considering the audience ('if it is the public') are two intertwined tasks that team members must take into consideration. In response to a question about the purpose of their work, Sophia suggested that different datasets can be created for several reasons, primarily education and conservation. This is the case when the dataset is intended for conservation purposes:

> We go the optimisation which is less accurate in terms of what's actually there, but [pause] better accessible. If it is for conservationists who need to know exactly the shape of this stone or exactly what's going on with this door, if it is falling over years, then we take it to the more accurate side. And we're actually exploring now different ways in which to showcase 3d point clouds so that we could share them on architects' and conservationists' computers. (Interview [HES], 2020).

For Sophie, because conservation purposes necessitate making data more accessible, they are inextricably linked to educational purposes. Digital heritage is not simply a means of bringing

an object or a site to someone unable to visit ('How can we reach people who are not as reliant on the internet as we would hope when we put these models online'). The primary goal of making models more accessible is to provide a variety of ways to 'layer on either interaction, or more immersive storytelling within a model'. This is why, while they were scanning, they recorded three-dimensional sound. ('So as you're exploring the model, you can hear the birds that are nesting, and you can hear the waves behind you. And as you manipulate the model, the sounds move around you.') Sophia is enthusiastic about her job because, as she explained, she believes that the more she and her colleagues can use digital heritage to inform and challenge established narratives in the past, the better.

Traces by invisible workers at MEK

Figure 6-1 depicts an index card from one drawer in the card archive room at MEK. These drawers contain index cards of objects categorised according to geographical location. The card includes the following information: The object is an animal figure discovered in the Thuringian village of Großensee; its inventory number is 'III.d. 175 L', its category is '35 F 1', and its registration number is '26/34'. The description field indicates that the object is in the shape of a brown clay rooster or an unfired clay rooster [Ton-brauner Hahn]. Anonymous workers left a variety of traces of themselves on this inanimate object, an index card. In the 'location' [Ort] field, there is a handwritten addition of 'ringen' next to 'Thü' to clearly identify Thuringia as the state. Below it is another handwritten line that reads 'Kr. Eisenach', which means the county of [Kreis] Eisenach. In addition, this set of index cards in the drawer was unusual. Several cards had the red letter 'C' and the black letters 'GK' written on their top right corner.

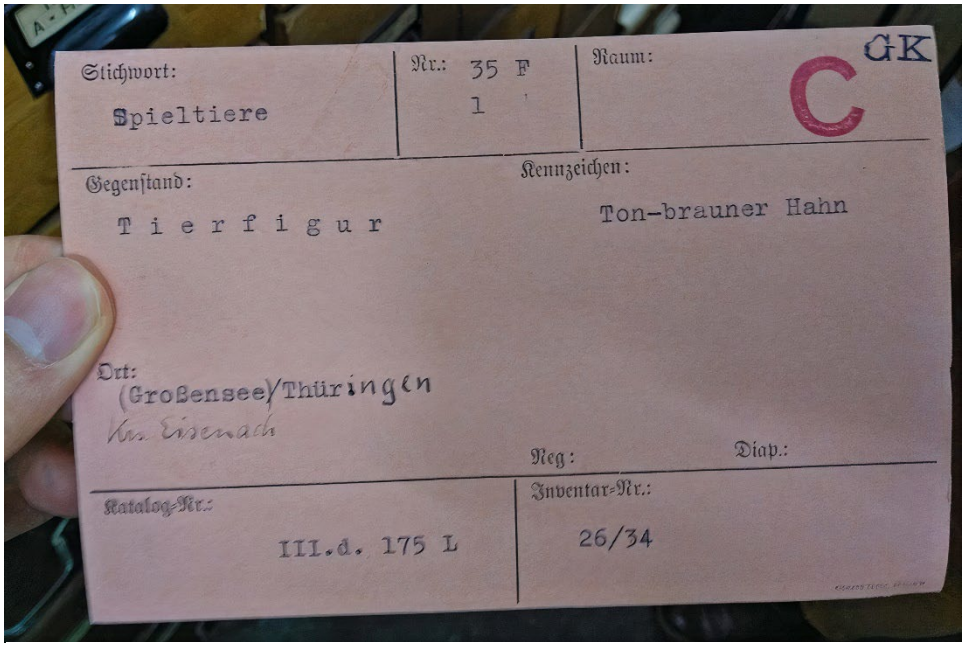


Figure 6-1. Index card of an 'animal figure' found in the MEK's card archive room

When I inquired as to what this meant, Jana, the museologist at MEK who escorted me that day through the card archive room, explained: 'I don't know! None of the actual colleagues at the museum knows… It could be "Gesamtkatalog" (whole catalogue), but that's just guessing'.[35] It is possible that these traces would have been considered insignificant by an indexer tasked with transferring thousands of index cards to a digital catalogue system; however, they are critical for a heterogeneous group of employees who are learning through experience.

Supplementary parts such as 'Thüringen', 'Kr. Eisenach', or 'GK' assist in translating technical language for those unfamiliar with cataloguing methods and classification systems. Indeed, the catalogue number 'III.d. 175 L' indicated that the object originated in the German state of Thuringia. One of the MEK's predecessors used this cataloging system, the Museum of German Folklore. According to Jana, before the current catalogue system with subject groups was introduced in 1935, there was another system that referred to the origin of the object. In that system, 'III d' stood for 'Thüringen' and 175 is the object's number. 'L' was included because this number originally contained 12 objects (from 'A' to 'L'). While an experienced curator or museologist with extensive knowledge of the museum's history and multiple cataloguing systems can interpret this catalogue number, a general staff member such as a photographer or curator assistant will have difficulty deciphering the clue. These traces were not intended; rather, they

[35] Personal email communication, March 2021

functioned similarly to marginalia notes in a book. They would be deemed too insignificant to enter the documentation systems.

The traces left by invisible workers imply that there were hidden needs of translating technical knowledge across teams and departments in the organisation. Swathes of technical knowledge were well documented and communicated via written protocols. Any staff member can decipher an object's category number of '35 F 1' by looking through a booklet titled 'Systematik – Katalog' (Museum of European Cultures, 2014), which contains the list of 74 broad subjects and the narrower terms. It is a piece of explicit knowledge. On the contrary, the inventory number shown in Figure 6-1 is more difficult to decode, because it belongs to the cataloguing method that is no longer used at MEK and that applies to a minority of objects, some among them were lost during the Second War World. This number represents implicit technical knowledge, as few staff members can explain what a set of characters like 'III.d. 175 L' means. It becomes a piece of 'tribal knowledge' as it spreads throughout different museum bodies (in this case, MEK and its predecessors, the Museum of German Folklore, and the Ethnological Museum) without being actively discussed or pointed out.

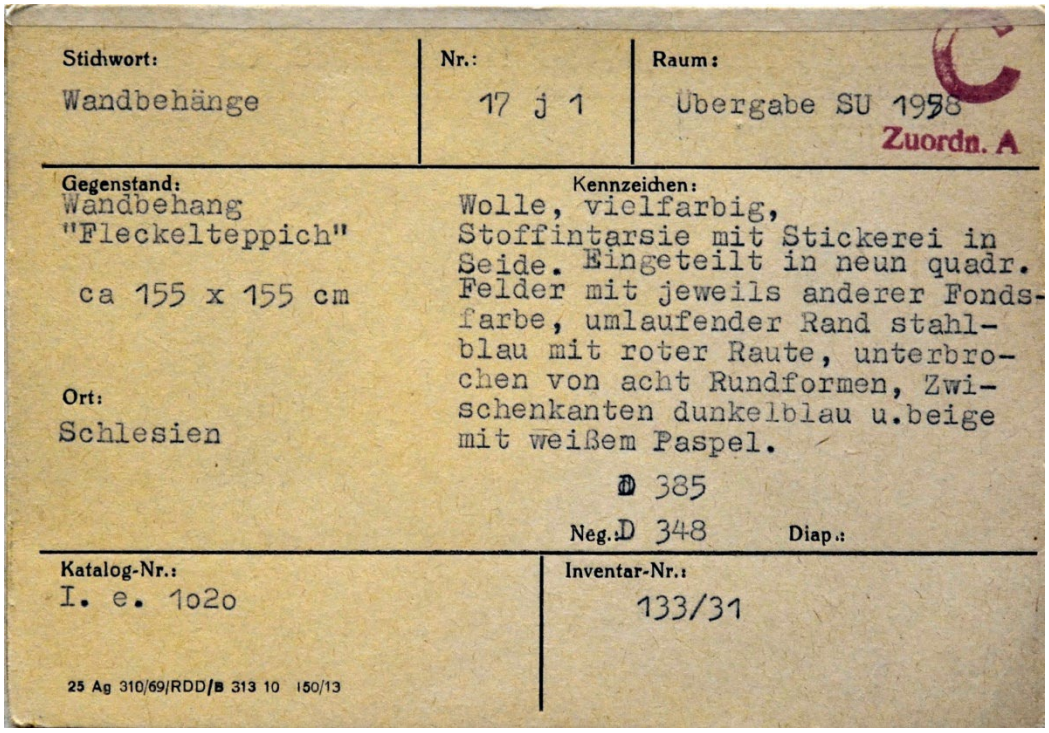
In aggregate, the three mini-cases above examine the inner-personal, ground-floor dimensions of a collective commitment to the maintenance of the backbone of daily GLAM operations, namely the smooth flow of information. In cases 1 and 3, given that the primary mission of museum institutions is to preserve their collections, documentation practices in the back-stage are critical to the institution's operation. Back-stage labour can consist of straightforward tasks such as identifying the object, entering its details, and organising the object's information in the system. Paying adequate attention to these meticulous tasks would help minimise bottlenecked issues in collections management and conservation, and ensure smooth coordination across teams and departments. In the specific GLAM environments, there can be a scarcity of highly trained personnel who are dedicated to meticulous tasks such as maintaining data quality (SHM case), integrating the 3D into every aspect of conservation (HES), and giving traces in the index cards for other colleagues to follow (MEK). It is demonstrated in these mini-cases that the background work is deemed craftwork because it is based not only on research and expertise, but also on individual and cross-team attention to detail in the handling of the tasks.

6.2 FROM DIGITAL DOCUMENTATION TO DIGITAL ACCESS

This section discusses in more detail the development of three generations of museum collection catalogues at MEK: index cards, integrated collections documentation systems, and a centralised online catalogue. It addresses the craftwork of moving from paper-based systems to digital documentation, as part of an ongoing collective effort to expand digital access to museum collections.

As discussed in Chapter 4.2, the legacy of standardisation at MEK put a great deal of pressure on everyday museum workers to manage catalogue information for all 287,000 objects. In this section, I will show how both index cards and the MDS serve as imperfect tools in a way that enables the improvement of object representation in digital documentation systems, and that the complication brought about by the paper-based manner of managing objects reveals the value of a digital catalogue system, which enable multiple advanced methods of sorting, organising, and retrieving object information. I will discuss an undertaking at MEK to convert 100,000 index cards to digital catalogue entries, and then present a comparative analysis of three distinct generations of object entry design: index cards, integrated collections documentation systems (or MDS), and a centralised online catalogue (SMB-digital). I will demonstrate how the index cards of the 1930s necessitated the multi-functionality of digital catalogue systems (MuseumPlus Classic and RIA), which placed a premium on automation and operational effectiveness.

We can consider a physical index card to gauge how much effort one needs to make to convert information on the card to an object entry in a digital catalogue. The index card view shown in Figure 6-2 followed the old cataloguing method of the Ethnological Museum.


Stichwort:
Wandbehänge

Nr.:
17 j 1

Raum:
Übergabe SU 1958
Zuordn. A

Gegenstand:
Wandbehang
"Fleckelteppich"

ca 155 x 155 cm

Ort:
Schlesien

Kennzeichen:
Wolle, vielfarbig, Stoffintarsie mit Stickerei in Seide. Eingeteilt in neun quadr. Felder mit jeweils anderer Fondsfarbe, umlaufender Rand stahlblau mit roter Raute, unterbrochen von acht Rundformen, Zwischenkanten dunkelblau u.beige mit weißem Paspel.

D 385
Neg.: D 348 Diap.:

Katalog-Nr.:
I. e. 1020

Inventar-Nr.:
133/31

25 Ag 310/69/RDD/B 313 10 150/13

Figure 6-2 The index card of 'Silesian wool quilt.' (Wikipedia Commons)

The object in Figure 6-2 is a Silesian wool quilt with the title 'Fleckelteppich' and the catalogue number 'A (17 J 1) 133/1931'. It is a pictorial representation of the life of Christ and scenes relating to the coming Christ, consisting of nine square fields, each with a different base colour. This object was chosen for the purposes of clarity: the entry was publicly available on SMB-digital,[36] the object was in decent shape in the MEK's storage, and its digitisation process was well documented and put online in Wikimedia Commons.[37] Each of them provides all the object's basic information concerning its keywords, geographical provenance, catalogue number, inventory number, and a brief description[38]. In the version on top, which is the older one, we can see traces of invisible workers. Someone wrote the object's dimension: '155 x 155 cm'.

[36] https://smb.museum-digital.de/index.php?t=objekt&oges=240708

[37] https://commons.wikimedia.org/wiki/Category:Silesian_wool_quilt_(Fleckelteppich)

[38] The bottom description reads: 'Multicolored wool, fabric inlay with embroidery in silk. Divided into nine quadrangle fields, each with a different base colour. Steel blue surrounding edge with a red diamond, interrupted by eight round shapes. Dark blue and beige intermediate edges with white piping.'

The conversion: Index card to MDS

MEK had started converting its index cards to digital object entries in MuseumPlus Classic for several years. At the time I talked to the staff (October 2020), only 130,000 among 287,000 objects had entries of their own in the old museum system (MuseumPlus Classic). It was slightly under half of the total, but already an enormous number. One staff estimated that the average time to convert one index card was eight minutes. That average amount excluded the delay caused by all sorts of confusion when the workers who did the conversion had to deal with inconsistent data or unreadable texts:

> So we calculated. With eight minutes per entry, plus the usual holidays and working time during the year, we came to the conclusion that two persons need three to four years [to finish the data input] and they are not allowed to get sick. Three to four years, these people are just doing nothing else, only to input the entries to the MDS. (Interview [SMB], 2020)

The average of eight minutes per entry accounts for delays caused by various types of confusion, such as when workers performing the conversion were confronted with inconsistent data or unreadable text. Because the workers were not MEK employees, they lacked background knowledge about the collection and tacit knowledge about object organisation that a MEK employee was supposed to possess. This lengthy conversion process was both necessary and irreversible. As time-consuming as any manual data conversion task can be, these activities result in a positive outcome: all object views were digital in a centralised system, and their associated data was supposedly organised in a reliable and scalable manner.

The object entry of the same 'Fleckelteppich' is shown in MuseumPlus RIA (Figure 6-3). Its identifier '501038', not inventory number or category number, serves as the object's unique point of reference. The digital entry noted that data migration from the legacy system to the RIA version occurred on November 30, 2020. In the MEK's previous digital catalogue system (MuseumPlus 6.0), most fields in an object's basic information panel are free text based. In comparison to drop-down lists, the free-text format enables the user to enter data freely. While the free-text format allows for greater flexibility in terms of input content, it severely systematically restricts quality control. Suppose the system administrator wishes to display an error alert when invalid data is entered. In that case, they must establish explicit rules for what constitutes invalid data. It is challenging to create rules for all seventeen SMB museum members. Thus, the free-text format acts as an implicit writing rule: it specifies how information should

be written in a data field. This method of data entry cannot ensure that different users use the identically matched terms for the same piece of information. There were no editorial rules to oversee, for example, the vocabularies and writing rules for person and object names.

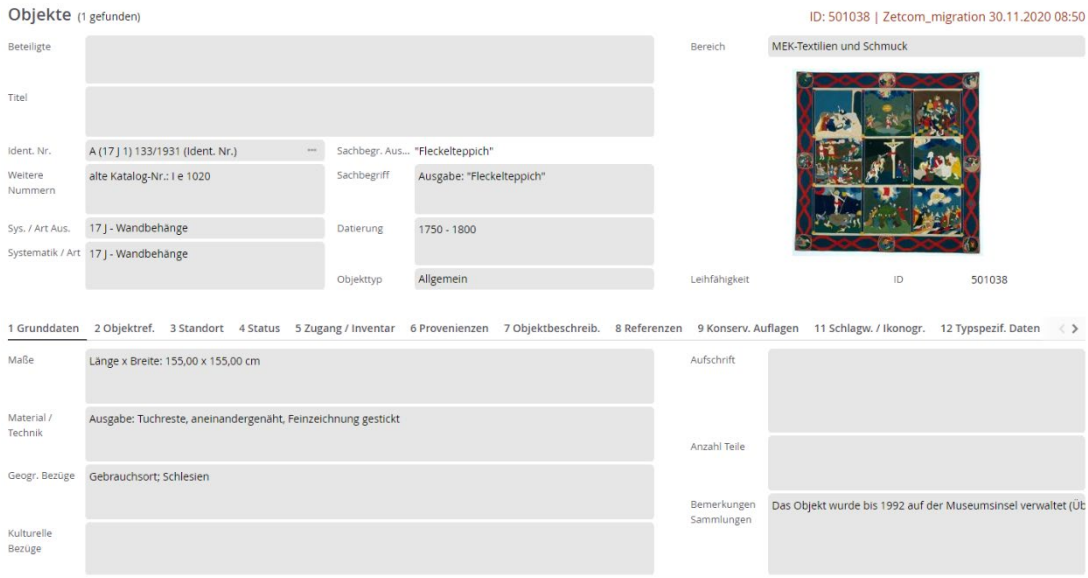


Figure 6-3. MDS view of 'Silesian wool quilt'

The controversy surrounding object provenance demonstrates how data handling issues impair infrastructure's ability to scale beyond a single-site practice. The provenance information is stored in the tab 'Zugang/Inventar' (Access/Inventory). To note where the object came from, MEK staff used to include the name of the individual, whether it was a photographer, a collector, or a private donor. Other SMB museums perceive object provenance in separate ways; they wish to include the means of acquisition, such as purchasing, receiving as a donation, or receiving from an auction. The GD of SMB, which oversees the MDS for all museum members, once decided to include a drop-down list of three options in this field. This decision drew criticism from some museum members, including MEK, and the format for this field in the software was eventually changed. As shown in the previous chapter, Tanja expressed her impatience when confronted with the field indicating the origin of the object (Ch. 5.2). More importantly, what she suggested is that inconsistent data issues seemed to be the most prevalent in the maintenance work of museum documentation:

> One field that you always have to fill out is where you got the object from. […] all the different museums have to agree on how the field is being used in the new system. If the majority says, we only want these three or four options in the field, then we have a

> problem. So the biggest challenge is to get everyone to agree on the parameters for each different field. And each house, each collection has very good arguments of why we should adopt their idea. (Interview [MEK3], 2020)

As a reminder, SMB is comprised of seventeen museums and four research institutes. Although each member uses the identical two versions of the documentation system provided by the company 'zetcom', MuseumPlus Classic and MuseumPlus RIA, each museum member has its own method of documenting objects. That is why it was challenging to get all SMB members to agree on the parameters for each different field; as Tanja pointed out: 'each house, each collection has very good arguments of why we should adopt their idea'. As a result of their inability to agree, the integration of each museum's holdings into the centralised catalogue system became unmanageable.

From the MDS to online catalogues

Apart from data conversion, the museum would need further efforts to put their object information online. Among 130,000 object entries created in the digital catalogue system, only a tiny number of them, 1,353 objects, were presented in the SMB's centralised online catalogue. Explaining why there were so few objects from MEK available in SMB-digital, the museum director stated that it was due to an implicit rule that an object entry needed a good description and a good photo to be published in SMB-digital. This rule was to ensure a minimum level of data completeness and consistency throughout all the collections being published within the SMB network. It was also adequate to consider the platform's usability: the user could have an appropriate view of what they were looking for.

Cataloguing an object is about recording the history, description, and details of that object. However, the index-card way of keeping object information differs from the modern way of organising museum objects, according to which all collections feed their data into one central collections' management and documentation system (MDS). Paper-based museum knowledge systems such as index cards and registration books resemble what Sennett (2008) refers to as imperfect tools with their own virtues: they provide an alternative and suggest how something could be done better. Sennett uses an example from Voltaire's *Encyclopedia* to argue that hand-made glass, with its irregularities and distinctiveness, influenced the development and refinement of glassblowing techniques. The index cards of the 'animal figure' (Figure 6-1) and the 'Silesian wool quilt' (Figure 6-2), as well as MDS-based catalogue entries (Figure 6-3), are all examples of

imperfect or incomplete tools that are needed for refinement of skills. The instructive experiences gained from daily contact with the imperfect tools helped the workers improve their jobs. Incomplete index cards and incomplete digital catalogue entries, one after another, had left sufficient 'reflection space' for museum users – not necessarily a documentalist or an indexer but any everyday staff – to ponder about repair, maintenance, and improvisation.

Compared to an index card (Figure 6-1 and 6-2), a digital catalogue entry in an MDS contains fewer pieces of tribal knowledge. The dashboard view of MDS enables a high degree of intertextuality, which allows a digital catalogue to convey more efficiently the know-how knowledge of the organisation. Even though disseminating this knowledge requires formal and informal rules that are not given explicitly, this knowledge can be asynchronously transferred between team members thanks to the modular structure and the interface technology of any modern MDS that simplify the exchange of data with other users and other applications. If we consider the job of taking care of object information – namely, making object data complete and consistent – as continual craftwork that requires the constant reflection of the staff, then an imperfect tool such as the index card shown in Figure 6-1 enabled the workers to obtain instructive experiences from working through a dozen of cards withdrawing from different archive drawers. These instructive experiences also come from common observations, made by infrastructure scholars, that any way of organising object information could be both a standard for one community of practice and an annoyance or misfit for another (Gasser, 1986; Star, 1991b); however confusing these standardised tools might look, they provide design implications to the successor tools and systems (Star & Bowker, 2006).

Numerous functions in the MDS case were superfluous and would never be used by the MEK's staff. The integrated catalogue entry may be inconvenient for a public member who likes to obtain basic information about an object. However, the system grew accustomed to the daily operations of the staff. In some hidden corners, accommodation took various forms: fitting, improvisation, or working around. The long description view (Figure 6-4) suggests that the invisible workers had to combine somehow the brief description from the two versions of index card. In the right bottom of the full view, the 'Comments/ Collections' [Bemerkungen/ Sammlungen] field notes that the object was managed by Berlin's Museumsinsel until 1992. This

piece of information may not be contained in the limited space of an index card, not least squeezed in a row of the registration book.[39]

Figure 6-4. Long description of 'Silesian wool quilt'.

Historically, objects were catalogued using physical, paper-based tools: index cards for cataloguing and registration books for numbering and registering objects. Later digital solutions were grown onto this installed base. The long description of 'Silesian wool quilt' in MuseumPlus RIA demonstrates that the object's description remained consistent over time. While people's perceptions of certain objects may change with time, as those depicting dissonant heritage, the index card's role remains fundamental and indispensable. First, the index card conveys the essence of an object – what distinguishes it from others. Secondly, it provides staff with the fundamental knowledge necessary to perform object and data-related tasks. What might be incorrect in an index card is precisely what might be incorrect in a digital catalogue entry.

From the perspective of someone who worked daily with photographic objects, Theo pointed out that there was one critical problem with the old way of organising object information: having

[39] This is the page in the registration book that contains the most basic information about the object 'Silesian wool quilt': https://commons.wikimedia.org/wiki/File:Fleckelteppich2017_11_25_C.jpg

pieces of it scattered in separate books and cards. The problem is that there were no entries for images. The museum catalogues contain only the entries for objects that belonged to a collection. One of the main challenges for back-stage work at MEK has been dealing with data incompleteness:

> … you don't even have descriptions of what is on the picture, of what we see. So often you have just a number. But sometimes not at all. It's very difficult to make this accessible, because you have so little data, and [to fill that gap] requires a lot of research. That makes the [conversion] time even longer (Interview [SMB1], 2020).

The MDS's description view of 'Silesian wool quilt' (Figure 6-4) shows that the object's description remained consistent over time. While perceptions of people on certain objects may change over time,[40] the role of the index cards remains fundamental and indispensable. On the one hand, the index card conveys the essence of an object – what distinguishes it from others. On the other hand, it provides staff with the fundamental knowledge necessary to perform object and data-related tasks. What might be incorrect in an index card is precisely what might be inaccurate in a digital catalogue entry.[41]

As a result of the previous mismatch between the old analogue system and the new digital system, it is necessary to re-examine mandatory fields and image requirements as part of the transition from old to newer generations of systems. As of October 2021, only 14,115 objects from the MEK's collection are presented in the centralised online catalogue, representing a small subset of the 130,000 objects that have entries in the MDS. As mentioned previously, one reason is that to be published in SMB-digital, an object entry must have a thorough description and a high-quality photograph. This internal rule was implemented to ensure the completeness and consistency of data across all collections at SMB.

Consider the representation of the same 'Silesian wool quilt' object. The SMB-digital object entry (Figure 6-5) is linked to the MuseumPlus object entry via a semi-permanent identifier called 'Bookmarkable URL'. The added value for the user is evident: starting from the museum object, further information can be accessed directly and, depending on the interests, the people associated with its history and their links can be followed. Apart from basic information, this

[40] Recently, there is a vibrant discussion among heritage and museum studies scholars about the changing perceptions of material culture in various parts of the world – including Europe – during the colonial period; see Binter (2019), Brulon Soares (2019), and Drayton (2019).

[41] See the discussion in the previous chapter on structural mishandling of data (Ch. 5.2).

online object entry includes various view options (simple list, image list, detail). The licensing agreement (CC BY-NC-SA) mentioned at the bottom of the page permits sharing and remixing of artworks but not commercial use. The transition from older to newer generations of systems necessitates a re-examination of mandatory fields and image requirements aligned with contemporary practices of knowledge dissemination.

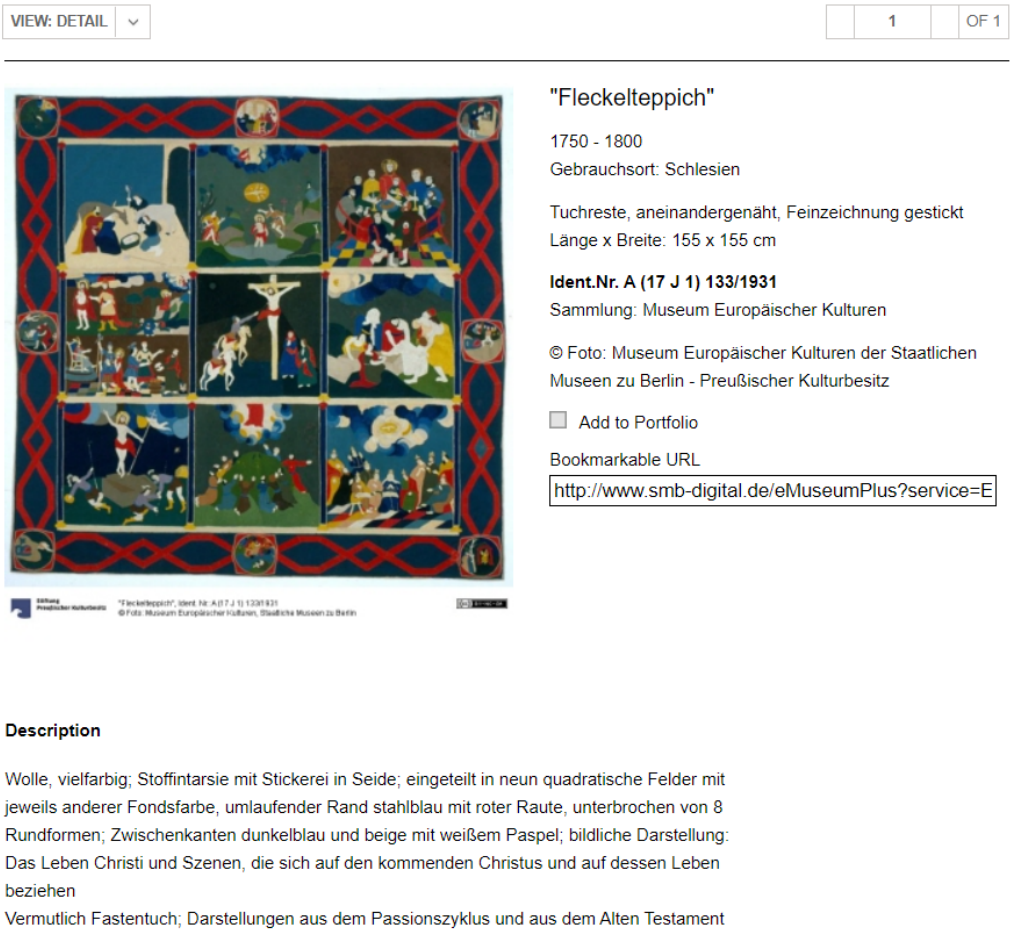


Figure 6-5 The object entry 'Silesian wool quilt' in SMB-digital

The standardised procedure of registering and cataloguing objects and its modern technical requirements have necessitated the move from index cards – and to a lesser extent, registration books – in the 1930s to an improved representation of objects in digital environments. The same rules from the index card era still apply: one object is allocated one registration number, and some fields are mandatory and must be completed for all objects. The MDS view, however, offers a far greater extent of details. The system administrators can set the scope of each field.

They can decide the input style for each field as free text or a drop-down list of several options.[42] The object description can be shown next to the image or a set of images of the object. To have similar functions, staff in the age of the index card would have required multiple books, albums and drawers, and human labour to take care of them. The shortcoming of object entries in the MDS would later inform the representation in SMB-digital, a centralised online catalogue of multiple memory institutions.

The online catalogue of SMB-digital was developed rather than built on an existing installed base – index cards and various MDS versions. Following continuous repair and maintenance efforts, the SMB-digital platform crystallised as a condensed representation of the previous solutions' shared features. When we compare the SMB-digital view of the 'Silesian wool quilt' (Figure 6-5) to the MDS view (Figure 6-3) and index-card view (Figure 6-2), we see that the two subsequent systems display the object's identification number ('A (17 J 1) 133/1931') rather than an object number ('17 j 1') and inventory number ('133/31') as their index-card predecessor did. The display of two distinct numbers is no longer desirable for a digital tool, as it reduces usability and interoperability of the system.[43] In short, the MDS-based object entries informed the interface and interoperability of SMB-digital. Both MuseumPlus (particularly the new RIA version) and SMB-digital marked the transition from serving users in physical locations to serving digital users; however, it was the latter that bolstered museum institutions' new relevance.

Conclusion

The chapter demonstrates how museum documentation has developed craftwork characteristics over the course of the museum's complex institutional history by examining three distinct modes of object representation at the Museum of European Cultures (MEK). The chapter emphasises that while index cards and electronic catalogues are inherently insufficient tools, they are necessary for optimising object representation in museums' knowledge management systems. The discussion on supporting tools and systems at MEK in the second section shows how leaving traces in documentation could be essential because the way people name things helps others identify the intellectual underpinnings of thinking processes and, on several occasions,

[42] See the discussion on the free text and drop-down list formats in Chapter 5.2.

[43] Indeed, while subgroup '17 j' refers to wall-hanging objects (Wandbehänge) and subgroup '17 k' is for carpets (Teppiche), the 'Silesian wool quilt' is a combination of both. In Chapter 4, I discussed how the MEK's complicated category systems, which were taken for granted, became inhospitable to new generations of objects and material.

trace mistakes. By examining cataloguing activities in both physical and digital environments, I illustrate how these activities enact characteristics of craftwork and how museum staff is constantly striving to improve their methods. By promoting the collection's value in a more open and user-centric manner, the cloud-based MDS and the SMB online catalogue assisted the institution in expanding its user base. Even though the technical solutions were far from perfect, they compelled institutions to actively construct their digital public spheres to engage meaningfully with their digital users.

CHAPTER 7. MAINTAINING EXTERNAL CONNECTIVITIES

The preceding chapter illustrates the relationship between craftwork and the ability of infrastructure to accommodate growth and development. Because back-stage craftwork can be considered as a crucial human contribution to the stabilisation of the installed base, as Chapter 6 suggested, addressing it would strengthen the argument for considering infrastructure as 'doubly relational' (Harvey et al., 2017b, p. 5), which recognises both its internal connectivity and its capacities to reach outwards. In the preceding two chapters, I have centred my attention on the internal connective capabilities, demonstrating that critical object-related tasks are intricately interwoven into the informational fabric of museum institutions. The peripheral nature of these activities significantly influences a fundamental facet of institutional memory work: the construction of internal connectivity. This chapter turns to another dimension – enhancing accessibility and fostering the institution's external connectivity, which assists institutions in preserving their relevance in the digital era.

Expanding on the notion of craftwork introduced in Chapter 6, this chapter situates object care within the broader context of digital transformations; it emphasises the processes of creating and expanding access to digitised collections as negotiating the connective capability of the institutions. This chapter focuses on two areas where museum employees constantly negotiate their professional boundaries: their professional role and what constitutes a genuine and authentic museum collection. Section 7.1 examines the insider practices that attempt to provide user access to digitised forms of cultural heritage or enable a user presence in the cases of SHM and MEK. Section 7.2 analyses the development of the Alvin platform as a centralised interface and a public 'meeting point' for non-institutional users to gain access to institutional resources. It reveals how a consortium model ensures compatibility between the centralised portal and the diverse range of objects, instruments, artefacts, and cultural spaces associated with consortium members, both public and private institutions.

7.1 EXTENDING BOUNDARIES OF ACCESS

This section examines the various efforts made by GLAM institutions to increase their external connective capabilities. The section highlights the tensions and contradictions that arose during the adoption and use of digital tools to facilitate user access to cultural heritage, with a particular emphasis on how existing socio-technical arrangements shape access to digital cultural heritage.

It inspects the roots of the tensions that emerge when museums expand digital access for users: museum staff perceptions of their professional role and what they believe constitutes an authentic and valuable museum object for engagement. The publication of 3D models in the Royal Armoury/SHM case demonstrates the pivotal role of disseminating the value of collections and facilitating public engagement with digital objects and digitised materials. The second case discusses a shared effort of MEK and Wikimedia Germany to engage users outside of the museum walls – the Wikipedians – in knowledge co-production and to expand the scope of the collection in the future.

Access to digitised objects at the Royal Armoury/SHM

As a result of the Cultural Heritage Bill that the Swedish parliament adopted in 2017, the new central agency of National Historical Museums (SHM) was created in January 2018 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' (SHM, 2019, p. 8, my translation). As people's historical awareness increases, so do their opportunities to see the connection between the past, the present, and the future.

The SHM member we are evaluating in this section is the Royal Armoury, which houses numerous artefacts from Swedish military history and royalty. One of the most valuable collections at the museum is a set of 16th-century armour that King Erik XIV may have worn upon his return to Stockholm from a campaign. Erik Lernestål is an imaging professional and a member of the museum's core staff. He used photogrammetry to create 3D models of various objects in the collection. Erik described the process by which the museum makes digital copies of its objects available online. He created the 3D models first with the CapturingReality software, and then uploaded them to Sketchfab. On this platform, users can upload digital scans for others to download, use, and reuse under a Creative Commons licence. Different versions of the images are available on Imgur. Additionally, there are explanation videos for the objects on YouTube and SoundCloud, as well as articles about the objects on Wikipedia. For Erik, these are his straightforward mechanisms for increasing public access to 3D digital models. He described his workflow:

> I don't know very much about 3D, how it works and what software to use. I only know the names, like Blender, ZBrush and Unity and whatever have you. My workflow is to take the pictures, and then use them for RealityCapture. There's a plugin for RealityCapture so you can upload directly to Sketchfab. That's what I do. And then I use Sketchfab to create the scene and work with materials. I don't do any post-processing outside RealityCapture. (Interview [SHM2], 2020)

In terms of 3D production, there is a clear contrast between this case and the mini case at HES (Ch. 6.1). The HES team has been experienced with creating 3D datasets for years; for large projects such as the Edinburgh Castle, the site has been scanned 'over seven years'. They have cutting-edge equipment so that, before uploading models on Sketchfab, the team aims to achieve 'submillimeter accuracy' and 'high resolution' as much as they can. Sophia acknowledged that the purpose of this meticulous work is to produce the 3D data suitable for long-term conservation. In the Royal Armoury/SHM, the main challenge with Erik and his small team is resource constraints, in terms of both human resources and costs for equipment. He wished he had automated multi-camera capture rigs while capturing the images. With the rigs, he said, he could scan the object in 'half an hour or less'. Also, Erik and his colleagues have a different purpose; as they work for 'Digitisation and IT' department, they aim for 3D scanning and digitisation of museum objects and buildings as fast, affordable, and precisely as possible. Erik said, there is still the Skokloster Castle within the SHM where 'we have 70 rooms waiting to be scanned (laugh)'. That is why he needed the equipment to create 3D objects and manage them on a large scale.

Even though both teams have made tremendous efforts to make the cultural heritage objects available in 3D, the purpose of Erik team in creating 3D models was not well defined at the beginning. When Erik said he had overseen 3D scanning at the agency, the long-term mission was described as along the line of making the objects publicly available, ready to be used and reused under simple conditions:

> I've been in charge of developing how we work with photography. In 2016, we sniffed out this, I mean, the photogrammetry technique, started doing tests with that. It was still not part of our day to day work. But we do it in certain projects. We don't do it as an ongoing way of documenting objects or interiors yet, but we're exploring it more and more. Our aim has been to try to enhance the visual quality of a 3D model over the internet. (Interview [SHM2], 2020)

After uploading the 3D models on Sketchfab, Erik realised that these models had somehow breathed new life into virtual reality worlds. The ten 3D models of the first-floor State Rooms at the Hallwyl Museum have received over 20.000 downloads and over 150.000 views on Sketchfab. Erik informed me that, because of the publication, he discovered several instances of reuse on the Internet, which surprised him. For example, on the online game platform VRChat, a user created a virtual reality world based on the models of the Hallwyl House made by the team. He also observed that the integration of 3D models into a variety of gaming and industrial environments had created new avenues for reaching new audiences. He showed me how the music video 'Circles' of Post Malone featured the parade shield of King Erik XIV in its opening few seconds.[44] The 3D models of the shield were created by Erik and uploaded on Sketchfab for others to reuse.

The Royal Armoury/SHM Museum illustrates how museum professionals have begun to recognise that accessibility efforts aimed at social inclusion may fall short of serving marginalised users or precarious social groups if they do not expand the notion of accessible space. The publication of 3D models of their objects at SHM members suggests that museums can promote their objects on a variety of platforms and media instead of developing their own standalone platform. As one SHM employee put it, they place the digital resources on suitable platforms that are already well established among the public and have many users. The institutions can then choose different platforms for distinct types of digital resources in order to reach the greatest number of users possible. By making their 3D models reusable, as the case shows, SHM members can encourage users to extend their experience to other platforms. The agency allows each member institution to facilitate the engagement of external actors with its ongoing extended installed base. This practice of the agency resembles the 'installed based-friendly' approach proposed by Aanestad et al. (2017c), which emphasises coordination across multiple actors, addressing heterogeneity, responsiveness to evolving needs, and transformation strategies.

[44] The music video is available at https://www.youtube.com/watch?v=wXhTHyIgQ_U. As of June 2020, when our interview took place, the video had accumulated over 240 million views. In the first running second, the image of King Erik's parade shield appears.

Participatory approach to object access in 'Wiki Goes MEK!'

MEK[45] is located 25 kilometres southwest of Berlin in the Dahlem village (Ch. 5.1). According to Samia, an employee, its location on the outskirts determines its typical audience: the typical visitors to the museum are not tourists. As a crossroads of multiple cultures both within and outside of Europe, a significant portion of the museum's permanent exhibition is devoted to craftwork culture. One of its intended target audiences should be underrepresented young craft professionals. Samia defines these individuals as those who are economically able to visit a museum and have the desire to spend their time in a pleasant manner:

> … like, in a passionate way, they don't want to be bored. They want to do things. And a museum does exhibitions. If you do an exhibition that is attractive to some audience, those people will come. As you have seen in the *Fast Fashion* exhibition[46] here, I think that's a topic that is very relevant, especially in Berlin, or in the bigger cities where you come across topics of sustainability so often [...] this is something that will exclude the majority of the population. Which is okay, I think, if it's not the only type of exhibition you have, because the museum is also a place of research. (Interview [MEK2], 2020)

Through this reflection on an underrepresented target audience group, Samia suggested that there were conflicting goals regarding the long-term mission of the museum. For the employee, the museum is not only an exhibition space, but also a 'place of research'. Its mission is to serve the public – regardless of the user groups that comprise it – as well as a subset of 'some audience' – those seeking to 'spend their time pleasantly' and 'passionately' in the museum. By referring to the latter's interest as incompatible with that of the majority of the population, the curator implicitly acknowledges that these two objectives are at odds.

Conflicts, disagreements, and ambiguities that necessitate negotiation do not occur by chance but rather follow a pattern. In the cases of the two museums – SHM and MEK – the pattern is about utilising the necessary means, within the constraints of available resources, to accomplish the mission of enhancing the external connectivity of the institution. The pattern emerges as a result of infrastructural practices within the institution being constantly influenced by two opposing forces. On the one hand, the transition from the information society to the network

[45] The Museum of European Cultures (MEK) was first introduced in Chapter 5.

[46] The exhibition 'Fast Fashion: The Dark Sides of Fashion' took place at MEK from 27 September 2019 to 31 January 2021. More information at https://www.smb.museum/en/exhibitions/detail/fast-fashion/

society and the growth of digital information infrastructure have paved the way for developing novel social methods and modes of knowledge production. The path to a networked culture requires the development of technologies that facilitate collaboration, linkages, and more democratic dialogue between institutions and the public. On the other hand, the organisational legacy and traditional work conventions contribute to significant institutional inertia that prevents any infrastructural change.

What emerges from the interviews and conversations at both museums is that the staff is more receptive to change, owing to the removal of technical and social barriers. Samia acknowledges that one of the benefits of the digital world is that the museum's collection is accessible to most of the public. There are far fewer barriers, especially now that so many people who would not normally visit a museum are doing so online:

> Through this loophole, you can still be relevant to them without them having to visit the museum. Because the internet is often a safe space, especially for the younger audience. There's a lot of connectivity within this. Some museums do that very well. There's a lot of potentials to enhance connectivity, and also the interactivity in the digital sphere, between the museum as an institution holding objects and the digital visitor. (Interview [MEK2], 2020)

As explained in Chapter 4, MEK is part of the National Museums in Berlin (SMB), along with other sixteen museums. The centralised organisational structure, along with a multitude of legacy systems such as museum documentation, knowledge infrastructure, and information architecture, constitutes a set of forces that can hinder the efforts of individual institutions to build connectivity outwards. This was illustrated in the case of social media duties at SMB (Ch. 4.1). For instance, if MEK staff wishes to post on Instagram or Youtube, the content must first be approved at a higher level before being posted on the correspondent channels of SMB. The MEK Facebook page, which promotes upcoming events and new exhibitions, is the only social media presence of the museum that SPK does not directly control. In terms of technical integration, SMB requires all museum members to use the same museum documentation system, which causes various data handling issues and uncertainties among the staff, as presented in Chapter 5.

However, there are individual efforts at the museum that attempt to reach out to digital users via unconventional channels and the placement of digital resources on external platforms. With the support of the German chapter of Wikimedia (Wikimedia Deutschland), since 2013,

volunteers who contribute to Wikipedia, or Wikipedians, have visited various cultural institutions as part of the 'GLAM on Tour' series. This project aims to assist cultural institutions in making cultural data and information accessible to all. MEK is one of these institutions. 'Wiki Goes MEK!' is one initiative that resulted from this collaboration. Prior to the event, Wikipedians browse the website and online database for topics or objects of interest. They discuss proposed topics in advance with museum staff. For instance, the chosen topic for 'Wiki goes MEK! 3.0' in 2019 is the everyday culture in the former German Democratic Republic, in commemoration of the 30th anniversary of the Fall of the Berlin Wall.[47] Over the course of one weekend, Wikipedians visit the museum, inspecting the objects on display.

As 'Wiki Goes MEK!' seeks to improve the representation of everyday culture in Wikipedia, the museum invites a wide range of audiences – people who edit Wikipedia pages – to explore its objects and topics. During the event weekend, the Wikipedians can photograph or scan the objects. They can also ask questions or request items from staff. They can search the museum catalogue and request books for research at the MEK library, located in the same office building. After the event, they have a few weeks to finish their articles and post them on Wikipedia with freely used photos, having permission from the museum. What makes this on-site collaboration unique is that it facilitates the flow of information. Rather than relying on the organisational silos of SPK/SMB to define its institutional life, MEK has chosen in this project to leverage the modularity of systems and services provided by the external partner. There is no need for information about objects to sit in index cards for years. The digitised versions of the objects do not have to remain unaffected in museum documentation systems. Individuals and commercial actors can access the data and images online. They can even transcend them into new contexts to elicit novel experiences. While Wikipedia is the most popular online repository of knowledge, Wikimedia Commons is one of the largest free media repositories. The museum views this chain of events as an ideal opportunity for knowledge transfer.

As observed by scholars in cultural and digital memory studies, the Web not only serves as a repository for lexicalised material, but also as a source of potential dialogue partners (Brockmeier, 2010; Pentzold, 2009; Veale, 2004). Wikipedia articles as texts can become active agents 'in forms of networked, global remembrance' through their discursive interactions (Pentzold, 2009, p. 262). As a small-to-medium-sized institution with limited resources, MEK is

[47] This event's documentation is available at https://de.wikipedia.org/wiki/Wikipedia:GLAM/GLAM_on_Tour/Wiki_goes_MEK!_3.0

experimenting with the idea of putting some of its digital resources on a Wiki platform that is already well-established and has a large user base. As we have seen in the SHM's approach discussed in the first section, a horizontal integration strategy may entail the institution selecting multiple platforms for various types of digital resources in order to reach the greatest number of users possible. These platforms are obligated to do everything possible to meet the ever-increasingly complex requirements of their audience. Julius1990, a Wikipedia user, expressed their anticipation one week before the event 'Wiki Goes MEK! 2.0' took place:

> Personally, I like the choice for this weekend because it will make objects available that are frequently requested by external users. We can make them freely available to the scientific community in this way […] It is not easy for a small museum to reach the scientific community. It makes more sense that you put your objects and information on Wikipedia if you aim for collaboration with researchers in the long term. And also, free images is important. If you are a researcher and you publish a book, you would rather use illustrations with free licences to reduce reproduction costs.[48]

It is worth noting that making the photographs of the object freely available to the scientific community is not a straightforward process. The Prussian Heritage Image Archive (Bildarchiv Preußischer Kulturbesitz, or BPK) manages image licences from all SPK institutions. The BPK[49] facilitates the commercial reuse of digital images from the National Museums in Berlin. Suppose a researcher, for example, wishes to use an image from the SMB collections. In that case, he or she must pay or negotiate for the exclusive right to use the image in their publication – whether it is a catalogue, a book, or a chapter. Tanner (2004) challenges the widely held belief that selling the right to publish something is a viable economic model. A more recent study by Kelly (2013) confirms the same conclusion. It is not economically profitable when an institution or a related agency sells single publishing rights. Besides that, the rapid digitisation of materials and the development of online platforms have simplified the process of online publishing.

From the institution's side, the primary factor that discourages museum professionals from controlling online collections is the belief that open collections have a more significant impact (Eschenfelder & Caswell, 2010). Certain cultural institutions, on the other hand, continue to view control of online collections as a requirement for preserving the integrity of works. The

---

[48] This comment (my translation), along with other preparation tasks and discussion prior to the event, can be found at https://de.wikipedia.org/wiki/Wikipedia:GLAM/GLAM_on_Tour/Wiki_goes_MEK!_2.0/Themensammlung.

[49] Part of the State Library, the BPK does not only work for SPK's institutions, but also for other museums outside.

most frequently cited reasons for denying use requests, according to Eschenfelder and Casweld, are that they are disrespectful or detrimental to the artist's work, contradict the institution's values, seek to modify the work, or reflect 'poor taste' (2010, p. 6). While open access to museum images is still an evolving practice (Kelly, 2013), advocates for open access argue that when memory organisations make their collections available online, they avoid a one-sided view of history and ensure that non-majority cultural perspectives are reflected in the materials (Morphy, 2014). Certain museums have decided to publish portions of their extensive photo collection under open culture licences such as CC0[50] on third-party platforms.[51] Cultural data activists also urge museums to remove unnecessary usage restrictions, based on the guiding principle that, when copyright or related rights are no longer valid, museums have no legal obligation, and thus no moral obligation, to restrict the material's use.

The two books shown in Figure 7-1 contain all the articles completed following the first two versions of 'Wiki Goes MEK!' in 2017 and 2018. The pink book's cover features a photograph of an object on display in the museum's permanent exhibition. 'Conchita Wurst on the crescent moon' is the title of the object. It depicts Conchita Wurst, an Austrian artist who won the 2014 Eurovision Song Contest. This object is fascinating because it demonstrates the contact between religion and popular culture. Figure 7-2 depicts a screenshot of the Wikimedia Commons entry for this object. Any public member can access the object's German-language Wikipedia article[52] and its photographs, as well as the technical specifications for each photo, on Wikimedia Commons. The CC BY 4.0 licence for the image indicates that others may distribute, remix, and build upon the work, even commercially, as long as proper credit is given. This licence is frequently recommended to ensure the greatest possible dissemination and use of the materials. A user with a more technical bent or a researcher can view this artwork as a Wikidata item with its own unique identifier. Each of these three platforms (Wikipedia, Wikimedia, and Wikidata) publishes free and open data to the public. Additionally, it can be connected to external datasets from different sectors.

[50] This abbreviation, which is based on the international Creative Commons licencing system, indicates that the material may be freely used, including for commercial purposes.

[51] See Pekel (2014), for example, for practices at the Rijksmuseum, or Wu (2020) for the recent initiative at the Smithsonian Institution.

[52] https://de.wikipedia.org/wiki/Conchita_Wurst_auf_der_Mondsichel

Figure 7-1 Collections of Wikipedia articles produced in 'Wiki goes MEK!' 2017 and 2018

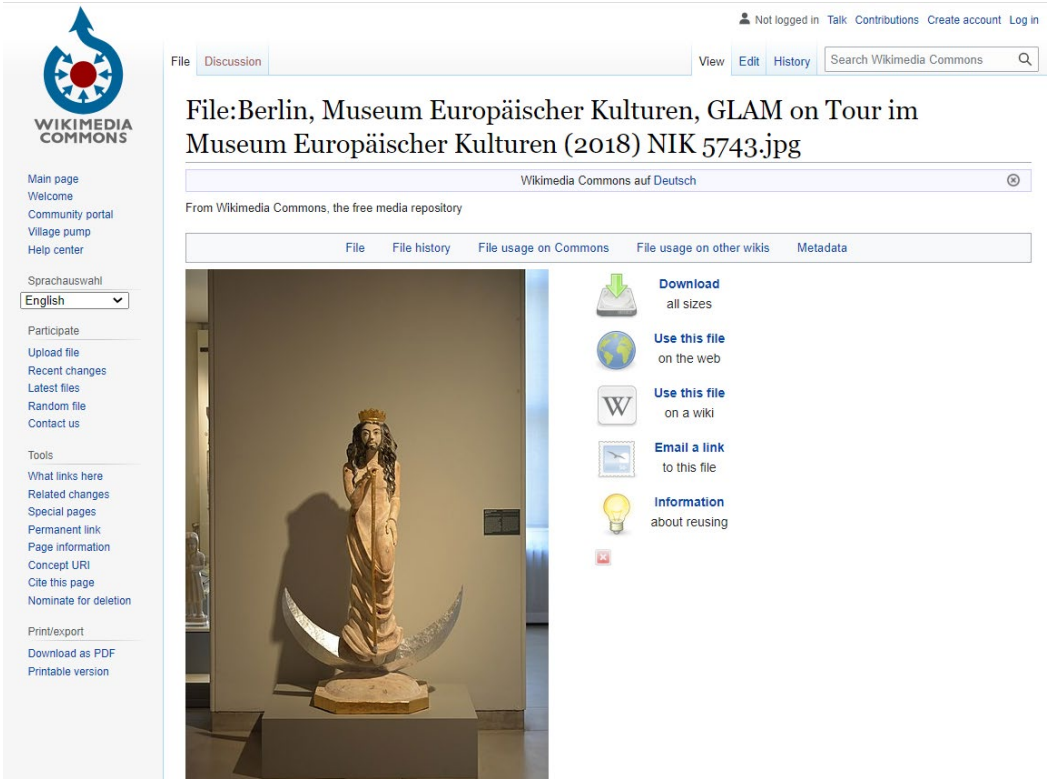


Figure 7-2 Wikimedia page of 'the sculpture Conchita Wurst on the crescent moon'

Cases of collaborative knowledge production, such as 'Wiki goes MEK!', demonstrate how emerging forms of collaborative inquiry into institutional holdings and maneuvering of cultural memory have challenged the ontological stance of institutional memory work. These initiatives are part of sectoral and global efforts to restructure the power dynamic between memory keepers (the institutions) and those they serve (the communities). In this specific case at MEK, participation in cultural heritage is less about providing access and more about committing to a long-term relationship. 'Wiki Goes MEK!' is an example of how some museums shift their service emphasis away from cultural heritage navigation and toward curating collections in digital formats. A small SMB member is making an effort to look after not only the objects, but also the people who use them. As shown in this case, the regular collaboration of the museum with Wikimedia and the Wikipedians helps foster a dialogic mode of memory-making that recognises the plurality of user voices and places museum objects in visible locations, making them more accessible to users outside of the walls of the institution.

7.2 A CONSORTIUM MODEL

As demonstrated in Chapters 5 and 6, unseen work in the back-stage contributes significantly to the maintenance of the infrastructure backbone. For staff at MEK/SMB and SHM coming up against, adjusting to, and attempting to transcend the limits between what the institution owns and what it seeks to deliver is a natural part of their everyday work. What about the institutional actors attempting to reach out to broader audiences and professional communities to keep relevant the value of their newly digitised collections? In this section, I continue the bottom-up approach to designing for access that I introduced in the previous sections. My investigation into how individual, small-to-medium-sized GLAM institutions negotiate their way forward to make better use of their digitised collections is illustrated through the case of a centralised data portal in Sweden.

Alvin[53] is a platform for preserving digitised collections from Swedish university libraries and cultural institutions. It was developed in collaboration with a number of memory institutions from Sweden's archive, library, and museum sectors. Prior to the conception of the Alvin portal, extensive work had been underway for several years to digitise Uppsala University's cultural heritage collections. Alvin was developed by Uppsala University Library in collaboration with

[53] Alvin is an abbreviation for 'Archives and libraries virtual image network.' The platform website is at http://www.alvin-portal.org

the universities of Lund and Gothenburg, and since then, has grown to encompass approximately thirty universities. The concept was for the digital platform system to receive all types of special collections and to make them accessible to other libraries as well. As a result, the Alvin Consortium was formed as a collaboration of public and private sector organisations tasked with the responsibility of coordinating the platform. The consortium is made up of a variety of GLAM institutions, including Västers City Library, the Antiquarian-Topographical Archive (governed by the Swedish National Heritage Board), the Veterinary Museum in Skara, Uppsala University's Coin Cabinet, and the Folklife Archives, which houses the Scania music collections, to name a few.

As many partners can contribute to the shared services management and ways of achieving desired outcomes, this strategic partnership enables numerous institutions to pool their resources, whether financial, human, or digital, such as shared databases. Each partner in this consortium model can thus be seen and act simultaneously as a user, a customer, and a developer. The primary goal of the Alvin platform is to provide affordable, accessible, and inclusion-focused services to its identified clients, which include, but are not limited to, its institutional partners. The shared objective is straightforward: to increase public awareness of the value of their digitised collections. It is hoped that the Alvin project will serve as a model for how university libraries and other cultural institutions can collaborate on digitisation (Svensson, 2015).

The Alvin portal serves as a centralised interface and a digital public meeting point for non-institutional users to gain access to institutional resources – their descriptions, metadata, and images. Unlike the front-stage where everything seems to run smoothly to the eyes of the visitors, it is work regarding the back-stage that reveals conflicts and frictions between various voices and perspectives. This back-stage preparation is an unseen but strenuous operational field, with messy practices, the possibility of human and non-human errors, as suggested in the analyses of the MEK case (Ch. 5 and 6). The decision-making process in a consortium such as Alvin is not analogous to that in a corporation or hierarchically structured institution, such as MEK/SMB. How does the consortium resolve the back-stage conflicts and establish consensus?

When asked what the most challenging aspect of daily work is when managing a cross-institutional, collaborative project as Alvin, Stefan Andersson, an information specialist at Uppsala University Library, noted that one apparent difficulty was the lengthy process of reaching an agreement:

> **Stefan**: Maybe we underestimated the amount of time to agree on everything, because sometimes it took a very long time to agree on digitisation and what to do, what priorities are […] it takes some time if you are more than one.
>
> **Interviewer**: How much time does it take to agree on something?
>
> **Stefan**: Sometimes it's quite complicated, if you have a lot of people involved, and not everyone will be on the same level. It could be more difficult to communicate due to different ways of thinking, about such things like technology. A number of people will not understand it but they still have lots of opinions about it (laugh). And that's as it is. I think you have to be aware that to agree on things takes time. (Interview [ALV1], 2019)

Prioritisation is a contentious and negotiated process rather than the result of a systematic or technical approach in entangled institutional settings where public agencies, donors, and other stakeholders all have competing interests in governance systems (Colenbrander et al., 2015; Glassman et al., 2012). Which types of material should be digitised first and which should be completed later is a decision made by each institution based on their perceived strengths and capabilities. Socio-technical processes for digitisation and digital preservation are thus fragmented in the consortium context of Alvin, as a result of inconsistent, heterogeneous and sometimes incomplete data sources among a variety of institutional members, including public and private organisations. As Stefan indicated, there was no baseline mapping of who does what and what is required to create a coordinated decision-making mechanism ('not everyone will be on the same level'), nor were there clearly defined procedures for stakeholder engagement ('A number of people will not understand it but they will still have a lot of opinions'). When it came to a consortium of more than thirty institutions, reaching consensus for priority setting was a challenging process, due not only to the time constraint ('perhaps we underestimated [the time needed]'), but also to the partners' divergent perspectives.

Given the size and heterogeneity of the consortium, as well as its mandated operational timeframe, establishing effective sufficient agreement is more crucial than achieving maximum consensus when managing collaborative work across diverse communities of practice. Since not everyone within the consortium has the same level of technological competence and vision, task and work type reconfiguration by workers with some level of authority and associated accountability is required to reconcile multiple repository management requirements. Per Cullhed, a strategic development manager at Uppsala University Library and a key member of

the development team at Alvin, discussed the consortium members' efforts to reconcile divergent perspectives:

> That's a sort of a mechanism for strengthening the competence within the consortium. You have the 'Alvin day' one time per year, where we try to gather all the consortium members and all the members of Alvin. They each have their own catalogues and they do a little bit differently. The sum of the technical platforms and the catalogues is what we see here. That's important to remember too. Sometimes when we have to discuss stuff – it's been a lot about the technicalities and the different technical parts of Alvin, you sort of forget about the people who use it. I mean it's the institutions who use it. That may cause differences as well. (Interview [ALV1], 2019)

Not to 'forget about the people who use it' is a crucial aspect of back-stage negotiation at Alvin. The platform and the consortium are both parts of a socio-technical arrangement in the sense that they connect different social agencies to provide a range of technical services. As consortium partners pool and share resources, this range of services must not be too comprehensive. Wade (1999), while evaluating a dozen small to medium-sized academic library consortiums, notes that many of the consortia surveyed provided joint services and engaged in a narrow range of activities that can exist within an informal arrangement. These activities, according to Wade, do not necessitate a formal legal framework, as they present 'arm's length cooperation' where each library operates independently, and there is no delegation of control over service delivery that would otherwise be the responsibility of any individual member (1999, p. 9). This socio-technical arrangement exemplifies the relationship between the Alvin platform and the consortium members. These institutions must collaborate effectively to ensure that the consortium's needs are met by each university library's collection. There is an annual 'Alvin day' where Alvin members meet and discuss the consortium's goals. As the members all have 'their own catalogues and they do a little bit differently', this 'arm's length cooperation' does not require a tightly bonded relationship between members or a complicated formal legal structure.

The two aspects of back-stage requirement at Alvin – ensuring a multiplicity of perspectives and a defined but limited range of activities – highlight the need to recognise diversity and assess individual preferences among the consortium members. Their objectives and expectations vary according to the type of memory institution they are and the collections they possess. What is more critical for the implementation of the platform, when examining the process of reaching consensus and collective action, are the crystallised forms of accomplishment that were shaped

over the consortium's development by the collective commitment of all consortium members. 'The sum of the technical platforms and catalogues is what we see here', explained Per, who was also a senior conservator and director of the Uppsala university library's cultural heritage collections. Per was referring to the Alvin portal's user interface and technical capabilities.

Alvin's web interface is the result of collaborative efforts among the consortium members who attempted to impose their 'definitions of the situation' (Hughes, 1993, p. 572) as the different sub-social worlds intersected and interacted. Stefan described the collective action of not only designing but also assessing an affordable and accessible portal interface for all institutional consortium users as follows:

> It's about how to make a system look like other similar systems, and to make it as clean as possible. Basically if you're using Alvin, you have a search form, then you have a list of hints, and then you have a record. Then you see the digital content such as images, videos, etc. That's the structure it is. And that's how search engines and library systems normally work. (Interview [ALV1], 2019)

The portal had to 'look like other similar systems' to be usable. In other words, the user interface should be intuitive and include basic functions like the 'search form'. A related criterion, 'as clean as possible' interface, suggested that conflicting needs, viewpoints, and agendas should be minimised or eliminated. This consideration of the functionality of the portal, needing to be resonated with that of other systems, resembles what Star and Griesemer (1989) view as translation work at multiple levels in the MVZ (Ch. 2.2). The work of representing diversity at Alvin consortium is similar to that of the MVZ-museum world in the way it creates 'boundary objects' – such as the Alvin portal – that are capable of inhabiting multiple life-worlds concurrently and meeting the demands of each. The portal consolidated resources and collections from a variety of GLAM subcultures, including university libraries, city-county libraries, art collections, and historical museums. Each member belonged to a distinct disciplinary world, with its own set of standards, commitment to methods and preservation techniques, and definition of best practices.

As we have seen in the above-mentioned cases, expanding access for diverse users may require staff to challenge established boundaries, such as the institutional boundary of what user engagement can mean, or value hierarchies within the GLAM profession in an age of participation and openness. By breaching those boundaries, the true extent of flexibility and reactivity enacted by GLAM digital infrastructures can be revealed and questioned. In both

instances, the ability of staff to programme accessible spaces was facilitated by an adequate level of trust within the organisation. In the case of SHM, the user perspective is prioritised, which results in strategic decisions made by the central agency (Swedish National History Museums), which coordinates activities involving multiple actors. While continuing their efforts to 'open up' to new connective possibilities, MEK engaged with the existing infrastructure of Wikimedia in an informed and deliberate manner. In the case of the Alvin platform, the consortium members strategically positioned themselves in the cultural heritage sector in such a way that they, as a hybrid collective, were prepared for emerging user needs and changing behaviour. These installed-based friendly approaches enable SHM, MEK, and Alvin to improve the responsiveness of their institutions to evolving user needs and to ensure its compatibility with online engagement practices.

Conclusion

This chapter builds on the findings of Chapters 5 and 6 by investigating how unseen activities in the back-stage of institutional memory work contribute to shaping the local practices and add to the infrastructure backbone of the institutions. In shifting the analytic focus from the internal to external connectivity, the chapter examines the bottom-up form of designing for access, where museum staff members negotiate their way forward to expanding accessible spaces and individual institutions negotiate their way forward to making better use of their digitised collections. I started, in Section 7.1, by discussing the issues of extending the boundaries of access that require an intervention in the existing 'installed based', which refers to the infrastructure backbone and the existing practices and norms upon which work practices are based. As demonstrated in the cases, enabling access to digital cultural heritage is inextricably linked to persistent concerns about the scalability of infrastructure and compatibility between new infrastructure components and existing socio-technical arrangements. While continuing their attempts to 'open up', SHM have provided museum staff a reflection space to contemplate ways of improving the selection, maintenance, and access to their collections, all of which contribute to a better overall service to their users.

Section 7.2 paid close attention to the ways in which existing infrastructure shapes the practices of museum staff and GLAM professionals working at the intersection of cultural heritage and community system design for user access. The consortium model suggests that institutions can benefit from developing reliable and accessible online spaces where audiences can access the institution and interact with objects in cost-effective ways. By making use of the centralised data

portal, Swedish university libraries with a desire to digitise their collections can do so in a safe and scalable manner. Making decisions, however, can become perplexing at times, especially when a large number of actors and voices are involved. The case of the Alvin Consortium seeking consensus shows the challenges of balancing the goals and expectations of multiple stakeholders concerning a centralised digital heritage repository. Communication may become more layered due to divergent viewpoints on technical elements or new technological adoption. Even though each partner has their own idea about the proper requirements for the system, the throughline that pulls stakeholders through the implementation of the platform and development is the shared idea for expanding access. The cases presented in this chapter overall illustrate the infrastructural development process, in which socio-technical components must integrate with or connect to other infrastructures or tools in 'installed base-friendly' manners.

CHAPTER 8. ACCOMMODATING NEW MEMBER AND THEIR PERSPECTIVES

By examining resource allocation issues in various types of GLAM institutions, this chapter seeks to reinforce the point made by STS theorists and infrastructure studies scholars that since infrastructure is concerned with enduring alignment between contexts and communities, it tends to be relational, and that its relational character towards organised practices can help reveal social tensions and differences in points of view (Appel et al., 2015; Mongili et al., 2014; Star & Ruhleder, 1996). The chapter aims to answer the question: if the background work in museums is frequently referred to by employees as 'a lot of work' [SHM1], 'so many things to do' [HUN1], 'just so much work and so little time' [MEK1], are the resources limited on what and for whom? The preceding analyses have shown that the mechanism by which entities are granted authentication and access to shared resources is at the heart of the various infrastructural practices that take place at the back-stage of institutional memory work. Chapter 7 showed that expanding access through digitised collections is a process of negotiation that has been legitimised by user feedback and staff routines. The extent to which the museum has its own agency is thus reflected through the stabilisation of staff practices, routines, and expectations. Chapter 6 showed that craftwork in the back-stage is a crucial human factor that contributed to the stabilisation of the installed base, the expandability of which is required for enhancing the connective capabilities, both inward and outward, of the institution.

This chapter aims to show how resource allocation and access to shared resources are predicated on one critical aspect of maintaining infrastructure: infrastructure is relative to working conditions. The preceding analyses have pointed out two issues concerning resource constraints. Firstly, even large-scale national museum groups such as SMB in Germany and SHM in Sweden have struggled to allocate the right people and resources at the appropriate time. Secondly, the presence of background work in the everyday functioning of the museum institutions in the study has a relative nature; background work tends to be disproportionally considered as informal (Ch. 5), and the voices of the everyday workers who perform this type of work are not dominant in the museum work-worlds. Building on these previous observations, this chapter explores two themes frequently found in the museum studies literature: deaccessioning and democratising access. There is a growing consensus in recent years that museums must restrain themselves from over collecting (Macdonald & Morgan, 2019; Merriman, 2015; Pattersson et al., 2010), together with preserving their crucial resources for initiating meaningful object-based

learning and engagement with the collections. However, the tensions between different dispositions in terms of collecting and fostering engagement have not been appropriately addressed from the point of view of relationality. This chapter uses the cases of Glasgow Museums, the Hunterian, and Alvin Consortium to unpack the tensions and implications of allocating resources in the back-stage of museum institutions. In doing so, the chapter attempts to answer on what and for whom the museum resources are limited.

The chapter is divided into three sections. Section 8.1 delves into the issues of originality and uniqueness of the museum collections. Drawing on qualitative investigations among the museum staff at Glasgow Museums, a municipal museum, and the Hunterian, a university museum, this section explores further the theme of resource scarcity in other types of museum institutions, particularly small-to-medium sized ones, that are also bound by resource constraints but must still undergo their own digital transformation. Based on this outline of differing attitudes toward collection decisions, Section 8.2 presents the issue of resource scarcity at the Hunterian in three dimensions: conceptual (what it means to be a museum collection), dispositional (what museum staff is supposed to do), and operational (how to maximise resource utilisation while running things smoothly). Section 8.3 uses the Alvin Consortium case to demonstrate how a number of resource-constrained GLAM institutions in Sweden have collaborated on the development of a common interface and registration capabilities to optimise resource allocation. The three sections together demonstrate that (1) the shared missions of digital transformation may be too demanding for some institutions with limited resources, and (2) the resource problem is relative to the perspectives of everyday users regarding the expansion of infrastructure and accommodation to new members.

8.1 PERSISTENCE OF EXISTING INFRASTRUCTURE TO COLLECTING PRACTICES

Chapter 4 and 7 have discussed how museums are confronted with issues surrounding traditional hierarchies of value, which may impede the willingness of institutions to adopt digital strategies aiming to enhance user engagement. In the process of accommodating a broad range of users, staff responsible for social media at MEK (Ch. 4.1) and digitisation staff at SHM (Ch. 7.1) have encountered contradictions and tensions that expose and call into question museum boundaries which shape and hinder a practice of assembling access. From the viewpoints of these everyday museum workers, 'What counts as a museum object?' could be a persistent

question about the identity of their museum. Examining the views of these workers, when it comes to creating opportunities for users to access digital cultural heritage, has revealed hidden layers of meaning about and the originality and uniqueness of the collections that their museums hold. For a MEK curator who takes care of its Facebook page, building access via social media is 'a means of getting in contact and staying in contact with your community, with people who like your museum, to think of your museum as their museum' [MEK3]. At SHM, the digital strategies adopted by its members endorse the view that digital objects can exist in their own right and perform roles that might go beyond reproduction and interpretation. Publishing digitised versions of museum objects online can complement the curatorial process of selection that preserves the authority on the object in a way that it enacts a new set of social relations constructed for what the real object is, either through Sketchfab or virtual reality worlds (Ch. 7.1). Both cases illustrate a 'decentralised' standpoint on who performs the process of selection, who decides what is significant, and who has the authority to dictate what the identity of the museum should be.

In the following, the two instances of museum workers being uncertain about what are true, authentic museum objects to be collected – one at Glasgow Museums (GM) and another at the Hunterian – resonates what has been addressed earlier in Chapter 6 and 7: museum workers engage in the process of actively expanding and negotiating infrastructural boundaries about what truly constitutes an authentic museum collection. What is more is that the two instances underline a common collections management issue museum workers encountered on a frequent basis: unclear policies on what not to collect. This section describes how a lack of appropriate policies and protocols might result in staff ambiguity about the identity and scope of museum collections. In doing so, the section connects with the following one in detailing how museum staff bump up against and negotiate the infrastructural boundaries.

Vicky[54] is a former employee at GM. In answering the question about their experiences on the collections and preservation, Vicky started with an observation that the museums have historically avoided collecting digital works openly. Then they recalled that in the museums within the GM network, there are generations of digital items, but they have frequently never been included in the collection. 'If you go to [museum name]'s accession register, you will struggle to find any explicitly digital content [that had been] accessioned as a museum object',

[54] Anonymised name

said Vicky. Being included in data management responsibilities at one member of GM, in their hindsight view of events, Vicky noted that the management of this museum might have focused too much, sometimes exclusively around that 'what's an explicitly terrific collection? [pause] So the lovely things come out of this, but they are not the collection'.

Vicky recalled a personal experience with what they referred to as 'para collections' during their time as a museum back-end researcher at the GM member:

> I can not recall the specific details, but it was something along those lines. One previous employee was tasked with the job of disposing of the throne of Akhenaton. Of course, it's not a throne of Akhenaton. It was a prop that had been painted and set up in an exhibition. So, they said, 'I disposed of a throne of Akhenaton'. 'Well, you didn't really because it's a prop'. (Interview [GLA2], 2019)

Vicky expressed their concern about over-collecting at this museum – what museum scholars have been referred to as the practice of collecting and preserving 'everything' (Harrison, 2013, p. 589; Lubar, 2015, p. 88; Macdonald & Morgan, 2019, p. 36). The museum Vicky worked at [name withheld], according to this former GM employee, used to see all types of historical collections as unique, as time-sensitive, and as needing to be safeguarded. In other words, the museum acquired the pieces in that 'unique collection' based on trust. The long-ingrained tradition of collecting everything that has historical importance and thus would add value to an 'explicitly terrific collection' was exacerbated by the volume of 'para-collection' items accumulated – which makes collections administration at times tiresome and ambiguous pick-and-place exercise. The practice of collecting 'para-collection' resulted from what Vicky pointed out as a lack of clearly defined policies regarding the types of objects and forms of content that must be collected. Consequently, the museum acquired 'all kinds of material which were not really collection but should-be in the collection', recalled Vicky.

Nicky Reeves is a curator of scientific and medical history collections at the Hunterian Museum. Being asked, 'What is your daily working routine and the challenges in your work?', he expressed one of his daily concerns, about the disconnect between old and new definitions of collections. He suggested that the institution he worked at, given its specific status as a university museum, already had this generational divide:

> there are lots of competing demands because we are serving multiple different stakeholders – not all of them understand the collections, or understand what the

> collections are for, many of whom don't understand quite how difficult it is to do things with objects whilst conserving them. It's interesting and important that we are part of it, we are a university service. It's where we are. We are a service just like estates and buildings, just like catering. (Interview [HUN1], 2019)

Nicky defined an 'old-school' approach as a mindset that collection decisions should be made by the curator, and possibly the director. This 'attitute', as Nicky put it, unquestionably insists that the curator is the best person to know, and they know best because they are curators – 'there is a slight circularity here'. Nicky asserted that the opposing attitude should be that curators such as himself do not need to possess professional knowledge about all the objects for which they are responsible as curators. This conscious approach to a museum's content, and the implications this might have for the future, suggests that the skills of the collections manager, database manager, and registrar are as important as those of curators or museologists. All skills must complement each other's roles and contribute to the museum's overall function. Nicky discussed the growing importance of the museum back-end, where data and metadata management are critical: 'I think, storage and database management is real museum work. I don't think it's work which then facilitates other things. I think it is wholly central to the museum enterprise'.

The role of the university museum in serving multiple different stakeholders has aggravated generational issues about what constitutes good object handling by converging channels of support towards what the staff – in this case, the curators – believe to be the right thing to do. The engineered activities may fail if there is no broad support from relevant actors and agreement on what should be offered to each group of stakeholders, as discussed in the efforts of crafting access at Alvin Consortium (Ch. 7). Nicky's remarks about the old/new school mismatch, as well as multiple stakeholder perspectives, demonstrate how differing attitudes toward standards of documentation and collection assistance affect the museum's critical task of object care. The issue with this 'kind of proprietorial attitude', as Nicky suggested, is the conventionally underlying inhospitality towards visions of the peripheral actors; instead, this attitude imposed the notion that a centralised site is enforcing a collections management policy, 'physically and architecturally'.

At the Hunterian, a university museum whose primary mission is to experiment and evolve new initiatives in 'curatorial and collections pedagogy' (Gaimster, 2016, p. 375), the collection's accessibility was inextricably linked to the plurality of its uses. By relocating a significant portion

of its collection to the newly opened Kelvin Hall and establishing a new museum, gallery, and study centre, the Hunterian's administrators hoped to 'quadruple the percentage of items from the university collection on public display, from the current 0.5% to 2%' (Miller, 2013). While the Hunterian's role, like that of the University of Glasgow in the Kelvin Hall, was to increase access to the collections, within the context of complex institutional histories, there are divergent perspectives on the value of access. Collection access can be measured in terms of visits, or by the number of objects that have been interrogated, encountered, or seen. According to Nicky, museum staff can track this and say, 'We have had 1700 encounters with objects this year', for example.

> But none of those [metrics] were very meaningful. And my six or seven contacts who are like me, academics who understand this material in huge detail when they came, spend a week here – that was more meaningful. […] And those are all competing and from the university's perspective it is very much about embedding access to the collections within undergraduate and graduate curriculum. (Interview [HUN1], 2019)

In this instance, the curator drew a comparison between various approaches to raising the value and public awareness of museum holdings. Those who argue that access to cultural heritage is not only cognitive and physical, but also social and emotional, taking into account the sensory, affective and transformative qualities of cultural heritage objects and displays, were consistent with this position (Kist & Tran, 2021; Morgan, 2012; O'Neill, 2002). His remark implies a contrast between two opposing perspectives: that of a 'dashboard type' of measurement and that of museum employees who value a close examination of the objects. In terms of the sensual aspect of user interaction, the stats-centric evaluation approach may undervalue the visual spectacle value of a collection. This stat-centric approach to museum access undermines what Witcomb (2007, p. 36) 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'. It also entails a dearth of meaningful, sensuous interrogation of the 'vital objects' which have a high capacity for sustaining museum exhibits (Candlin, 2016), and 'a sense of place' which is crucial for the construction and articulation of shared community identities (Watson, 2007). Nicky asserted that the encounter with collections could be more meaningful if led by someone who understood the material 'in huge detail'.

This section presents circumstances in which museum employees express their views on what constitutes an authentic museum collection and on meaningful approaches to enhance visitor

engagement. It complements previous cases in Chapter 4 and 7 in showing that there are diverse ways of giving access to the collection while emphasising the everyday concern from museum employees about working with insufficient resources. This section conveys the relational nature of giving access to the collection, i.e., giving access does not mean that every object in the holdings has the same priority, nor every worker associated with this practice has the same voice. In the context of the uncertainty over what and 'how much to collect' (Macdonald & Morgan, 2018, p. 24), this section and the following show that, from an infrastructure analysis perspective, planning a responsive collecting mechanism to deal with the uncertainty inherent in producing heritage futures is an 'unfinished work in progress' (P. N. Edwards et al., 2009, p. 365) that entails ongoing negotiations and contestations at the local level.

It should be noted that museum scholars have long observed how collecting paradigms are evolving with an emphasis on de-growing museum collections (Morgan & Macdonald, 2020). Professionals as well as scholars have been proposing potential procedures for 'rationalising' collections, arguing that knowing the frameworks in which things were collected helps to perceive better what may have been omitted (Lomas, 2014; Macdonald & Morgan, 2018). This section aims to highlight the relational back-stage contexts in which museum staff perceive what they mean by collections, disposal, mobility, and deaccession – essential concepts which can be inscribed into their judgments and actions towards accommodating new objects. In describing the process of museum staff actively expanding infrastructural boundaries of collecting practices, this section shows specifically how breaking these boundaries can be relative. Expanding the boundaries of what new members to be accepted by existing infrastructure is relative in the sense that, while this boundary-breaking constitutes and exposes an installed base founded upon staff perspectives of the museum collection, it may not be taken forward by distinct reasons. As seen in the SHM case in Ch. 4.1, the perspectives of everyday workers may interrupt the current work order and be thus assumed to be not taken seriously by the upper management. The following section examines another reason: resources constraints. It shows that the stability and persistence of existing infrastructure are so strong at times that shop-floor workers appear to have little chance of implementing digital transformation with the resources available.

8.2 RESOURCE CONSTRAINTS AND STAFF INTUITIVE DECISION-MAKING

The Hunterian Museum houses an enormous collection of scientific instruments. During our first meeting, Nicky informed me about the distressing situation of the storage, which includes a large warehouse filled with undocumented items that were 'improperly collected in the early 1990s'. The warehouse's storerooms were crammed with 'often repetitive' hardware sourced from a variety of science departments and acquired by the museum. The majority of these objects were collected 'with the sincere belief that it will be documented', he acknowledged, and were not collected 'in any discriminating way'. Many of the objects were in good condition twenty years ago, but they were not in good condition at the time we spoke. And the staff was currently 'dealing with some of them 'quite robustly', pondering the fact that some of them are hazardous, and whether 'we're going to destroy, or we're going to get a hazardous waste company to bury them'.

According to the Museums Association of the United Kingdom, being hazardous is a valid reason for an object to be disposed of, in terms of safety of collections and safety of individuals. The Museums Association notes in its disposal toolkit that any hazardous item can be subjected to a 'curatorially motivated disposal' (Museums Association, 2014, p. 9). The disposal is motivated by two major reasons: (1) it eliminates any hazard posed by an item (e.g., contamination); and (2) by removing the item, the museum frees up resources and optimises space to provide better care for other parts of the collections. The disposal is facilitated by the item's lack of meaningful access, i.e., its inability to generate 'public enjoyment and engagement' with it (Museums Association, 2014, p. 9). As Nicky made clear, '[I]f something is a hazard that cannot be used in teaching, it cannot be displayed', which means that its use within the context of a university museum is severely limited.

When it comes to trying to discard anything, one of the most frustrating conundrums, as Nicky noted, is that 'the stuff you want to dispose of is impossible to dispose of because you do not know it is yours'. Staff cannot discard certain materials based on their personal beliefs, whims, or intuition. At the very least, there are two types of issues at hand. There are the items that lack documentation, as 'you knew nothing about them, therefore they don't have any utility', and then there are the items that 'you can't make decisions about because you can't prove they are yours', Nicky explained. There was a great deal of ambiguity about what the proper course of

action should be when it came to object handling at the Hunterian, which has objects that have been on loan as well as a lot of objects where 'there is no documentation, or it is not clear that it is ours', according to the curator.

As a curator of scientific and medical history collections, Nicky is approached on a monthly basis by staff from the Estates and Buildings services, or 'a technician or a janitor in Glasgow'. These university staff assumed that curators would 'going to magically know all the things are'. According to Nicky, the technicians were respectful ('They're very deferential'), and they frequently requested his permission to do something with the discovered objects. However, it is often the case that Nicky has to decline their request: 'I nearly always say we do not want to collect these things. Either we've got one already, or one of these exists in another big collection, it's not our role to collect all the [sorts of things]'. Nicky would interview a technician, eliciting information about their job and duties, their length of service in the University's Estates and Buildings department, whether they could tell him about the object, and their thoughts on it. And then he would suggest 'perhaps making a five-minute film', because technicians who had worked with the material for years 'usually know most about it', and they were respectful of other staff members' work ('they are very deferential').

Again, we see a problem cycle associated with a lack of guidance on how to determine who is responsible for what (see Ch. 5.2). The staff 'listened' to their experiences and chose what they believed to be the correct course of action, which resulted in ambiguity and resistance: 'if you are so concerned to make sure you do it right, you end up not doing it at all. Like you know, we need to have standardised process' (Interview HUN1, 2019). All through their daily work routine, Nicky and his colleagues were frequently confronted with the question of whether these items should be added to the collection: '… the same questions each time, and we also need to think very carefully about where we're going to store the multimedia. Pardon me, those are good questions to ask, but sometimes it's stopped me from just going forward'. They were required to store multimedia files (photos, videos) of the material on the museum's database if they chose to document what they found. There was no clear protocol for storing the files because this type of protocol presupposes that they must take the material in the first place, and the material was considered a museum object. Nicky, on the other hand, was adamant about taking the multimedia files as part of documentation. As long as they had the file, they could say, 'we will decide what to do with it', which seemed to be the only way to keep the team moving forward.

'We had a conversation about this recently', Nicky told me during our interview. This is where the disagreement began. Because 'we are not collecting anything', his co-worker was 'quite resistant' to keeping the multimedia in the database, arguing that it was merely 'not metadata that pertains to a collection item'. Nicky made his feelings known:

> I was kind of saying, 'but we're collecting the multimedia'. I'm kind of having a conversation about (pause)… and X [colleague's name]'s resistance is mostly just because (pause)… X agrees we could do all these things, but right now, X got so many things to do. Right. So let's, let's talk about it in the future. But I think that seems like a sensible thing. The idea that there's not a distinction between collections management and content management. (Interview [HUN1], 2019)

The analysis in Chapter 5 reveals how individual staff members at MEK face ambiguity and resistance, as their dealing with museum documentation is an intersection of feelings, thoughts, and experiences. In the Hunterian case, the two colleagues were at odds over the data they gathered. The task of determining the nature of the information they collected and deciding what to do with it was simply too much for the staff, as each of them had 'so many things to do'. If they choose to take the item, whether it is physical material or a multimedia file, this decision creates additional complications. The conversation devolved into trivialities such as whether they would refer to this encounter with the material as an 'event' or an 'exhibit' in EMu, the Hunterian's documentation system: '[The distinction] doesn't matter [...] if I were to make set pictures and interview at a location, we would call it an event, we wouldn't call it an exhibit'.

Only a few weeks before our meeting, Nicky and his colleagues visited some university staff members in the department of electrical engineering, where they discovered 'these rather nice devices' called Epstein frames, which are 'big heavy like 30, 40 kilogrammes, squares, and heavy wood with coils'. These frames were intended to form a circuit for the purpose of testing the magnetic properties of steel bars. They are devices that were created in-house by technicians in the 1950s or 1960s – a 'really nice object' for illustrating the routine, mundane nature of teaching engineering at the university level. However, it is not a device that was used to 'make discoveries… it's just a practical calibration device that was made in the house', and overall, 'it looks quite cool'. The curator team from the Hunterian was unable to take the object due to a lack of space. The team photographed these objects. And then Nicky said to the technicians, 'it is yours what to do with it'. He estimated that, 'they'll probably put it back in their cupboard for another 20 years – that tends to happen. But it's their responsibility'.

In January 2019, Nicky received an email from the University's Estates and Buildings services informing him that they had discovered a massive ceramic bathtub in extremely poor condition on the Gilmorehill site. The bathtub was broken, 'substantially discoloured and distressed', and stayed in a room that was assumed to contain asbestos-containing materials (ACMs). Nicky compiled a report with the goal of establishing that the discovered bathtub was the original one[55] installed in the Lister Ward of the Glasgow Royal Infirmary.[56] Nicky argued emphatically in his Lister Ward report against taking in the bathtub, despite the fact that he believed it was probably the only Scottish hospital bathtub remaining in the world from the nineteenth century. As he later explained during our talk, the museum is unable to display or use the building due to its poor physical condition. The bathtub, which was discovered in the building's basement, weighs 'probably 7 or 8 hundred kilogrammes'. To gain access to the room in which the bathtub resides, staff must 'unscrew the panel, take off the wall and crouch down'. Since the bathtub was installed there, presumably several decades ago, new pipes have been installed in this already small space, effectively trapping the bathtub. The bathtub would certainly have to be dismantled in order to be moved, as it is fairly unlikely that the pipes could be removed. Leaving those concerns aside, the primary concern of the museum staff was the bathtub's functionality. 'Is it a memorial? Is it of use? Is it historically significant? Is anyone ever going to do any research on it? Are we gonna use it for teaching? No, we can't move it', the curator stated cautiously. If the bathtub were to enter the museum store, it would consume a significant amount of space. The additional space it would require in the store could be detrimental to the long-term storage and accessibility of other collections. 'We do not have a lot of space', he concluded.

Nicky attempted to unravel the history of the hospital and the object in his 'really lengthy report', 'just to establish provenance'. The Hunterian's collections development policy contains detailed instructions on how he must make a recommendation to the strategic development board of the Hunterian, which will then recommend to the university court. This working protocol serves as a safeguard against any member of staff disposing of objects without a valid and formal reason. Nicky described the task of researching the material's provenance as 'extremely time-

[55] According to the Wellcome Historical Medical Museum (1927, p. 156), once filled with hot water, this original bathtub held its warmth for an extended period, 'thereby enabling several patients to use the same water'.

[56] Various hospital blocks at Glasgow Royal Infirmary in the late Victorian and early Edwardian periods were ambiguously referred to as the Lister Ward due to the presence of Joseph Lister in one of the wards in the 1860s. Lister is best known for developing antiseptic surgery, the use of carbolic acid to clean and sterilise instruments and wounds, while working as a surgeon in Glasgow. The 'Lister Ward' objects were relocated to the Wellcome Historical Medical Museum in London. Most of these items were donated to the University of Glasgow by the Wellcome Historical Medical Museum in 1965.

consuming'. He was required to send the report to individuals at various museums for feedback, awaiting their independent judgement. And then, he cautioned, 'some of them may say, you need to keep this and we can't ignore them. Because it's a consultation. We've consulted, we don't have to approve. But I'm interested to see what's going to happen, I'm not sure. But it's been really, really time-consuming'.

'Too much work', 'too many competing demands', 'too much short term problems', etc. are recurring concerns of everyday workers. Recall from Chapter 5 that time-consuming tasks are a daily part of the museum's background work. Tanja and her colleagues at MEK had to carry out a random series of tests and checks to identify any discrepancies in the digital documentation systems. At the Hunterian, after gathering evidence, following minute provenance trails, making professional judgments, and drafting a detailed report, Nicky was required to present his findings to the museum's board of directors and to other experts. As he put it, 'it [his report] is proper history writing and making sense of our 1960s documentation'. By arguing against the addition of massive and heavy objects to the museum's storage, the staff member was able to save valuable storage space. The tasks required adherence to a strict working process while also representing the subjective opinions of staff on alternative types of accessible spaces in museum environments. These 'articular' manifestations of background work illustrate how staff members have been aware of limited back-stage resources on a dispositional level. This awareness results from their enhanced sense of self as gatekeepers in the cultural heritage organisation. They are dispositional because this treatment of bulky objects or hazardous material represents the emergence of a new set of socially organised practices at the intersection of three different but intermingled communities of practice: curation, documentation, and digital preservation.

The analyses in Section 8.1 and 8.2 suggest a need for greater attention to how existing infrastructure, here described as an 'installed base', shapes the practices of museum staff working at the junction of curating and designing for user access. Section 8.2 examines staff strategies that cope with the stability and persistence of the existing installed base and provides insight into mechanisms that support change. It looks at staff decision-making at the Hunterian to demonstrate that situation awareness about resource constraints is relative to on-the-ground perceptions of museum staff about what conflicts with the interest of the museum, or more specifically, what can cause the deterioration of its collections. As Nicky raised his warning, the collections at his museum were 'typically underused, and under understood […] because of poor cataloguing, but also just because of architecture, and disposition'. The following section

provides insight into a mechanism that supports change in Alvin Consortium. This mechanism does not rely on the perspectives of everyday workers – such as presented in Section 8.1 and 8.2, but those of individuals, as members and everyday users of infrastructure. Section 8.3 demonstrates how GLAM institutions, on the operational level, can negotiate themselves forward to be part of a common digital heritage ecosystem to serve their communities better when designing for digital access.

8.3 MAXIMISING RESOURCE UTILISATION: THE CASE OF ALVIN

As mentioned in Chapter 7, the Alvin platform was established in 2010 with funding from Uppsala University and external projects. Its back-end design, configuration, and implementation have been confined strictly by the budget constraints of an institution and, shortly thereafter, a consortium. As Stefan pointed out, all components should be open-source software whenever possible to avoid licencing costs and future issues similar to those that plagued the former Waller database, [57] as a study by him, Per and their colleagues suggested (Andersson et al., 2011, p. 10). Fedora Commons, a modular and open-source repository architecture, serves as the backend system for metadata and data storage, as well as version management in the platform. In addition, metadata is stored following an internally customised format. The goal is to describe diverse types of material – not just manuscripts, but also archives and images and other types of resources – in a single, consistent, and affordable system.

In terms of metadata management, the developing team makes use of METS, which keeps the descriptive metadata and the file metadata in one format. Stefan Andersson, an information specialist at Uppsala University Library, explained: 'A special thing about Alvin is that we can also handle archive metadata, which is normally using the EAD format. So it's a combination of MARC, EAD and METS'. The capability of the repository to combine metadata schemes and its compatibility with various document types, object categories, and action types, as suggested by Stefan, makes it a viable solution for consortium members, allowing them to cope with changes across generations and in shifting ecologies.

[57] A digital catalogue of the Waller Collection of history of Science and Medicine is kept at Uppsala University Library.

Table 8-1 shows the most downloaded items from Alvin in 2020.[58] The diversity and wide uses of these objects demonstrate the importance of digitisation and online publication in igniting community-based projects and participatory approaches. The second most downloaded item is a list of names of Polish citizens who were saved from Nazi concentration camps by the White Buses of Folke Bernadotte in 1945. The second most downloaded item is a list of names of Polish citizens who were saved from Nazi concentration camps by Folke Bernadotte's White Buses in 1945. This list served as the foundation for over 500 in-depth interviews with concentration camp survivors, which later became the community project 'Witnessing genocide[59]' governed by the Polish Research Institute in Lund. Sweden's most valuable book, *Codex argenteus*, also known as 'The Silver Bible', is the fifth most downloaded item. The book, stored and displayed to the public at Carolina Rediviva university library, is the most comprehensive text still existing in the Gothic language. The project of scanning and publishing the *Codex Argenteus* and its editions was intended to benefit scholars interested in the Gothic language, but it has now benefited a broader audience (Munkhammar, 2010).

Object title	Numbers of download	Alvin record number
Litvrgia Svecanæ conform to the Catholic Church and the Christian	556	80052
List of Polish citizens evacuated from Nazi concentration camps by the Swedish Red Cross during the leadership of Count Folke Bernadotte	444	109677
Gabriel Jönsson's leftover paper	416	64469
Skultuna working community: cultural-historical building inventory in Västerås municipality	395	350711
Codex argenteus (Silver Book)	313	60279

Table 8-1 Most downloaded items from the Alvin portal, as of May 2021

[58] The Alvin team uses statistics provided by awstats, the open-source log file analyser, with the plugin 'GeoIP.' Data is available at http://www.alvin-portal.org/stats/www/2020/awstats.alvin.html.

[59] https://www.ub.lu.se/hitta/digitala-samlingar/witnessing-genocide

As an online repository for digital and digitised documents from a variety of GLAM institutions (Ch. 7.2), the Alvin platform was aimed to support a wide range of electronic file formats. It must also store the data files, i.e., the digitised version of objects, and record relationships between items. The interface of online repositories is designed in a way that is simple enough to be usable by different types of institutional users and communities of practice who may come to access, use, and re-use the material that is being put online. Table 8-2 shows how two distinct types of cultural artefacts are displayed, and what types of metadata are presented on the Alvin platform. On the left is an entry for a Denarius Caracalla silver Roman imperial coin,[60] and on the right is a map of the Kyoto Imperial Palace,[61] which served as the residence of the Japanese Imperial family until 1869.[62]

[60] Permanent link for this record: http://urn.kb.se/resolve?urn=urn:nbn:se:alvin:portal:record-101417

[61] Permanent link for this record: http://urn.kb.se/resolve?urn=urn:nbn:se:alvin:portal:record-91734

[62] For clarity purposes, the long fields of 'Physical description' and 'Notes' are not included in the table.

		
Title	**Roman Empire, Caracalla, Denarius**	**Map [Kyō no Miyako (京の都)/ Kyoto], Spiritual emperor's residence in Japan**
Language	Latin	Japanese
Persons	Caracalla (M. Aurelius Antoninus), 188-217 (issuer) Julia Domna, c. AD 170-217 (depicted)	Thunberg, Carl Peter, 1743-1828 (former owner)
Value	1 Denarius	
Origin	Rome, Roman Empire (hist), AD 211-217	Kyoto, Japan, ca 1772-ca 1776
Related records in Alvin	References: RIC IV.1 : Pertinax to Geta, 373a, p. 272	
Object type	Coin	Map
Subject, topics		City map
Subject, geographic		Topographic maps (tgm II) Woodcut (tgm II)
Subject, geographic		Japan (sao) Japan - history - 1600-1868 (sao) Japan Kyoto
Subject, temporal		18th century
Location	Uppsala University Coin Cabinet	Uppsala University Library
Identifiers (local)	461734 (inventory number) alvin-record:101417 (alvin)	9578 (image search ID) 1967/91 (accession number) alvin-record:91734 (alvin)

Table 8-2 Comparative view of two objects, with metadata from Alvin

Both objects are housed in the collections of Uppsala University: the coin is kept in the Coin Cabinet's drawer, while the map is kept in the university library's storage. Apart from the basic information ('language', 'persons [the owner]', 'physical description', 'abstract', and 'notes'), the Roman denarius coin lacks subject-related information such as its topic, geographic subject, and temporal subject, whereas the Kyoto map contains all of them. The coin was given a value of '1 Denarius', while the map received no value. These omitted fields within the two entries indicate that each object type has its own set of mandatory and optional descriptors. While both the coin (AD 211-217) and the map (ca 1772–ca 1776) are antique artefacts, the metadata belonged to the coin include fields that are lacking in the Kyoto map, such as value and units of measurement – denomination, weight, fineness, diameter, and mintage.

There are in total 37 record entries[63] relating to the Roman denarii, i.e., Marcus Aurelius Roman Imperial Coins (27 BC-476 AD). All these coins are part of the Coin Cabinet at Uppsala University, and none of the entries include a subject description or classification information. The coin collection is an example of repeated divergency from conventional bibliographic data practices that makes coin collections a 'segmentation' from the library world. As Kling and Gerson (1978) observed, an essential feature of social worlds is their ability to differentiate into subworlds. This segmenting of worlds can lead to the formation of another sub-social world, functioning with 'its own standards, boundary setting, and maintaining mechanisms, and subject to the same potential debates and challenges or drifts which lead to its segmentation' (A. Strauss, 1982, p. 188). The sub-world of coin collections serves and provides services towards researchers and people who also work with semantic web technologies but have special interests in numismatics – including coins, medallions, tags, badges, nickels, and other related items.

Kent-Inge, a librarian and systems developer at Uppsala University Library, noted that in 'opening up' the Alvin platform must rely on the API of K-samsök, a centralised web service for applications to retrieve cultural heritage data from institutions in Sweden. This web service serves as a link between the databases of GLAM institutions and diverse types of actors who want to use the data in their own applications. The drive for this task is that:

[63] The search result showing 37 entries can be found at https://www.alvin-portal.org/alvin/resultList.jsf?faces-redirect=true&includeViewParams=true&query=Roman%20Empire,%20Caracalla,%20Denarius&searchType=EXTENDED&dswid=-4410

> [Y]ou can get metadata from Alvin through OAI-PMH[64] in Dublin Core. The coming spring we're gonna work with this [translation of format], so you want to get this out because right now you don't have an API that you can really use with Alvin. But this will be possible through K-samsök which has an API. (Interview [ALV1], 2019)

K-samsök is a Swedish aggregator for cultural heritage data delivery to Europeana, a web portal containing digitised collections of more than 3,000 institutions across Europe. Stefan commented that when someone transfers the metadata to K-samsök, 'K-samsök will manage it, because Europeana also has a different metadata format'. At the time I was in my second fieldwork trip, Kent-Inge and colleagues at Alvin were translating Alvin metadata format into the K-samsök RDF.

As a consortium platform, Alvin resembles what Bowker and Star (1999, 2000) call a 'boundary infrastructure', which is workable to diverse types of memory institutions and communities of practice. The two objects above show how a common object entry interface can work with both maps and coins. Ambiguity and missing information are therefore inevitable. Both objects in Table 8-2 have 'alvin-record' identifiers. However, while the roman emperor coin is assigned with a unique 'inventory number', the Japanese emperor's residence map has a unique 'image search ID' and an 'accession number'. It is possibly because the Coin Cabinet has employed an inventory number system, while the University Library uses an accession number system based on the year of registering ('1967/91'). These two distinct systems draw jurisdictional boundaries over their collection and make to impossible for one system to work with the members of another, or to merge with another. To avoid disputes, the designers of the Alvin platform must either invent a new system, or combine these two, as they did, and it worked well.

Within Alvin, the registration interfaces and file storage should be identical for all member libraries, archives, and museums. Both databases under development and planned new applications require a detailed level on the design of interfaces and database functionality. According to Per, the more people who work with and contribute ideas about how systems should be designed, the better. The more appealing this view is, the more people from the public will want to access the portal, resulting in expanded collaborations. Even though there is freedom for Alvin members to brand and individualise their collections on their own websites,

[64] The OAI-PMH (Open Archives Initiative Protocol for Metadata Harvesting) protocol is a means for multiple institutions to exchange metadata to increase access to digital documents. As of September 2021, Alvin metadata records can be harvested via OAI-PMH, version 2. These metadata records are freely available under Creative Commons CC0.

these institutional users have collaborated on the development of the shared interfaces and registration capabilities (Ch. 7.2). The health of the consortium and future collaboration prospects are highly dependent on the stability and usefulness of the shared interfaces, as well as registration and dissemination capabilities. To meet this requirement, a unique standard number or code commonly referred to as an identifier[65] can be used globally or in systems other than Alvin to identify the resource.

On the surface, looking at the metadata records such as those in Table 8-2, one can say that the multiple identifiers displayed in each record can be confusing to an average public user. In Alvin, a unique, lasting identifier is automatically created for all records in the form of a URN:NBN[66] provided by the National Library of Sweden (Kungliga biblioteket, or KB). When staff provides an electronic resource with a Uniform Resource Name (URN), they enable a more straightforward and more secure retrieval and identification of the resource, because a URN does not change when a resource is moved to another address. The Uniform Resource Locator (URL), or 'network address', however, does change. For long-term digital preservation, a rule of thumb is that URNs must not be replaced as long as the owners do not modify the content of a resource. Multiple identifiers shown in the last row of Table 8-2 are numbers or codes used locally to identify the resource. They could be the accession numbers or inventory numbers. In Alvin, a unique Alvin ID is automatically created for all records in the form of 'alvin-record:[database ID]'. For example, 'alvin-record:91734' points to the 18-century map of the emperor's residence in Kyoto, being preserved at Uppsala University Library.

When asked how digital resources in Alvin will benefit future generations of scholars and students, Per shifted his gaze to the wall-mounted screen in the meeting room and took a moment to locate the object in Alvin he wanted to show me as an example. 'Magasin för konst, nyheter och moder' is the title of an illustrated Swedish fashion magazine published between 1823 and 1844 by Fredrik Boije. Recognised as the first true fashion magazine in Sweden, students have used digitised versions of it for years, according to Per.

[65] Examples of general identifiers used in libraries are ISBN (International Standard Book Number), ISSN (International Standard Serial Number), and DOI (Digital Object Identifier).

[66] A Uniform Resource Name (URN) namespace for National Bibliography Numbers (NBN) was established in 2001. NBNs were used because they can be applied to resources that are not catered for by standard identifier systems such as International Standard Book Number (ISBN). A number of European national libraries, including the Swedish one, have since then implemented URN:NBN-based systems.

> I know many students that have used [it]. This is a publication on the fashion. From the beginning of the nineteenth century. They look like this. [Click to enlarge the image] The PDFs have been downloaded and analysed when it comes to texts, by text mining programs and so on. There are 11 students reports written on this material. They have used quite extensively here at the history department. This specific material. Sure, yeah I can send you a link. This is a typical image from that book… Fashion images. (Interview [ALV1], 2019)

There is much to do to fill the gap between contrasting socially inclusive potentials and the practical reality of user experience may encourage institutions to re-evaluate the balance between caring for objects and caring for people. Managing collections is not only about storing, preserving, and displaying objects, but also making them available in digital media for the long term. In this sense, the persistent identifiers[67] have played an essential role:

> If you want to publish something on the Internet, the first thing you might think about, if you're not in the LAM (Libraries, Archives, Museums) world, is to put the resource on a webpage and make them accessible and reusable. But everyone knows that the webpage might go down in 5 to 10 years and then everything is gone. If you have it in a safe repository and use the web to expose what you have, it doesn't matter if the webpage goes down because the material is still in the repository. (Interview [ALV1], December 2019)

Using the URN service, the Alvin portal allows public users to obtain a permanent link for each record. The URN is a type of persistent identifier that can be used to identify online resources in a unique and permanent manner, regardless of their URL or location on the Internet. These nationally governed namespaces ensure that online resources will be accessible in the long term.[68] Typically, national libraries and larger organisations are responsible for assigning URNs to digital resources. Then, medium-sized organisations (such as Alvin) and smaller, local organisations (such as university libraries) can benefit from this concerted, nation- and alliance-wide effort at long-term preservation.

---

[67] Persistent identifiers (PID) systems have been developped in a variety of sector since the mid 1990's. Example of external PID systems are NBN, Handle, DOI, ARK, PURL. Here I focus on the use of URNs in the heritage sector.

[68] Many national libraries have employed URNs for reliable referencing of their digital objects. For example, the German National Library administrates and assigns URNs from the namespace 'urn:nbn:de' and it offers a URN resolving service for Germany and Switzerland. See more at https://www.dnb.de/EN/Professionell/Services/URN-Service/urn-service_node.html

The persistent identifiers, in this case, can be considered as 'invisible mediators of action' (Bowker & Star, 2000). Like classifications, controlled vocabularies and other types of standardised tools, these unnoticed small details – assigned a technical name of URN – become sites for mediation between the purposes of the systems designer and the demand of the community or user. Chapter 7 shows how the technological affordances of the Alvin interface – the possibilities and permissions that the interface encloses – were negotiated among the consortium members until they reached a one-size-fits-all solution. The institutional users, i.e., the Alvin members, reflecting on their appropriate communities of practice and then incorporating their demands and needs into technological use, are given access to the underlying sociotechnical information architecture (Ch. 7.2). Their uses inform back the design of the platform interface. In the front-end, the institutional users can take part in defining the technological requirements of the information architecture and systems. In the back-end, system designers put their effort into keeping digital resources traceable. Unliked standardised tools being taken for granted and a drive for marginalisation of entities at MEK/SMB (Ch. 4.2), the standard permanent identifiers in the Alvin case, in the role of mediators of action, help initiate a dialogic exchange system developer and user, and both sides are aware of the choices being made at the community level. Per recalled a moment:

> [There is] an archive from a concentration camp where the relatives to those persons mentioned in the archive [say] that they have found their aunt, their mother and they're very happy to be able to find the records. These are photographs of people coming from concentration camps to the south of Sweden in 1945. They are refugees and this is the archive from that location. The relatives looking for their mother, father, and aunt. They have found material in this archive and they're very happy to have been able to find it. When you get these messages from here and there, it's encouraging. (Interview [ALV1], 2019)

The act of storing digital objects in a digital repository with a permanent link, and the act of maintaining that repository and strengthening the archival record are both community-minded gestures of opening a dialogue between the system developer and its user. According to Per, keeping digital resources traceable via the use of persistent identifiers has allowed diverse types of users beyond the walls of Uppsala University – private, smaller institutions and the public ones – to reuse and refer to the digital resources in a consistent and scalable manner:

Overall, the chapter focuses on a back-stage area where negotiations frequently occur: mobilisation of material and conceptual resources. Practical comprehension emerges as a result of unofficial 'bending' of work conventions or as a workaround for a protocol lack. It shows how the shared institutional commitment to inclusiveness arises with on-site understandings. While the first two sections demonstrate how a centralised agency can impose rigid work conventions that are incompatible with contemporary work environments and emerging forms of knowledge production, the third section reflects on the emergence of a collections management 'growth model' centred on stakeholder engagement. Certain small-to-medium-sized GLAM institutions, such as the members of the Alvin consortium, have opened their collections and created opportunities for the public to participate in reusing and recreating objects. The use of standard persistent identifiers, as analysed in the Alvin case, helps resolve resource constraints in the back-stage; by leaving traces, they ensure that digitised items are indefinitely reusable and provide a path for other institutions and users to follow.

Conclusion

The chapter aims to interpret the relative nature of resource allocation from an infrastructure point of view. Section 8.1, in delving into staff perceptions of the identity and scope of a museum collection – at GM and the Hunterian – complements the line of analysis laid out in the previous chapters, concerning the back-stage challenges caused by staff ambiguity and uncertainty in dealing with the stability and persistence of existing infrastructure. Section 8.2 illustrates how, in the face of resource constraints, it is not uncommon for employees to act in accordance with their best judgement in each situation. Both sections bolster the argument advanced in the preceding analyses regarding the back-stage conditions for institutional memory work. They demonstrate how the back-stage routines and habits that ensure daily operations run smoothly stem from the expectation of museum staff to maintain order and to keep their professional roles relevant in light of contemporary demands. Section 8.3 extends the infrastructure requirements for optimal resource allocation to multiple institutional users, as demonstrated by Alvin members pooling their human capital, physical, and intangible resources to create a single, consistent, and affordable digital repository system. By 'opening up' their digitised collections in a shared repository, Alvin transformed into a hub for long-term contacts that promote reciprocity and trust among consortium members. This chapter identified contexts in which users of infrastructure, constrained by limited resources as one of the forces that cause the inertia

of the installed base, perceive what they mean by change and stability – concepts that, while relative to their working conditions, can be incorporated into their judgments and actions.

CHAPTER 9. POTENTIAL FOR MUSEUM PARTICIPATION: AN INFRASTRUCTURE-BASED APPROACH

This chapter builds on the preceding five empirical chapters and examines three matters of contention that emerged from the analyses: the meaning of boundary-crossing, the role of implicated actors, and the need for due attention to everyday work. Overall, this chapter argues that, from an infrastructure analysis perspective, reshaping museum work and museum spaces occurs in the form of an awareness of the internally accumulative forces that influence the capacity of an institution to adapt to changing circumstances, rather than as a direct consequence of upper management agendas and aspirations. While Section 9.1 highlights the gap between top-level management priorities and everyday practices of museum staff members, Section 9.2 focuses on how implicated actors and their in-the-margin visions contribute actively to pushing the boundaries of what constitutes a participatory mindset involved in their professional roles. Section 9.3 takes into accounts the two previous discussions, emphasising the instances and circumstances where staff feelings, practices and knowledge could have emerged from the entangled museum back-stage settings and influenced the continual alignment of everyday practices with what has been envisioned as the participatory potential of museum work.

9.1 CROSSING BOUNDARIES AS EXPANDING CONNECTIVITIES

As stated in the conceptual framework of this thesis (Ch. 1.2), I hypothesise that the back-stage negotiations in museum work are constantly influenced by two opposing forces: the institutional legacies that maintain the status quo and the dynamics of social change that compels the institutions to engage in decentralised, participatory practices. The objective of 'going back-stage' of this study, presented in Chapter 3, is to elucidate the complex network of actors that influence memory-making practices in the museums and to construct contrasting social realities that coexist within the institutional setting where these practices take place. In this section, I follow the argument of Star and Strauss (1999), pointing out that the blurred line between visible and invisible, formal and informal, is closely linked to the relations of power and invisibility in museum work. A close examination of the hidden role of the behind-the-scenes, messy or marginal facets of everyday activities is helpful in disentangling these facets as a crucial part of the materiality of how museum work is done.

Working through the relations of power and invisibility

The issue of power and invisibility emerges when considering the relationship between the digital strategies of upper management and the daily practices of museum employees on the ground. The analyses at SMB, SHM, and the Hunterian indicate a contrast between top-level strategies and priorities and everyday staff practices, particularly during the digital transformations that many museum members within these two organisations are undergoing. The existing boundaries of back-stage work, framing matter such as forms of numbering and registering objects (Ch. 6.2) and what museum professional roles are (Ch. 7.1), constitute and expose the installed base of infrastructure. When the practice of object handling conflicts with a newly adopted digital strategy, or a confusion about, for example, which families of objects are relevant, what is authentic, and what truly belongs to the museum may result. The instances of social media adoption at MEK/SMB (Ch. 4.1), of Vera at SHM persuading colleagues to replace established paper functions with digital documentation (Ch. 6.1), of Nicky at the Hunterian deciding not to take a massive item into the storage (Ch. 8.2), all show that the stability and persistence of existing infrastructure appear to be so strong at times that shop-floor workers appear to have little chance of implementing a digital strategy with the resources available.

The analytical chapters reveal that intuitive decision-making processes of everyday workers tend to follow as the outcome of the mismatch between top-level management priorities and everyday staff practices. What the cases of SHM (Ch. 4.1), MEK/SMB (Ch. 5), and the Hunterian (Ch. 8.2) have in common is that documentation activities, as well as supporting tools and systems, constitute the informational backbone of institutional memory work. Proper maintenance of this backbone enables the institution to avoid any harm to its holdings and bottlenecked issues in collections management. Chapter 5 discusses a lack of official documentalists, and specialised staff dedicated to cataloguing and collections management tasks at MEK, a small-sized members within SMB. Externally hired workers were tasked with indexing and transferring information from index cards to the digital catalogue. The meticulous and labour-intensive nature of these tasks results in a high number of data entry errors, i.e., information entered in the wrong way.

As maintaining order and providing proper care become a part of background work routines, the back-stage of museums is critical as a site of agentive relations and as sites of more-than-technical assemblages. As we have seen in Chapter 4 and 5, multiple layers of museum documentation represent the nexus of thoughts, emotions, and experiences. Employees

frequently face constant negotiation and attempt to 'work things out' in the absence of consistent policies and procedures. That is, the back-stage of museum work manifests as an arena for interactional activities 'through which arrangements are established, kept going, and revised' (Strauss 1993, p. 88). There is a lack of the ingredients necessary for accurate decision-making. There is frequently no evidence available to museum staff regarding the appropriate course of action. Museum staff would know what she may want to suggest to colleagues in other departments or the upper-level managers but faces a lack of clearly defined protocols for cross-departmental communication and particularly for providing instructions. This lack of protocols for providing instructions regarding areas of collections management, whose reasoning requires a high level of expertise and technical knowledge, is comparable to Feinstein's (1974, p. 6) description of traditional clinical reasoning as deriving from a state of 'amorphous judgment', or what Berg (1998, p. 227) refers to as the problems confronting modern doctors, which are frequently too complex for those outside the institution's walls to fully comprehend.

Due to the complex relationship between power and invisibility in the back-stage, interactions between distinct lines of work – photographer, curator, and conservator – are pivotal for comprehending the meanings of each actor. In this study, a lack of meaningful interaction manifests itself in a variety of everyday problems. The most frequently encountered issues relate to the overwhelming workload of museum staff. At MEK, the primary role of the curators is entwined with a bunch of side-lined tasks: coordinating restoration, enlisting colleagues to take photographs, and identifying and recording items. What irritated Tanja the most was not the overabundance of informal tasks, but the fact that the receipt of objects and associated information was occasionally managed carelessly, and it was part of her job to 'keep things in order' (Ch. 5.2). Even though the task of determining what went wrong was largely invisible and unnoticed, it was critical to the successful operations of the front-stage. Due to the lack of automated methods for determining which data fields are correct and complete, staff members perceive that they have much work ahead of them. As analysed in Chapter 5, MEK staff became hesitant to adopt the new MuseumPlus RIA system, citing concerns about error circles in running the MDS, which had been caused by poor cataloguing in the past.

The discussion of the relations of power and invisibility in the back-stage contexts indicates that in the cases of MEK and the Hunterian, the collections can be under-used and under-understood as a result of staff ambiguity – and resistance in some cases – to the everyday work order, which is stabilised and persisted by existing infrastructure. If the backbone of the

infrastructure of the museum is not solid and consistent enough, what staff is going to do? The following part, in exploring the processual aspect of craftwork involved in building access and museum connectivity, shows that work performed in the back-stage of GLAM settings is predicated not only on a high level of skills and expertise, but also on a shared understanding of which tasks should be assigned to each related line of work in the shared missions of participation and social inclusion.

Processual aspect of craftwork in the back-stage

The examination of craftwork in two areas of museum documentation, namely digital documentation and digital access (Ch. 6.1), highlights how negotiation between the two components of craftwork (required expertise and assigned responsibilities) is a critical factor that distinguishes institutional memory-making from personal memory-making. As discussed in the first chapter, the former is distinguished from the latter by the fact that institutions constantly exert control over the dynamics of mediated memory work. Retaining something as a memory object in a museum is more than a personal act of remembering; it entails the collaboration of multiple actors while adhering to pre-established rules and constraints. Being bound by norms and standards while retaining locally situated staff routines and habits is what distinguishes the institutional exercises in building digital documentation and creating digital access as a craft. The craftwork featured at the very ground of museum work, i.e., in everyday practices of staff who takes care of the informational fabric, illustrates the point being made by infrastructure studies scholars: not just that infrastructures are not inert and they can be expanded, shifted and changed (P. N. Edwards et al., 2013; Jackson et al., 2007), but also are they infused with social meanings and serve as a reflection of broader priorities and attentions (Howe et al., 2016).

Crossing boundaries is, therefore, part of the ability of infrastructure to go beyond one-site practice, i.e., the backbone construction or an existing 'installed base' (Star & Ruhleder, 1996; Star, 1999; Aanestad et al., 2017). Under the lens of this infrastructure analysis tradition, I have begun to investigate the processes of infrastructural change in the studied organisations by firstly, through Chapter 4 and 5, looking at what infrastructure studies scholars refer to as the 'inertia' of the installed base (Bowker & Star, 1999; Öberg et al., 2014), which means that institutions tend to maintain the status quo due to the 'installed base' of infrastructure. Then, in Chapter 6 and 7, I examined cases in which museum staff members are actively involved in crafting access to digitised collections to redefine professional museum roles and reaffirm the relevance of their institutions in the digital age. The extension of the installed base at SHM,

MEK and the Alvin Consortium analysed in Chapter 7, resembles what Aanestad et al. (2017b) call an 'installed base-friendly' approach for handling technical heterogeneity and the involvement of multiple actors. In including transformation strategies, which involve a reciprocal interaction between technologies and organisations, this approach is helpful in acknowledging that complex change processes are triggered by both technological and institutional transformations (Aanestad et al., 2017a).

Examining documentation work from the ground, i.e., how to deal with the installed base, also reveals the compatibility between social norms and technical standards. Bowker and Star (1999, p. 117), in addressing inertia of standardisation, suggest that as staff who work with knowledge infrastructure in their everyday routine cannot avoid 'the inescapable inertia of terms or categories already in use', the information attributed to any new objects would be 'read backwards' into existing technical systems – such as index cards, ledger books, and databases. In that sense, they argue, entities unknown at the time of data collection would be marginalised or simply removed from the data. Following Bowker and Star's steps to read the technical components of infrastructure 'backwards', I showed in the analysis (Ch. 6.2) that craftwork-like nature of documentation work in the background draws attention not only to the mechanistic but also to the social development of know-how in the museum settings. As Sennett (2008, p. 9) also suggests, craftwork refers not merely to technical and labour-intensive work but everything that requires a high degree of learned skill and makes 'the intimate connection between hand and head'. The imagined body of a museum institution, which claims the authority of institutional memory work, is more than just mechanistic. The routine duties that the museum staff performs involve a variety of interactional and imaginative processes that generate a reflection on the significance of the work overtime. The index cards and MDS-based catalogue entries are examples of imperfect or incomplete tools that are needed for the refinement of operations and skills (Ch. 6.2). The workers improved their skills because of daily contact with these tools.

Sennett (2008), addressing the processual and generative aspects of skilled practice, states that imperfect tools have their own virtues: they offer an alternative and suggest how something can be done better. Incomplete index cards and digital catalogue entries, following this line of thought, can leave enough reflection space for museum staff – not necessarily documentalists or indexers but any everyday workers who get in contact with the museum objects. The mishandling of object data as discussed in the cases of index cards and MDS at MEK (Ch. 5

and 6) illustrates structural malfunctions or local work practices that can seed the development of staff disengagement. Therefore, making complete and consistent object data is a continuous craft that necessitates a constant reflection on the part of the staff. Standardised tools, such as the index cards, enable workers to gain instructive experience by working through dozens of index cards drawn from various archive drawers.

As a new participant recruited to existing infrastructure, SMB-digital must become acquainted with the inherent unreliability of the infrastructure. Infrastructure scholars have previously asserted that any method of organising object information can be considered a standard in one community of practice while being an annoyance or misfit in another (Star, 2002; Star & Bowker, 2006). Regardless of how perplexing these standardised tools appear, they have design implications for successor tools and systems (Slota & Bowker, 2017). 'We face up to our social responsibility and are constantly committed to making the collections visible, researching, processing and communicating them on site and in digital space', says one part of the SMB's mission statement. The learning process of infrastructure to get itself acquainted with new members is continual because, while struggling with the lack of consideration for usability, the new-coming participants of museum infrastructure (the MDS and SMB-digital) must trade off some desirable features (usability, scalability) for undesirable ones (complex inventory and category systems) and make potential improvements.

Crossing institutional boundaries

The previous discussion shows that overcoming the burden of institutional legacies, such as standards, and maintaining and expanding the installed base are prerequisites for infrastructure to scale beyond local, one-site practice. Examining the visions of everyday staff reveals that the vision of scaling up, as well as the capability of crossing and breaking boundaries, has become ingrained in daily staff practices at MEK/SMB, SHM and the Hunterian.

Staff actions of improvisation, maintenance and repair contribute to the incremental growth of infrastructure, which is built on a stable but scalable informational backbone. This is demonstrated in the empirics through two cases. Chapter 7 discusses the case of Erik, an imaging expert who urged SHM institutions to make 3D versions of their objects available on third-party platforms to increase access to their digitised collections (Ch. 7.1). When Erik realised that 2D versions were no longer sufficient for the emerging user's need, he began creating 3D versions of any object that crossed his desk. Chapter 8 examines the case of Nicky, a scientific

curator who drafted a lengthy report to the strategic development board of his museum. He claimed that there was no space in the storage room for the addition of a newly discovered, massive bathtub which was, in his opinion, possibly the world's only Scottish hospital bathtub from the nineteenth century (Ch. 8.2). The perspectives from Erik and Nicky are the result of not only the ambiguities and uncertainties inherent in back-stage practices, but also of the expectation from museum staff to adapt their daily work to the renewed social role of the museums that they envision. The activities of publishing 3D images and evaluating newly discovered objects are both envisioned and engineered by regular employees and are an unavoidable consequence of boundary-crossing – a characteristic of infrastructural practices.

The case of the Alvin Consortium addresses infrastructure scaling in a cross-institutional and cross-disciplinary dimension. The case illustrates how designing boundary infrastructures can be met with the challenge of providing working infrastructure that 'serves multiple communities of practice simultaneously be these within a single organisation or distributed across multiple organisations' (Bowker & Star, 1999, p. 313). The ethnographic sketches on the Alvin platform (Ch. 7.2 and 8.3) show dozens of small-and-medium-sized institutions having pooled their human capital, physical, and intangible resources to contribute to the richness of the platform. By ensuring collaboration across divergent communities of practice and compatibility of the centralised portal with a diverse range of objects, instruments, artefacts, and cultural spaces associated with consortium members, both institutional and private, the Alvin platform contributes to enfolding 'community values into community information systems' (Bowker & Star, 1998, 245). Alvin has become a public meeting point for long-term preservation efforts of small-to-medium-sized GLAM institutions that fosters mutual trust and reciprocity among the consortium members in terms of resource utilisation because of their shared commitment to digitising and disseminating the value of their collections.

A boundary infrastructure like Alvin keeps memory objects stored safely and highly accessible while being hospitable to new entities and visions of the marginal actors, through the use of 'boundary' technical objects such as the platform portal and persistent identifiers (Ch. 8.3). Nonetheless, as shown by the disagreement among the consortium members about the technical configurations being used in the platform (Ch. 7.2), the disadvantage of crossing boundaries is that the margin of negotiation becomes wider, as more user perspectives must be considered to consolidate various trajectories of a participatory mindset. As Stefan, a key member of the Alvin coordination team, indicated, disagreements over terminology or the appropriate language for

object description show a lack of protocol or unofficial agreement on how to decide who has the authority to do something. On the one hand, an online repository as a 'boundary object' (Star & Griesemer, 1989) has the advantage of taking into account all participants' perspectives, interests, and concerns when organising a collective action or managing collective work. On the other, as a boundary object, the Alvin model of cooperation is equally disadvantageous. It allows some members to resist translation, implying a 'wider margin of negotiation' (Fujimura, 1992, p. 175).

In this section, I have discussed how crossing-boundary capability is ingrained in a variety of staff practices aimed at realigning museum work toward participation and social inclusion. It is a critical characteristic of digital infrastructure at MEK/SMB, SHM, and the Hunterian that enable participatory memory work and more open access to existing or digitised museum collections. Boundary crossing is also a feature of an online repository such as Alvin that closely hold and completely cover all sort of material deriving from divergent communities of practice. This section presents how the need for boundary-crossing, which influences the ability of infrastructure to scale up, is an essential feature of infrastructural practices. While institutional infrastructure and standards can set the boundaries of professional roles and associated responsibilities (Ch. 4.1), everyday staff can become a vital actor in breaking these boundaries. The next section will delve into the voices, beliefs, and expectations of the ordinary actors in the back-stage of museum work.

9.2 THE ROLE OF IMPLICATED ACTORS

Analyses of back-stage routines reveal that diverse groups of everyday workers construct a collective idea of participation and inclusion within the entangled settings of the museums – which is discussed in the previous section as more-than-technical assemblages. The analysis of documentation activities (Ch. 5 and Ch. 6) shows that documentation work at MEK and SMB constitutes the backbone of the informational fabric. As demonstrated in the preceding analyses (notably Ch. 5), these types of work are typically carried out, silently and unnoticeably, by everyday museum workers. This section discusses how, while documentation activities are frequently regarded as routinely invisible, they prevent the institutional fabric from fragmenting in ways that foster user mistrust and disengagement. Through an examination of how documentation work intersects with cross-social world contexts, this section demonstrates that staff members must perform background work that extends beyond their formal job title to

maintain the informational fabric of their museums. It identifies the scope of background work being investigated in this study: it is the routine tasks that staff must perform to avoid any detriment to the operations of an institution and its objects.

Under the three pillars of the ethnography of infrastructure lens proposed by Star (1999, 2002) – attention to marginalised entities, relationality, and ethnographic sensibility – I have placed the analytical focus in the second step of this study[69] on the activities, interactions and behaviours in the background of museum work. The analytical chapters have unveiled the critical role of museum workers who perform the tasks of documentation, maintenance and repair. Chapter 5 has shown that while documentation is the backbone of the museum's informational fabric, nobody had an official role in it. It is done and figured out by 'implicated actors', the agencies that are discursively involved, but physically left out of the construction of the museum work-worlds that they inhabit. Through her studies of the reproductive sciences, Clarke (1998) argues that these kinds of actors that have non-standard positions in a social world are '*structurally* rendered visible':

> Network analysis emphasizes the recruitment and enrolment of allies instead of the mutuality of negotiations or the trade-offs often featured in social worlds analyses. Further, implicated actors – those silent or not present but affected by the action – are invisible in network analyses and are structurally rendered invisible, just as the silent or silenced are invisible in conversational analysis. They can easily be taken into account in a social worlds approach. In actor networks, differences among actors are also submerged, while in social worlds approaches they are highlighted and can be examined in ongoing negotiations (A. Clarke, 1998, p. 267).

In stating the advantage of a social words approach over network analysis in considering the distribution of power among actors, Clarke uses the notion of silence in both physical and social senses. Silence is physical because the actors are not actively participating in the actual doings of the social world. Silence and silencing are also social because they denote acts of unfairness – under-representation, exclusion, omission – towards users at the margin, who are invisible, have less power, and thus are not permitted the full status of agency. The notion of 'implicated actors' (A. Clarke & Montini, 1993) designates individuals or groups, human or non-human, who are

[69] Which is to reveal the intricate relationship between social and technical components of museum infrastructure (see Ch. 1.1)

likely to be affected by actions taken within an arena or social world,[70] but are neither counted as present nor given a voice immanent enough to have influence on the shaping and doings of that world. Because the actions are taken 'on behalf of' the silent actors, these doings are highly consequential for them.

Examining the invisible presence of these actors in the museum settings can reveal hidden layers of the infrastructure backbone. The in-the-margin position of an object can bring a hidden layer of narrative into the foreground (Ch. 5.2). At some point during the preparation for an upcoming exhibition, the curator at MEK discovered this object and thought it was interesting. The staff then started taking care of it: photographing it from multiple angles, improving the catalogue entry, and connecting it to other related objects. By stumbling upon the neglected object 'II A 3763,a-c' by chance, the background work of museum staff indicates some degree of alignment between the various lines of work imposed by the division of labour within an organisation. This discovery was made possible not by a formally hired documentalist or archivist, but by the extra task of a random curator or museologist. The object of 'Kapuzenmänner' may or may not be included in the future exhibition. However, its discovery was crucial to the maintenance process in the back-stage, in which – in the MEK case – the curators itinerate the preparation of an upcoming exhibition and begin negotiating their way through established curatorial practices and pre-defined procedures.

The analyses on the MEK/SMB case demonstrate that museum workers in the back-stage – the implicated actors – are more likely than the dominant ones, such as upper-level managers, to be affected by actions taken within the museum work-worlds that they inhabit. At MEK, the action is the decision at an upper level (SMB) to upgrade the integrated documentation system being used by all museum members (Ch. 5 and 6.2). A museum work-world can be considered as a social world with its own type of standardised tools, a set of collective expectations, with similar concerns, ambiguities, and uncertainties. Within each museum work-world, each line of work becomes a sub-world in the Straussian sense (A. Strauss, 1978, 1984), embodying characteristic modes of practice. As a subworld, each line of work has its kind of problems to be solved, a kind of tools and technology to be used, a variety of applications it should aim for, and a relationship with the social world to which it belongs and where it operates (Kling & Gerson, 1978; A. Strauss, 1978). Further analysis on the professional roles of staff at SHM (Ch. 7.1)

[70] In line with Anselm Strauss and Howard S. Becker's work, by social worlds, Clarke talks about groups that share commitments to activities, resources to achieve their goals and ideologies about how to make sense of their world.

affirms the previous observation that everyday workers conducting background work are not given a voice strong enough to have an influence on the shaping and doings of the museum work-world in which they are situated.

In considering the participatory and socially inclusive potentials of institutional memory work, it is crucial to identify the participating agents, which means to answer the question: Who are the active individual agents in the meaning-making processes? Answer that question paves the way to illuminating what the institutions mean by participation and social inclusion, as being seen in the daily operations of their memory-making practices. From the view of everyday staff, to intervene in the setting of inappropriate routines, or to suggest new routines could mean exposing the hierarchies of value in relation to their professional role and violating a set of local responses that are imposed by the inevitable division of labour. The case of Vera, a staff member at SHM in charge of the MDS and database systems, shows that sometimes it is difficult for an employee in one line of work to intervene on the existing workflow that also concerns another line of work, even though Vera's concern - data management issues - is critical in keeping the museum's back-stage operation running smoothly: '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 prioritise this"' ([SHM4], 2020).

Examining everyday museum workers who perform caring but mostly invisible tasks as 'implicated actors' in the processes of institutional memory making, Chapter 5 and 6 have revealed a crucial aspect on the presence of background work in the everyday functioning of the museum institutions in the study and the relational nature of their presence: background work in the studied institutions tends to be disproportionally considered as informal. In the GLAM institutional settings, particularly in often-compartmentalised museum spaces, such as those found in SMB and SHM, the role of implicated actors is more likely to be undervalued than that of the more dominant actors. Taking the case of documentation work: documenting activities are embedded in the everyday routine of most staff members: taking notes and photos, adding objects, or modifying metadata. However, being placed in a specific team and department, each staff member has a pre-defined clear role and is aware of their formal tasks, i.e., what they are expected to do, as formally indicated in their job description. Staff whose job is not formally 'documentalist' thus do not think their role and responsibilities have anything to do with documentation.

Chapter 6 also presents documentation work as a set of engineered activities that are purposefully crafted. As an essential backbone of daily operations, well-functioning documentation becomes itself an infrastructural condition: it keeps decision-making processes well informed and different teams well-coordinated. Being embedded in everyday staff practices, documentation work employs various data structure standards, data content standards and exchange standards. It constitutes an ongoing process of reflection and tinkering, improvisation and maintenance that arise from the workplace order. Overall, I consider documentation-related activities in the cultural heritage sector as invisible work – one that is often regarded as boring, unimportant, and allocated little amount of resource, but vitally embedded in every corner of the compartmentalised organisation. By exploring how documentation work cuts through various lines of work within the museum, Chapter 5 and 6 show that examining the maintenance of infrastructure backbone directs attention to the relationality of workplace order. This managing of the intersection between social worlds is entangled in a complex setting of institutional memory work where the collective idea of participation and inclusion is constructed by multiple, distributive groups of actors, who, for the most part, are in the margin.

Many instances of local re-configuration and adaptation happen at the periphery of museum infrastructure where the voices are unheard and unnoticed (Ch. 5), and institutional infrastructure is taken for granted (Ch. 4). Reconfigurations and adaptations to local contexts at MEK/SMB, the Royal Armoury/SHM, and the Hunterian have resulted from staff efforts. These reconfigurations occurred to alleviate friction by reducing variation in socio-technical processes of cross-departmental collaboration and information flow. As seen in digital documentation efforts (Ch. 6.1) and 3D scanning at SHM (Ch. 7.1), it is the everyday staff who must adapt old work conventions to modern-day local needs. Another instance is at the Hunterian (Ch. 8.3), when the curator team discovered massive objects and there were no clear protocols regarding whether these objects needed to be brought to the museum store. A curator chose to photograph these artefacts and interview the people who discovered them each time because of a lack of storage space and a worry for their future usage. These types of decisions happen at the periphery of infrastructure in the sense that the negotiations taking place is more about accommodating new elements to existing practices, or new members for existing infrastructure to host. As long as the negotiations have not been concluded, these types of decisions would have to be made repeatedly.

The decision made within a specific localised context at the Hunterian echoes the discussion in the preceding section about background work at MEK; these adaptations to local contexts are motivated by a desire of museum staff to 'keep things in order' (Ch. 5.3) – the expectation to ensure daily operations running smoothly and keep their professional roles relevant in light of contemporary demands. While Section 9.1 shows that breaking and crossing boundaries are part of the capability of infrastructure to reach beyond one-site practice, this section highlights instances and sites of action where ongoing negotiations by marginalised actors become the seed of momentum for infrastructural change. The following section explains why emerging bottom-up adaptations may face 'institutional inertia' because of not only the vertical integration of multiple technical systems, but also the constantly evolving professional roles and associated responsibilities against the backdrop of hierarchical knowledge structures. It also discusses how museum institutions can examine their own attitudes toward visions in the margins to engage in and sustain participatory memory work.

9.3 DUE ATTENTION TO EVERYDAY WORK

In examining the back-stage operations of museum institutions using an infrastructure-based approach, the analytical chapters trace the infrastructural characteristics hidden within institutional memory work. Hidden layers of working conflicts and incompatibilities of views exemplify infrastructure's first and most apparent characteristic: its invisibility. Daily operation, on the one hand, necessitates collaboration between constituent socio-technical components, information technology systems, and subsystems. The entangled back-stage, on the other hand, is where many forms of craftwork are performed – practices are messy, human and non-human errors are frequent, and trials require strenuous efforts. By demonstrating how background work is typically carried out, silently and unnoticeably, by everyday museum workers, Section 9.1 and 9.2 have implicated that this type of technical and material support can be decoupled from the visibility of the front-stage, i.e., the view of the user on what is actually happening in the museums. This section looks at the processes and agencies of this back-stage invisibility and delves into the actor-worlds of feelings, practices and knowledge that could have emerged from the entanglement of technical and social negotiations.

Moments when the museum's infrastructure is about to break illustrate Star and Ruhleder's argument that infrastructure 'becomes visible upon breakdown' (1996, 113). The preceding analysis finds that cases of informal work arrangements and hidden layers of incompatibility can

lead to structural issues in object management. Chapter 5 emphasises moments of potential infrastructure failure resulting from a lack of attention paid to the museum's documentation activities. Data-related issues, such as consistency and incompleteness, place a negative impact on staff engagement with tools and systems that support documentation work. If documentation as the museum's informational backbone does not function smoothly, everyday staff routines and practices are all affected. This circle of structural problems and staff disengagement sheds light on the essential role of staff who do support work, including maintenance and repair, that are often side-lined by the institution's tangible goals of memory-making and knowledge production. Well-functioning documentation, therefore, becomes an infrastructural condition in and of itself. Infrastructure, as one that could support well-functioning documentation in the case of MEK/SMB, can be thought of as incremental construction; this type of construction is a contingent and provisional process in which relationships change, conventions can be broken, and failures or periods of stagnation occur.

Chapter 4 has showed how the legacies of knowledge infrastructure obstruct compatibility or congeniality between new socio-technical components and the existing installed base, which refers to the backbone of infrastructure, and the existing practices and norms from which museum work takes place. As shown in the case of MEK, neglected entities – catalogue entries, cataloguing terms (Ch. 4.2), and museum objects (Ch 5.2) – can all likely be the consequence of a tendency toward standardisation and passive reliance on existing institutional infrastructure. In analysing the potential effect this tendency toward standardisation may have on the professional goals and motives of museum staff, I have demonstrated how the taking-for-grantedness of a long-standing standardised category system may be detrimental to institutional memory work. These categorisations have been used at MEK for several generations and have not evolved with changing digital ecologies. As Orlikowski shows, once standards and standardised tools, which impose a set of rules for staff in their daily operation, become institutionalised, the ability of human actors to act independently of them becomes remote (Orlikowski, 1992, p. 419). The making and becoming of infrastructure are influenced by the human agents that maintain and use it. They are not just every agent in a museum setting, but those who are responsible for behind-the-scenes, sometimes marginal and routinised tasks. They are those implicated actors that carry out what I refer to in Chapter 5 as background work.

The ineffective use of standards and standardisation, which are an unavoidable component of infrastructure, and the invisibility of their use in many cases illustrate how museum knowledge

systems may be unwelcoming to accepting new members or incorporating visions on the margins. Category 74 is the system's final category, but it is also the most frequently used by contemporary collecting practices at MEK. When malfunctions occurred and infrastructure was about to break down, the inappropriate use of the tool became visible. Being merged into new epistemic groups that were totally different in type and nature, category 74 ceased to function as intended. It is clear that many of the new objects were not 'photographs'. Within the generic term of 'photographs', no new sub-categories have been created to accommodate the new object types.[71] The taken-for-granted nature of such tools and standards not only impairs the ability of the merged parts to adjust and co-evolve mutually but also hinders the institution's willingness to adopt new perspectives on membership and participation. The relationship between the entire category system and the world in which it enacted meaning and function is deteriorating, and the ordering function of the system is losing relevance. Its ordering function changes from transparency to opacity because, as a socially constructed product, the category system is not capable of representing itself and its constituent parts.

The potential for breakdown does not inherently suggest that a museum's existing infrastructure is unreliable, or that constraints in resources and weak incentive structures are perpetually present. Graham and Thrift (2007, p. 10) state that 'continuous unreliabilities' are inherent in any kind of infrastructure system, as working conflicts and incompatibilities of views are hidden from everyday operations. One implication of this view in the museum contexts in this study is that, to reach a point where infrastructure adoption and use gain momentum, institutions must be willing to expose themselves to system vulnerability and failure risks. Section 9.1 and 9.2 have shown that a commitment to the maintenance of the informational backbone can strengthen the resilience of an institution to internal conflicts and unwanted inertia of the installed base. Data integration issues such as inconsistency or incompleteness in a museum back-stage setting will always exist, as each institution has its own capacity for troubleshooting and a limited range of human resources allocated to background work. A direct implication of infrastructure breakdown in the studied institutions is that these moments of breakdown have far-reaching consequences when the staff is incapable of resolving their overwhelming everyday problems; the consequences include uncertainties, staff disengagement with new technological adoptions (Ch. 5.2), or a collection being under-used and under-understood (Ch. 8).

[71] All sub-groups within the existing Category 74 used at MEK are shown in Table 4-2.

The discussion in Section 9.1 has pointed out that it is not uncommon for museum workers to feel overwhelmed by an abundance of work in the various museum environments examined in this study (such as national museums, university museums, and cultural heritage coordination centres). Due to a lack of consistent procedures, staff at the Hunterian, for example, spends an inordinate amount of time dealing with 'lots of things that could be streamlined, but which are not' (Ch. 7.1). But is the staff capable of resolving these regular, short-term, and over-burdening problems? To answer that, various levels of scrutiny into daily work are possible under the infrastructure analysis perspective. Through the empirics, a pattern of how everyday staff maintains control for the quality of museum data has emerged. Chapter 5 shows that repetitive data management issues that staff members need to solve at MEK can result in their disengagement with new technological adoption. As a result, even though curators and museologists are not officially responsible for data consistency, these staff members have developed 'rehearsed skills' for maintaining order (Ch. 5.3). Chapter 6 delves further into this maintenance aspect of documentation work, and demonstrates how MEK staff have improved their routines while working with 'imperfect tools' – such as index cards and modern MDS – by acquiring additional skills and habits necessary to ensure that their work runs smoothly (Ch. 6.2).

The cases of Vera at SHM and Tanja at MEK suggest that when museum staff finds something in disorder, they tend to 'fix' the information. A direct finding at MEK and an indirect implication of what has been found in collections management activities at SHM is that the most frequently encountered issues with documentation activities are data-related: incomplete data and data inconsistency. The most frequent cause of these issues is incompatibility among different cataloguing systems or different versions of the same family of systems. The analysis on MEK (Ch. 5) shows that, as the staff members navigate existing and often taken-for-granted object management practices and pre-defined procedures, they learn new skills and habits that help them deal with ambiguity and uncertainty. The recognition of structural data problems came about as a result of a casual examination of a typical museum employee (Tanja). It is a contingent and provisional process stemming from bottom-up efforts of the everyday workers who come into daily contact with museum objects. They are 'implicated actors' in the sense that, while their work realities have a significant impact on the daily operations of the museum, they are largely not involved in the discursive construction of their immediate working environment. Tanja's occupation at that time was centred on the reorganisation of existing object information, even though her job was to research and prepare for an exhibition. From an infrastructure point

of view, moments of breakdown are necessary because these breakdowns may be the only times when the internal working of an infrastructure becomes visible to the users of infrastructure.

In addition, the data quality-related issues have the potential to spiral out of control, resulting in the disengagement of staff members and ambiguity concerning their professional roles. As previously mentioned (Ch. 5.2), MEK and other SMB members were migrating old data from MuseumPlus Classic to MuseumPlus RIA and underestimated the complexity of data migration. The technical reason for data-related issues was that, while each SMB member had their own unique set of local requirements, the SMB's documentation work was reliant on a single supplier, a software solutions company called 'zetcom', which supplied both versions of the documentation system. At MEK, staff disengagement with the launch of the new cloud-based MDS system demonstrates the detrimental effect of entangled back-stage settings. Back-stage uncertainties analysed in Chapter 5 reveal how a fear of a future mistake circle makes the staff reluctant to see the new system being launched, and afraid of object data and information becoming publicly available.

The detrimental effect of these mistake circles explains why the common sets of object cataloguing and data management issues could contribute to staff confusion regarding their roles and associated responsibilities. Curators who presume the collections are there and should be known intimately can become easily irritated by a spiral of problems involving a single object they were working with. The analyses in Chapters 5 and 6 have emphasised the vital role of invisible labour in maintaining the informational and technical fabric of museum institutions. In the MEK's case, these documentation-related tasks can be summarised as inclination and duties to 'keep things in order'. This inclination constitutes a work convention being established in the periphery of formal organisations. For one thing, it is part of work-related arrangements that was born out of the desire and expectation of museum staff to have their formal tasks run smoothly: curators do curatorial work, museologists do consultancy and exhibition coordination, and photographers do things with images. For another, the stance or perspective of 'keeping things in order' arises within the intersection of multiple communities of practice mentioned above – curation, museology, photography, conservation, and preservation. Keeping that stance involves interactional, bottom-up processes that span across departments and teams, or sites of activity, and includes the efforts of various kinds of workers.

The detrimental effect of a lack of attention to everyday 'data work' follows a similar pattern at the studied organisations: things in disorder, staff trying to 'fix' the information, and staff being

burnt out of trivial, short-term, and over-burdening problems. As discussed in Chapters 5 and 8, the theme of having too much to do due to a lack of effective cross-departmental communication and consistent protocols recurs in a variety of museum contexts. Tanja suggested that MEK hire at least one person, if not two, to manage social media exclusively for the museum, who would handle 'all the nitty-gritty work of writing the posts'. Vera at SHM acknowledged that her curator and conservator colleagues 'have a lot to do'; thus, she could not be informing them that one of the most critical tasks is to register objects properly and keep the information about the collections up to date in the systems. At the Hunterian Museum, due to a 'lack of strategy', commonly 'agreed upon language', and consistent protocols, small and trivial tasks became repetitive, overwhelming Nicky with work and competing demands. However, unlike the MEK's staff, this onerous responsibility was not met with ambiguity or resistance. The 'mistake circle' at MEK (Ch. 5.2), caused by previous poor cataloguing, makes staff hesitant to see the new system implemented; therefore, staff says that they have 'too much work', as they can only determine which data fields in the new system are incorrect manually.

Even though these cases about maintenance work involved different types of troublesome work order (ambiguity and resistance at MEK, repetitive everyday actions at SHM and the Hunterian), they have a similar outcome: museum staff becomes disengaged. What the empirics reveal, as far as staff disengagement is concerned, is that negotiation in the background is required not only between departments and working groups, but also with non-human agencies such as IT systems and subsystems, protocols, and object data sheets. A workflow – formal or informal – that holds the informational fabric of an organisation together can evolve into a boundary-crossing mechanism, a socio-material arrangement that redefines connections, extends beyond human sociality and enables technological arrangements. Examination of museums' background work reveals the occurrence of workarounds prompted by a lack of consistent protocols and guidelines. Cases in the analysis chapters involving access to museum collections (Chapters 7 and 8) demonstrate the importance of considering and situating these protocol-related issues in a broader operation framework of supporting the back-stage to function properly.

The case of museum deaccessioning analysed in Chapter 8 can illuminate the critical role of non-human actors – in this case, consistent back-stage protocols. Even though a sizeable number of museums have published their acquisition and disposal policies to guide and supervise deaccessioning practices, the scope and degree of detail of these policies vary significantly between institutions. In the case of the found bathtub in the Gilmorehill site of Glasgow

University (Ch. 8.2), the curators face practical issues that their museum's policy does not address. We have learnt that Nicky chose not to keep the bathtub. At first glance, the item appeared to be 'massive' and 'in an appalling condition'. After conducting research on the bathtub's provenance, the curator stated in his report that 'this bathtub is unique'. He reasoned, 'it's probably the only Scottish hospital bathtub that exists in the world from the 19th century'. Nonetheless, he was absolutely convinced that the museum could not keep the bathtub, not only due to the museum's limited storage capacity, but also because 'we can't do anything with it […] We can't display it, we can't use it for teaching'. Nicky posited that it was sufficient that the material was well-documented digitally: 'We've basically got pictures in it. We've got this really nice diagram that shows exactly where it was in the hospital'.

When it came to deciding whether and how a piece of material should be kept, stored, and preserved in the museum's storage, Nicky devised his own protocol, a type of experience-driven decision making that 'black boxed' decisions that would otherwise have to be made over and over. The lack of protocol is exacerbated by a lack of adequate allocation of resources. The decision to keep or discard an object is far too complicated to be made on a regular basis, but Nicky is approached nearly every month by a technician in Glasgow seeking his opinion. Occasionally, he has disagreements with his colleagues about what to do with the items they have gathered. Each case requires staff to make a rational decision from scratch, weighing possible alternatives and outcomes, benefits and consequences, and selecting the option they believe is the best fit. These routinely stressful encounters parallel what Eddy observed of the quality of clinical practice: '[i]f every practitioner attempted to do this for every decision, the result would be either mental paralysis or chaos' (1990, p. 877).

Eddy's (1990) metaphor of 'metal paralysis or chaos' in clinical contexts can be applied to the situation in which museum staff is aware of the problem but unable to resolve it due to the amount of work required and the disruption of the established work order. Chapter 4 and chapter 5 together shed light on the institution's unwillingness to change by showing the intricate social and technical tensions that contribute to 'the inertia of the installed base' (Star & Ruhleder, 1996, 113), stemming from limited resources and weak incentive structures. As Star and Ruhleder (1996) point out, infrastructure 'wrestles' with this inertia, inheriting strengths and limitations from the installed base. More specifically at MEK, being asked about the long-standing practice of assigning born-digital materials and digitised items to the predefined category 74, a museologist recognised that the costs of implementing barcodes and developing

a new category system would have been prohibitively expensive at the time. Her portrayal of the underlying cause of the problem as a sectoral issue ('Not only MEK does. A lot of German museums are trying to deal with this'.) and the solution as implausible ('it would be a mess') show that museum staff on the ground are incapable of resolving the issue. The 'mess' she referred to is the accumulation of marginalisation and neglect. Taking ineffective standards for granted results in the neglect of crucial entities. Since no one questions the procedures, and no one has the time to change them, the category system became the standard in the newly installed MuseumPlus RIA documentation system, and future staff members will continue to work with the ill-structured category system. That also leads to staff disengagement with the launch of the new system that I mentioned above.

The analysis of staff feelings, practices and knowledge that could have emerged from the entangled museum back-stage settings show that paying attention to everyday work is to provide the staff a space to reflect on their professional role and their everyday work. The discussion on how infrastructure becomes visible in moments of breakdown demonstrates how critical it is to make communication inviting and more accessible to everyone. Following each breakdown incident, there is the potential for maintenance and repair: the need for new documentation procedures and the repositioning of collections databases. Museum employees find themselves in a continuous learning process because of their reciprocal interaction with museum documentation and cataloguing systems. Cases at MEK, SHM, and the Hunterian show that the museum staff is constantly informing themselves on what should be done differently to ensure that their everyday work runs smoothly. Especially in the SHM case, the pressure to expand access to as many objects as possible from various actors within the organisation came dangerously close to driving the digitalisation team to the point of 'digitising everything'. SHM's infrastructure may fail in this case not as a result of internal disruption brought about by merger integration, but as a result of a breakdown in the relationships between the infrastructure and the domain of activity it is expected to support.

The discussion in this chapter sheds light on how the infrastructure studies perspective enables an examination into a variety of bottom-up factors – everyday work, staff reflection on their professional roles, routine and habit, taking-for-granted practices – and by doing so reveals different trajectories of what participation and social inclusion could mean in everyday practices at museum institutions, and which agents would contribute to enacting these values. The discourse accentuates that infrastructural transformation does not emanate solely from

normative dialogues concerning the redefined social roles of memory institutions. Building on the discussion of platform boundary-crossing from Chapter 8, Section 9.1 points out the issue of power and invisibility as a critical tension inherent in the proper maintenance of institutional memory work. While professional conventions, standards, and protocols may establish boundaries, museum staff becomes an integral part of breaking them. Section 9.2 diagnoses this role shift in precise manner, emphasising how museum staff members are required to perform invisible background work that extend beyond their formal job title to maintain the informational fabric of their institutions. Section 9.3 delves into the invisible contribution of everyday museum workers and their in-the-margin visions to infrastructural changes. It discusses how hidden layers of work conflicts and viewpoint incompatibilities help us understand how involved actors in daily operations of the museums are absent from the discursive construction of their immediate working environment.

Conclusion

This chapter relates the preceding analyses to the gap in the literature identified earlier: the role of marginalised participatory agents, both human and non-human, in the ongoing alignment of museum work toward participatory missions. It discusses three critical insights into the organisational and professional tactics that legitimise infrastructural changes that facilitate the institutions working toward participatory missions: boundary crossing (9.1), participatory mindset from below (9.2), and due attention to everyday work (9.3). Expanding upon the contributions of the previous analytical chapters, this chapter explains why and how an infrastructure-based approach to museum work helps reveal the bottom-up nature of everyday work, staff routines and expectations, and taking-for-granted practices, as they have been implanted into the day-to-day functioning of institutional memory work.

In line with STS-oriented scholarship on infrastructures, this thesis embraces the examination into hidden layers of work in the background and neglected entities in the museum settings, as well as their connections with the world within the politics of categories. The chapter demonstrates how the ethnography of infrastructure perspective allows for an investigation of museum work from the background and particularly from below, i.e., from what museum workers perceive, think about, and express concerns on what they do on a daily basis. The three parts of the discussion in this chapter show that the capacity for noticing, for improvement and for wheeling the institution forward is relied a great deal on and, primarily developed from, the perspective of everyday workers.

CHAPTER 10. CONCLUSION

This chapter summarises the main results as well as the aspects of the study that make a significant contribution to the field of knowledge in the intersection of Science and Technology Studies (STS), museum and heritage studies. The conclusion of the study is that the STS-oriented infrastructure studies approach, which aims to examine the back-stage negotiations in museum work, is useful for obtaining a better understanding of the socio-technical underpinnings of action and implementation when diverse actors in the museum settings align their everyday work practices with their envisioned participatory prospect. While positioning this study against existing knowledge, the conclusion explains the key results in relation to the research goals and objectives (10.1). It demonstrates how this infrastructure-based approach can be helpful for promoting more grounded, long-term perspectives to investigating the internal conflicts, ambiguities, and uncertainties that arise from institutional memory-making practices, as well as the diverse trajectories of participatory missions toward which these practices are accounted (10.2). Additionally, the conclusion discusses the limitations of this study (10.3) and suggests areas for further investigation (10.4).

This dissertation is set out to answer the research question: What are the backstage socio-technical negotiations that influence the participatory potential of museum work? The two steps needed to answer this question are outlined in the first chapter. The first step is to define the scope of museum background work. The second step is to reveal the intricate relationship between social and technical components of museum infrastructure. These two steps require a research plan of going to the back-stage of museum institutions. The operational framework of this study is informed by the three pillars of the ethnography of infrastructure lens proposed by Star (1999, 2002): attention to marginalised entities, relationality, and ethnographic sensibility. The conceptual framework outline in the first chapter (Figure 1-1) explains the significance of various components of the framework, which has been variously materialised, formulated, and occasionally overlooked in the infrastructure studies literature. This conceptual framework serves as a conceptual guide for the analytical focus of this dissertation – socio-technical negotiations in the museum settings – as well as for the implementation of my ethnographic fieldwork, which is centred around the conditions under which the objectives of participation and social inclusion can be achieved over the long term and sustainably.

In the following section, I summarise the crucial results in relation to the research goals and objectives and explain how they contribute to the existing literature.

10.1 RESEARCH RESULTS

Aim one: Define the scope of background work and analyse the actors who perform it

- Objective one: Analyse the scope of background work

Prior literature on museum work has not given concrete definitions on the back-stage and the front-stage of museums. Based on what has been discussed about this relative revision about the back and the front, such as behind the scenes work (Macdonald, 2002), back-stage work and processes (Bowker, 1994a; Star, 1999), for the purpose of open theoretical sampling, I divide cultural heritage institutions and their production of knowledge into two parts: the front-stage and the back-stage. The back-stage concerns the information systems architecture, communication flows among teams, standards, and protocols. The front-stage is characterised by the interaction with users and various agents involved in the interaction: interfaces of digital systems, exhibition spaces, textual and visual interpretations, websites and social media, and other types of related platforms. As explained in the first chapter, this division strategy of back-stage and front-stage is not always sensible; however, it fulfilled the objective of provisional sampling. What has been suggested from the analysis is that both sides are affected by shifts in information representations into a digital realm in a way that has shaped how systems are expected to function, how everyday practices need to respond, and what it means to maintain the systems.

Overall, this objective of defining the scope of background work has been achieved through examinations of the role of both human and non-humans actors who were previously marginalised in the construction of the museum work-worlds. Background work is defined in this study as a set of routine tasks that staff must perform to avoid jeopardising the daily operations of the museum or causing any detriment to its objects. The sites of background work are where human and non-human errors frequently occur, conventions might be broken, and improvisation happens. All these aspects tend not to belong to the front-stage. While the front-stage serves as a platform for interaction between the system and the user and thus allows the museum to maximise its social impact, the back-stage consists of the informational fabric and socio-technical components that enable the platform to function on a daily basis. The back-

stage work also encompasses the back-end components, including technical components of infrastructure such as information architecture, IT systems and subsystems, data standards and protocols, and the human resource responsible for operating and managing them.

- Objective two: Analyse the agents who perform background work

The presence of the 'implicated actors' discussed in Chapter 9 signifies the scope of performing background work. This type of work concerns the preparation, maintenance and repair activities taking place to support and ensure the successful performance in the front-stage which, in this study, means the public space of the museums. The infrastructure studies approach allows analytical attention to (1) infrastructure as the relational backdrop of behaviour and practice and (2) the negotiations between its socio and technical components. With this perspective in mind, I place background work in the broader frame of what has been frequently neglected in the museum settings, against what has not. Chapter 5 presents an instance at MEK when a staff member discovered a forgotten object in the storage while researching for the next exhibition. The lone trace that points to this object is a tiny piece of information stored in the MDS among a slew of incomplete data; however, this type of trace highlights the invisible presence of background work and museum workers who perform them in the museum settings (as analysed in Ch. 5.1 and 5.2). The work performed behind the scenes to correct the information of an object would never be displayed in the public space where museum artefacts interact with the audience.

In keeping in line with an infrastructure-based approach (Ch. 2.2), Chapter 5 and 6 bring to the fore the work of those actors who are physically present but rendered invisible by dominant actors in the social world, i.e., the museum work-world, in which they find themselves. They are support and technical staff who work behind the scenes to prevent the institutional fabric from fragmenting in ways that could foster user discomfort and distrust, both internal and external. These categorical lines of work are not confined to purely technical personnel or those who directly interact with information technology systems. Rather than that, as shown in non-MEK cases, the notion of background work can be applicable to various forms of work associated with the sites in the back-stage where essential tasks are performed, with the purpose of supporting the smooth operations in the front-stage. In this study, the agents who explicitly perform these types of work include curators (Tanja at MEK, Nick and colleagues at the Hunterian), educators (Samia at MEK/SMB), photographers (Theo at SMB), IT and digitisation staff (Vera and her team at SMB).

Aim two: Analyse the extent to which background negotiations influence the socio-technical potential for participatory interaction

While results presented for aim one confirms what has been discussed within the tradition of infrastructure studies, aim two primarily delves into what has rarely been addressed in the relevant literature (heritage and museum studies, and STS). As explained in the literature review (Ch. 2), an STS-oriented infrastructure perspective has not yet been employed by museum studies researchers to examine the entangled institutional setting, local constraints, and background negotiations that shape the potential of museum work to facilitate participation and social inclusion. Based on the deconstruction of museum work brought about by aim one, aim two is directed to answering the main research question. An examination of socio-technical negotiations that take place in the background of museum institutions is an exploratory task. What is known, researched, and discussed about museum practices from STS-oriented infrastructure perspectives is not sufficient to embark on an extended study focusing on practices that evolve as infrastructure grows, especially given the constant influence of the broad social dynamics on what participation and participatory practices are.

In the following, I identify four categories of background negotiations that can influence the socio-technical potential of museum work for participatory interaction in the studied memory institutions.

1. **Staff members work through the hierarchical organisational structure as negotiating against a lack of attention to background work**

Cases in the analysis chapters regularly refer to a recurring set of issues that stem from the hierarchical organisational structure of an institution, which can impede its ability and willingness to initiate change. The effect to which traditional conventions, standards, and standardised tools and systems constitute socio-material barriers that lead to institutional inertia toward change has been addressed extensively in the literature (Neumann & Star, 1996; Star & Bowker, 2006). The literature also demonstrates how initiating digital transformation or implementing new technologies can create tensions with the infrastructure's 'installed base', which includes not only artefacts but also human norms, staff roles, routines, and habits (Aanestad et al., 2017b; Öberg et al., 2014).

However, what the study finds out is that the hierarchical organisational structure can correlate with a lack of attention to background work in two interrelated ways. First of all, as discussed in Chapter 4, the fixed boundaries imposed by official job duties and hierarchical organisational structure may lead to the reluctance of everyday staff to inform supervisors from other lines of work about problems that concern daily operations of the institution they work in as a whole. The insight from Vera at SHM (Ch 4.1) shows how the institution's hierarchical structure makes difficult explicit recommendations to address data integrity problems, such as streamlining data handling tasks to increase productivity and optimise the workflow. She was unable to raise data handling issues to the managers of other departments. Secondly, this inability to raise the voice can result in an overall lack of cross-departmental communication regarding technical issues, such as data mishandling, and this lack of communication – sometimes together with a lack of consistent protocol – leads to a technical bottleneck. The limited amount of human resources allocated to background work, at least exemplified in the cases of SPK/MEK/SMB and the Hunterian, worsens this technical bottleneck, and the everyday workers frequently express that they are overburdened with trivial, repetitive tasks. At the Hunterian, a staff member commented that they faced 'too much short-term problems'.

In discussing the complex relations of power and invisibility in the museum settings, Section 9.1 shows a stark disparity between top-level decisions and priorities and the daily practices of museum employees on the ground, especially during the digital transformations that many museums are undergoing. The existing boundaries of background work, as well as the intuitive decision-making processes of everyday workers that follow, expose the installed base of infrastructure. Cases at Glasgow Museums and the Hunterian, analysed in Chapter 8, highlight that at times the stability and persistence of existing infrastructure are so strong that the everyday workers have little chance of implementing digital transformation with the resources available.

2. **Those who perform background work maintain the infrastructure backbone while their voices are attenuated**

Analyses in Chapters 5 and 6 show that even though documentation work is frequently perceived as invisible and status-linked, it constitutes crucial activities that run through the core of compartmentalised museum operations and knowledge production. The investigation into museum work and everyday workers in the back-stage stresses the importance of invisible background work that staff does on a routine basis to keep the institution running and its goals intact. I have shown in Chapter 5 and 6 that documentation work, regularly rendered invisible

by a focus on normative ideals of a digital transformation, constitutes the backbone of institutional memory making. Most documentation activities and support work such as repair and maintenance become invisible once the action is inscribed in infrastructure. Nevertheless, these activities have huge effects on the smooth functioning of institutional memory making.

Examination of back-stage activities as a ground for agreement can reveal the miscommunication and lack of meaningful interaction between lines of work in different dimensions. As part of museum infrastructure, the underlying conditions only become visible whenever a breakdown occurs or is going to happen: operations come to a grinding halt, communication breaks down, or, more casually, someone within the entire process is at a loss for what to do (Ch. 5). The potential of breakdown can thus be imperceptible. The alarming noises in the back-stage can be drowned out.

On the technical level, staff may feel frustrated with various issues concerning the catalogue system, such as data put in the wrong field, incorrect or insufficient information. In the SMB, the leading cause for this was integrating data from various sources. There was no automatic method for detecting inconsistency found in existing databases. Thus, to improve data quality, staff could only do a random 'test and check' procedure, which required them to sacrifice a great deal of time and energy. For the MEK staff whom I interviewed, they needed to know what they were looking for to reach the specific object via the search function. Finding the incorrect fields, staff can only modify the problematic records one by one. On the material level, a workflow or streamlined processes that keep the informational fabric from shredding away are lacking. This could also create a new cycle of mistakes. This combination of extra, labour-intensive, and never-ending object-related tasks causes fatigue for museum staff. This is why in the MEK case, staff members became reluctant to see the new system launched and afraid of data publicly available.

3. **Museum staff actively engages in pushing the boundaries of what constitutes a participatory mission involved in their professional roles**

Throughout Chapters 5 and 6, I present how socially and technically constructed documentation work illuminates the unheard voices of the neglected, marginal actors. Documentation-related activities in the cultural heritage sector are part of what this thesis refers to as 'background work'. Even though frequently carried out by implicated actors, as discussed previously, these types of work are embedded in every corner of the compartmentalised organisation. However, as shown

in the discussion (Ch. 9.2), essential but non-dominant organisational actors are frequently separated from the construction of museum work-worlds. I have demonstrated how these employees carry out extra tasks, beyond the formal roles indicated by their job titles, to keep the institution running smoothly.

An emphasis on the implicated actors, i.e., the museum's everyday workers, compels us to consider the infrastructure's capacity and potential for scaling up. In the process of accommodating a broad range of users, staff might also encounter contradictions and tensions that expose and call into question museum boundaries which shape and hinder a practice of assembling 'access'. In examining the boundary-crossing characteristic of digital infrastructure that enables more open access to museum collections, Chapter 7 points out that the scale or scope of infrastructural development the institution wishes to achieve will influence its choice of a way to address issues of infrastructural stagnancy. Expanding access through digitised collections and external digital platforms was a process of negotiations that became legitimised through user and participant feedback and the institution's respective networks.

The analysis of back-stage work as grounds for boundary crossing helps illuminate the ways in which staff is compelled to negotiate perceptions of what constitutes an authentic museum object and a professional museum role in order to enable user access to museum collections. Chapter 7 shows that staff practices that help create online opportunities for user engagement are a process of actively expanding and negotiating infrastructural boundaries of connective capacities. In the SHM case, publishing the 3D models of their valuable objects on a third-party platform is analysed as an act of breaking boundaries. Expanding access is relational because the institutions within SHM have not yet gained any tangible benefit from their engaged practices. Being committed to the mission of expanding access makes the institutions focus on how they contribute to the community's needs and interests and needs. By centring user needs and leveraging their place in diverse heritage networks, staff at Swedish National Historical Museums can overcome infrastructural boundaries that hinder practices of designing for access.

4. **The difficulty in accommodating the participation of marginal entities can be attributed to resource allocation constraints and challenging institutional infrastructure**

In analysing institutional barriers to the voices of marginal actors, both humans and non-humans, Chapter 4 suggests that a tendency toward standardisation (category systems at MEK)

and a passive reliance on conventions (paperwork at SHM) are results of a lack of attention to background work. Furthermore, it addresses how employees and managers at two institutions are consumed by the paradox of organising change without enough resources. While Chapter 7 considers the degree to which museums can adhere to a collective commitment to social inclusion, Chapter 8 discusses the way in which museum staff can influence the capability of infrastructure to accommodate and be hospitable to entities in the margin and how this capability is constrained by an overwhelming lack of resources. The analyses in Chapter 7 and 8 clarify the difficulty in accommodating marginal entities and their perspectives, which has been earlier pointed out in Chapter 4 as a consequence of institutional barriers to paying attention to the voices in the back-stage of institutional memory work. Looking at the cases of MEK, SHM, and the Hunterian together, I have identified this difficulty as stemming from resource allocation constraints and challenging institutional infrastructure. Both organisational and professional conventions can restrict the possibility of an entity in the margins (social media team at MEK/SMB, and Vera's team at SHM) or the periphery (Category 74) of infrastructure to attain full membership status. Chapter 8 has highlighted how everyday museum staff reflects on the resource constraints at their own institutions to decide on how they can be hospitable toward the outside entities.

10.2 IMPLICATIONS TO RESEARCH

This section outlines the potential of an infrastructure-based approach to investigating the internal conflicts, ambiguities, and uncertainties that underpin institutional memory work, as well as the various trajectories of participatory missions in the broad GLAM sector.

1. An infrastructure-based approach helps clarify institutional mechanisms that enable or hinder participatory practices in memory institutions.

The analyses in this study have demonstrated that maintaining infrastructure to support the connective capacities of the institutions, both internally and externally, is a critical set of activities that runs through the heart of museum space and its production. By examining the entangled settings and local constraints of different types of museum institutions, the study shows that while everyday tasks are arbitrarily distributed across multiple lines of work, background work is disproportionately considered informal and mainly performed by implicated actors.

The research results presented in the previous section affirm that background work in the museum settings can have the capacity to drive the institutions to infrastructural change or in circles of stagnancy as the institution ponders various possibilities without acting on any of them. As underpinned by prior research in museum participation, the participation and social inclusion missions that many memory institutions are pursuing must be addressed in conjunction with a variety of social arrangements and communities of practice. One important implication of this study is that it is in the intersection of multiple lines of work that we can locate the collective commitment to action, engaged by diverse kinds of actors. In museum environments, as shown in cases of SPK/MEK/SMB, SHM, and the Hunterian, there are contentions and conflicts, but also adaptations and localisations – ways of 'working things out' between old and new ideas about how museums are supposed to serve the public, about the professional roles of museum staff and about the value of museum collections. On the one hand, the implicit acceptance of standards and standardisation perpetuates historical boundaries, reinforcing the institutional legacy of bureaucratisation and hierarchical organisation. On the other, the broad dynamics of social change generate a slew of entwined social and cultural forces that compel museums to adapt in order to maintain their social relevance in a changing landscape of cultural heritage. Emergent infrastructural settings owing to digital networks and technologies have brought about new dimensions of publicness, visibility, performance, and commitment. All these forces contribute to adding layers of concealment to what occurs behind the scenes at the museum.

The research results also show why the back-stage of museum institutions requires more reflection within the framework of infrastructure thinking. The discussion in Section 9.3 reveals that paying attention to everyday work is to provide the staff with a space to reflect on their professional role and their everyday practices. While both sides – front-stage and back-stage, formal and informal, visible and invisible work – are active sites of change, this dissertation postulates that the invisible, unnoticed, and unspoken back-stage of the institutional memory work is just as important as the visible and noticeable front-stage. What has been found in the empirics (Ch. 5, 6 and 7) indicates that the bottom-up nature of this back-stage implicated contribution can be frail and limited, as the ordinary everyday workers, who can be considered as 'implicated actors' – are most of the time not involved in the discursive construction of the museum work-worlds in which they inhabit.

2. This approach indicates that perspectives in the margins must be considered to consolidate various trajectories of a participatory mindset

In examining nuances and contexts by which everyday staff realise and perceive their routines, role and responsibilities, the analyses in this study show the potential for further development of concepts such as 'background work' and 'infrastructural practices' which can be applicable to other memory institutions and GLAM settings and validated by further studies inspired by the STS-oriented infrastructure analysis perspective. While pointing out the efforts of museum workers within studied institutions, this thesis elucidates an important background negotiation of institutional memory-making practices: working through the hierarchical organisational structure as negotiating against a lack of attention to background work.[72] Other types of GLAM or cultural organisations are frequently hierarchically organised and their knowledge production compartmentalised such as those found in museum institutions in this study (Ch. 4). These institutional constraints may entangle participatory memory work in complex settings staffed by actors with a variety of stances and voices.

As GLAM institutions compete with the dynamics of social change on one hand and the various levels of inertia produced by their organisational legacies on the other, this momentum accumulates over time and shifts constantly. Chapter 4 to 8 examine the infrastructural qualities of participatory memory work, and confirm what has been stated by infrastructure studies scholars, that infrastructure can be 'growing' rather than be 'built' onto an existing installed base, in the sense of an organic unfolding within an existing environment. An infrastructure perspective can be advantageous for delving into the system design processes as if they were perpetually 'tentative, flexible, and open' (Star & Bowker, 2006, p. 242). Bowker and Star, in discussing a better feasible approach to build computing infrastructures for communities, stated that: 'we need to understand not only 'information needs' in a superficial sense – we need a deep understanding of the structure and nature of the community we are building for, and of the ways it represents itself, others, and the past' (Bowker & Star, 1998, 246). The implications of the Alvin case presented in the empirics (Ch. 7.2 and 8.3) are in line with Star and Bowker's argument that the system designers must build for multiple social worlds at the same time.

In complement to the view of Bowker and Star (1998), the results of this study suggest that the 'we' implicated in their investigation can be expanded, in a way that the notion 'we' should encompass not only the designers of community-oriented information systems, but also the workers who assist in the process of organising people to achieve the goal of building mutual

[72] See 10.1 Results Aim One – 1.

understanding on what degree of participation must be involved in GLAM work. A long-term strategy to infrastructure scaling, as well as the attention to the boundary-crossing capability of infrastructural components as pointed out in the discussion (9.1 and 9.3), can enable the institution to coordinate the tasks, ambitions, and ideals of many social actors while also be hospitable to norms and standards belonged to another community of practice and visions from the marginal actors. A critical quality of infrastructure that supports institutional memory-making practices is brought into light: working across boundaries. This capability is likely to influence the potential of GLAM work – not only the work of museums, as this thesis attempts to show – to extend beyond the local level and on-site practices. The discussion in Chapter 9 indicates that grasping this boundary-crossing capability of background conditions can be beneficial for upper managers and strategy officers to manage digital transformation projects smoothly and cooperatively across teams, with well-informed decision-making procedures and efficient use of limited resources.

10.3 LIMITATIONS OF THE STUDY

This study has sought to present an account of the various forms of socio-technical negotiations that take place in the background of institutional memory work. An important step in the research plan, as outlined in the first chapter, is to investigate the back-stage of museum institutions. As the operational framework of this plan was informed by the three pillars of the ethnography of infrastructure lens proposed by Star (1999, 2002), namely attention to marginalised entities, relationality, and ethnographic sensibility, the epistemological stance of this back-stage examination is to place a strong emphasis on previously overlooked entities and their connections with the museum work-worlds they inhabit. The study thus investigates these entities within the politics of categories, which embrace an exploration into 'invisible work' (Bowker & Star, 1999; Star & Strauss, 1999), less dominant voices and marginalised actors. Even though this theoretical framework helps clarify in what ways infrastructural practices demand socio-technical considerations of visions in the margins that result in the increased potential of participation and social inclusiveness, it has two main setbacks.

The first setback of this chosen theoretical framework, on the analytical level, concerns the invisible status of infrastructure. As Star and colleagues assert, the everyday functioning of infrastructure is hidden from our eyes, until it becomes visible upon breakdown. This perspective is at odds with some recently emphasised and burgeoning views within Science and

Technology Studies (STS), which contend that infrastructures are not inherently invisible. Instead, according to those views, this invisibility arises from a particular framework wherein entities and individuals are apportioned highly specific locations and characteristics. One result of this study is about the expandability of the installed base; it highlights that the existing boundaries of background work expose the installed base of infrastructure, which can be crucial for museum institutions to align the envisioned participatory potential with the current degree of participation involved in their work practices. A direct implication is that if the backbone of the infrastructure of the museums was not solid and consistent enough, it would cause discomfort and mistrust among the users of infrastructure (within this study, the 'users' refer primarily to museum staff). However, the source of such discomfort has not been adequately addressed. Other scholars, such as Rubio (2020), has recently demonstrated that the majority of care given behind the scenes in museums is oriented toward a specific way of displaying arts, defining the role of museums, and positioning the primarily passive and autonomous spectators. Or, Graham (2020b) proposes the use of participatory-ontological thinking, which allows us to move beyond a simple description of a relational world to 'what is in experience' in the museum settings. The investigation of this study on discomfort, uncertainties and ambiguities caused by the inflexibility of the infrastructure backbone, relies on staff interviews. Its ignorance of other narratives that are not derived from everyday museum staff, which can be identified by a perspective that does not take infrastructure as invisible and relational per se, is one of the limitations.

Secondly, the theoretical framework and the methodology used for the investigation (Ch. 3) – based on a qualitative investigation among the museum staff – has not solved persuasively the question 'How about the Other?', which is still left unanswered since actor-network theory proponents call for the equally balanced assessment of humans and non-humans alike. Assessing how museum institutions accommodate different perspectives, interests, and commitments in shared discursive spaces, there are always divergences, overlaps, disputes, and resonances, but all sorts of multiple collective actors – together with their negotiations, conflicts, and ongoing participation – need to be heard and respected equally. It is written from a position of concern about the neglect of implicated actors who perform work behind the scenes and the lack of consideration for their voices. Given the variety of museum types and heterogeneity of museum activity systems, the need for all actors to be heard and respected equally has not been resolved resolutely within this study.

One direct consequence of the aforementioned setbacks can be seen in the discussions on documentation work and data quality issues in Chapter 5 and 6. While the infrastructure studies perspective enables an examination into a variety of bottom-up factors – everyday work, staff reflection on their professional roles, routines and habits, and taking-for-granted practices – and by doing so reveals different trajectories of what participation and social inclusion could mean in the everyday practices of the institutions, the question of which agents contribute to enacting these values is not appropriately addressed. In particular, the exploration of data labour behind the scenes of museum institutions has not taken into consideration the intermingled roles of actors – human and non-human – in the critical work of data entry, cleaning, and, more broadly, 'data care'. While the argument of this study is consistent with the work of scholars in the field of information infrastructures, which addressed the informality and pervasiveness of data labour (Suchman, 1995, 1996), as well as the undervalued role of 'metadata workers' (P. N. Edwards et al., 2013; Mayernik, 2019), the heterogeneous agency of data care is not adequately discussed in this study. To maintain balance and methodological consistency across cases, I have chosen to forego further investigation into what can be considered as the human errors at MEK, which are mentioned as the source of documentation problems.[73] This lack of specific investigation can be counterproductive in light of Star's perspective, which requires our view of infrastructures to always take into account assemblages of humans and non-humans.

10.4 AVENUES FOR FURTHER RESEARCH

The digital heritage infrastructure that shapes contemporary GLAM practices is currently an undefined field that is in vibrant construction. In this section, I propose two potential areas for future projects relating to infrastructuring museum work.

The first potential avenue for further investigation is to consider novel ways to pay attention to perspectives from below and use them to imagine what authentic social inclusion in memory institutions might look like in the future. In this study, addressing the infrastructural conditions under which memory institutions advance normative ideas of openness and social inclusion, I find specific reasons to assert that while the role of museum workers are defined by the institutional intent and orderly structure, in the course of their daily work, the staff encounter situations in which the embedded 'designer visions' are contradicted by their diverse interactions

[73] For example, see the case of Category 74 (Ch. 4.2) and the object 'II A 3763 ,a-c' (Ch. 5.2).

with museum objects and museum users. The daily work and encounters of museum staff with the objects of their work have allowed them a space for reflection to ponder about repair, maintenance, and improvisation, as well as how they could do their job better. It would be important for future projects to address specifically the potential for museum infrastructure to extend beyond the local and institutional levels. When the collective commitment to participation and social inclusion is realised and circulated, guided by the logic of collective organisation, this collective can then facilitate the emergence of new socio-political practices. The resulting collective should not be overlooked. The digital strategies of GLAM institutions can be shaped around the concept of infrastructure design: establishing digital infrastructures that facilitate professional collaboration and foster healthy dialogue between the institution and its audiences, and between the institution's dominant actors and its everyday workers. GLAM professionals can gain a better understanding of how digital infrastructures contribute to civil dialogue, participation, and redressing inequality and marginalisation in a European social context.

The second avenue is mapping the relationships of domination and unequal power distribution among participatory agencies in institutional memory work. The results of this study suggest that there are actors, things, and entities that are frequently overlooked and discursively neglected in the construction of the museum work-world they inhabit. While there have been scholarly efforts within STS and particularly infrastructure studies to take into consideration the actions and concerns of implicated, on-the-margin actors who are neither visible nor sufficiently heard by those in power, the same avenue has not been paved in a consistent and concrete way in museum and heritage studies. Chapter 5, 8 and 9 have shown that while museums are considering sharing their power of control to be more present and relevant in the digital era, their institutional legacies (including knowledge infrastructure) and organisational structure tend to maintain their authoritative and legitimising status. The analyses in these chapters indicate how the background negotiations between social and technical components of infrastructure can influence the institutions' momentum for sustainable change. The contrast between top-level strategies and priorities and everyday staff practices, particularly during the digital transformations (Ch. 9.1), suggests that if institutional agendas are politically driven and pushed top-down, i.e., by the part of the institution with power, i.e., actors with strong voices, giving voice to minor actors can be problematic. Therefore, deciding which communities the institution should serve is not as much as relevant to the potential participatory futures (as envisioned by the institutions) as determining how the institutions can balance emerging needs

– which are inextricably linked to those of users, communities, and stakeholders – with its capacity to overcome organisational constraints, work conventions, limited resources, and siloed modes of communication.

***

For closing remarks, the purpose of this thesis is to investigate the entangled settings in the museum back-stage and local constraints that shape the potential of museum work to facilitate participatory and socially inclusive missions. It aims to clarify the institutional mechanisms that constrain or enable participatory practices associated with emerging modes of knowledge production. This is accomplished through a back-stage study of the nuances and contexts in which everyday museum workers perceive their work routines, expectations, roles, and associated responsibilities. Employing an infrastructure analysis perspective, the study investigates the areas that have been paid little attention by museum and heritage studies, namely the relationship between power and visibility in museum work, and the back-stage negotiations. It examines the role of marginal human and non-human actors in back-stage work and questions the use and maintenance of knowledge associated with memory-making practices in museums as being shaped and reshaped by two forces simultaneously: the institutional legacies that maintain the status quo and the dynamics of social change that compels the institutions to engage in decentralised, participatory practices.

In examining invisible background work and implicated actors in detail, as well as their connections to the museum work-worlds within the politics of categories, the thesis demonstrates the potential of infrastructure thinking as a catalyst for reflection on 'going backstage' – or more precisely, studying the backstage of museum productions. It highlights the value of using the notions of background work and negotiations to establish a basis for agreement, as they can reveal miscommunication and a lack of meaningful interaction between lines of work on both social and technical levels.

APPENDICES

APPENDIX A: SUMMARY OF THE RESULTS OF THE DISSERTATION

A.1 Deutsche Kurzfassung der Ergebnisse

Die institutionelle Erinnerungsarbeit - und insbesondere die Museumstätigkeit - ist untrennbar mit der komplexen Vergangenheit der Institution, den bürokratischen und hierarchischen Organisationsstrukturen sowie der autoritativen Absicht und Macht verbunden. Meine Untersuchung befasst sich mit den Verhandlungen über alltägliche Praktiken in den Museen und deren Auswirkungen auf den Wandel der Infrastruktur. Das erste Ziel besteht darin, die infrastrukturellen Merkmale der institutionellen Erinnerungsarbeit herauszufinden, die eine partizipative Interaktion und soziale Inklusion ermöglichen. Das zweite Ziel besteht darin, die verschiedenen Formen und Motivationen der institutionellen Erinnerungsarbeit sowie die sozio-technischen Verhandlungen zu untersuchen, die im Hintergrund der Institutionen stattfinden. Diese Studie zeigt, dass organisatorische Barrieren die Arbeit im Hintergrund häufig daran hindern, aktiv und konstruktiv zur Leistung an der Front beizutragen. Sie zeigt auch, wie institutionelle Trägheit im Laufe der Zeit durch die hierarchische Struktur und die Legacy-Systeme der Organisation aufgebaut wird.

Diese Dissertation deckt verborgene Annahmen, Wertehierarchien und Vorurteile auf, die bei den Unterstützungsarbeiten, der Wartung und den Reparaturen im Backstage-Bereich des Museums zu finden sind. Die Ergebnisse zeigen, dass die Museumsdokumentation eine Reihe von Aktivitäten ist, die sorgfältig ausgearbeitet werden. Die Studie zeigt, wie die digitale Infrastruktur von Museen wachsen kann, anstatt auf einer bestehenden Basis aufzubauen, im Sinne einer organischen Entfaltung in einer bereits bestehenden Umgebung. Diese Studie legt einen starken Schwerpunkt darauf, wie die beteiligten Akteure zum täglichen Betrieb der Institution beitragen und wie sie miteinander interagieren. Im Prozess der Gedächtnisbildung in Museumsinstitutionen sind diese Akteure diejenigen, die unsichtbare Arbeit leisten - Dokumentation, Unterstützungsarbeit, Wartung und Reparatur. Obwohl die Dokumentationsarbeit häufig als routinemäßig unsichtbar angesehen wird, verhindert sie, dass das institutionelle Gefüge auf eine Art und Weise zersplittert, die das Misstrauen der Nutzer und ihre Entfremdung begünstigen könnte. Durch eine Untersuchung der Art und Weise, wie sich die Dokumentationsarbeit durch die verschiedenen sozialen Kontexte zieht, zeigt die Studie,

dass die Mitarbeiter zur Aufrechterhaltung des Informationsgefüges der Institution 'fürsorgliche Aufgaben' wahrnehmen müssen, die über ihre formale Berufsbezeichnung hinausgehen. Betreuungsaufgaben waren das, was diese Mitarbeiter taten, um sich überschneidende Bedeutungen, Einstellungen und Perspektiven zu artikulieren, die sich aus mehreren Arbeitsbereichen ergaben.

Die Untersuchung der Backstages von Museen unterstreicht den kritischen Charakter der Routinearbeit, die das Personal täglich leistet, um die Institution am Laufen zu halten, ihre Ziele zu erreichen und ihre Teams gut zu koordinieren. Diese Forschung untersucht, wie Gedächtnisinstitutionen, unterstützt durch neue Technologien, die Visionen einer sozial inklusiven Zukunft mit ihrem aktuellen Verständnis von Partizipation in ihrer Arbeitspraxis in Einklang bringen. Ich habe untersucht, wie digitale Infrastrukturen die professionelle Zusammenarbeit erleichtern und einen gesunden Dialog zwischen einer Institution und ihrem Publikum fördern. In dieser Arbeit zeige ich, dass die technischen Komponenten der Infrastruktur zwar für die Schaffung von Erinnerungen und die Produktion von Wissen notwendig sind, dass es aber ihre sozio-materiellen Arrangements sind, die offenere und dezentralere Formen der Gedächtnisbildung ermöglichen. Die Studie legt den Grundstein für die Einbeziehung partizipatorischer Ideen in die institutionelle Erinnerungsarbeit.

A.2 Summary of the results of the dissertation

This dissertation examines how institutional memory work in museums is inextricably linked to the complex history, bureaucratic and compartmentalised structure, as well as the authoritative intent and power of an institution. The study focuses on the background work of institutional memory production and how negotiations in the back-stage can influence the participatory potential of museum work. The first goal is to find out how institutional memory work is set up to allow for participatory interaction and social inclusiveness. The second goal is to look into the conditions and motivations of institutional memory work, as well as the socio-technical negotiations that occur in the back-stage. The dissertation reveals organisational barriers that frequently obstruct background work from actively and constructively contributing to the front-stage performance. It shows how institutional inertia is built up over time as a result of the hierarchical structure and legacy systems of an institution.

The study highlights hidden assumptions, hierarchies of values, and biases that are found in the support work, maintenance, and repair that takes place in the back-stage of museum work. The

research results confirm what has been stated by infrastructure studies scholars, that infrastructure can be 'growing' rather than be 'built' onto an existing installed base, in the sense of an organic unfolding within an existing environment. It does so by placing a strong emphasis on how the implicated actors contribute to the everyday operations of the institution and how they interact with each other. In the process of memory making in museum institutions, these actors are the ones who perform invisible work – documentation, support work, maintenance, and repair. The study looks at how documentation work fits into different communities of practice. It finds that in order to keep the informational backbone intact, museum staff members must perform background work that goes beyond their formal job title. Background work is what staff does to articulate intersecting meanings, attitudes, and perspectives derived from multiple lines of work.

The investigation into the back-stage of a museum emphasises the critical and relational nature of work that staff performs on a daily basis to keep the institution running, its goals accomplished, and its teams well-coordinated. This study explores how memory institutions make sense of socially inclusive futures and their current understanding of what participation means in the practices of everyday museum workers. It examines how digital infrastructures facilitate professional collaboration and foster healthy dialogue between an institution and its audience. I argue in this thesis that while technical components of infrastructure are necessary for memory-making and knowledge production, it is their socio-material arrangements that enable more open and decentralised modes of memory-making. The study lays the groundwork for the incorporation of participatory ideas and perspectives from below into institutional memory-making practices.

APPENDIX B: LIST OF EARLIER PUBLICATIONS RESULTING FROM THIS DISSERTATION

Sections of Chapter 7 has been included in the following publication. The article was written in collaboration with another researcher, Cassandra Kist. My contribution is the empirical work and analysis related to the SHM (Swedish National Historical Museums), and only that part was incorporated into Chapter 7 of my dissertation.

Kist, C., & Tran, Q.-T. (2021). Breaking Boundaries, Creating Connectivities: Enabling Access to Digitized Museum Collections. In M. Rauterberg (Ed.), *Culture and Computing. Interactive Cultural Heritage and Arts: 9th International Conference, C&C 2021, Held as Part of the 23rd HCI International Conference, HCII 2021, Proceedings, Part I* (pp. 406–422). Springer Nature Switzerland. https://doi.org/10.1007/978-3-030-77411-0_26

Sections of Chapter 5 was included in the following publication:

Tran, Q.-T. (2021). "Working things out": a back-stage examination of museum documentation. *Museums & Social Issues*, 15(1-2), 39–53. https://doi.org/10.1080/15596893.2022.2143760

Sections of Chapter 6 will be included in the forthcoming publication:

Tran, Q.-T. (forthcoming). From Index Cards to Digital Catalogues: Incomplete Object Documentation as Reflection Space. In D. Hansjörg, B. Göbel, L.-C. Koch, S. Schütze & A. von Poser (Eds.), *Collections as Relations: Belonging, Cultural Heritage, and Knowledge Infrastructures*.

APPENDIX C: INFORMATION SHEET AND CONSENT FORM

Project Information Sheet

The proposed research **Memory modalities in diverse types of memory institutions** aims to study the nature and quality of digital memory modalities of the involved memory institutions in their socio-technical potential for participatory interaction. This project is part of the H2020 European Training Network POEM (https://www.poem-horizon.eu/). The project will take three years and complete in October 2021.

The project consists of two main objectives: a) conduct cross-section research of the digital memory modalities of all involved memory institutions in their socio-technical potential for participatory interaction; and b) investigate best practices of memory modalities facilitating participatory approaches across Europe.

You are asked to contribute your expertise to the understanding of how participation is encouraged or hindered by the specific nature of digital infrastructures of professional institutions. This may lead to an unlikely situation, in which you do not feel comfortable or which could raise conflicts within your institution.

Participation in this study is voluntary. If you decide not to participate there will not be any negative consequences. Please be aware that if you decide to participate, you may stop participating at any time and you may decide not to answer any specific question.

All information collected for this research will be kept confidential and will only be used for the purpose of this research by **Quoc-Tan Tran** and academic colleagues with whom he collaborates as part of the research process.

Excerpts from the interview may be included in the final dissertation or other later publications. You can decide that any summary interview content, or direct quotations from the interview, will be anonymised so that you cannot be identified, and care will be taken to ensure that other information in the interview that could identify yourself is not revealed.

If you for any reason would like to pull out of the study, meaning the collected data needs to be destroyed, this is only possible before completion of the research. This is due to organisational matters. With the completion of the research, we are obligated to delete the list of codes that links your name to your personal data. This way, the collected data cannot be attributed to any of the participants directly.

Responsible for the analysis and storage of the data is **Quoc-Tan Tran**, Institute of European Ethnology/ Cultural Anthropology, University of Hamburg.

This research has been reviewed and approved by the Ethics Committee at the Faculty of Humanities (EKGW), University of Hamburg.

Interview Consent Form

I am aware of the nature, significance and scope of the proposed research '**Memory modalities in diverse types of memory institutions**'. For this, I was given a copy of the 'Project Information Sheet for Interviewees'. I am aware that I can ask any questions related to this study, to receive satisfactory answers to my questions.

I agree that my interview is audio-recorded to ensure an accurate recording of my responses. I know that the data obtained in the proposed interviews with me are further processed and will be used for scientific purposes.

I understand that all the information I provide for this study will be treated confidentially. I understand that in any report on the results of this research my identity can remain anonymous. This will be done by changing my name and disguising any details of my interview which may reveal my identity or the identity of people I speak about. I understand that extracts from my interview may be quoted in the researcher's dissertation, conference presentation, and published papers.

With regards to being quoted (Please check **only one** out of three following options):

	I grant permission for the researcher to use direct, attributed quotations from my interview.

For example:

> The Val de Bièvre *Écomusée* has a slightly different scope than the *Maison* at Athis-Mons because it is a genuine museum with its own collection of pictures, photos and objects (http://ecomusee.agglo-valdebievre.fr/). The collection numbers more than a thousand objects, but unlike most museum collections each object is accompanied by a specially recorded interview with its former owner. As the director explains, '[w]e can collect all sorts of objects. The object is not interesting in itself, but talking with its owner enables us to understand its use and its meaning, and this is the interesting part'. The emphasis here is less on

Source: Auclair, E. (2015). Ordinary heritage, participation and social cohesion: the suburbs of Paris. In E. Auclair & G. Fairclough (Eds.), *Theory and practice in heritage and sustainability: between past and future* (43-57). London: Routledge.(emphasis added)

	I grant permission for the researcher to use my responses in aggregate or anonymous statements.

For example:

> Support groups on *Facebook* allow members to engage in social interactions more frequently and develop an informal virtual support network.
>
> What I love about this group is that when I have a problem/question regarding the computer or devices that I use, as soon as I post the questions...bam! People help right away. Great technical support! – Ava

Source: Frömming, U. U., Köhn, S., Fox, S., & Terry, M. (Eds.). (2017). *Digital Environments: Ethnographic Perspectives across Global Online and Offline Spaces*. Bielefeld: Transcript.

	I do not grant permission for the researcher to use any direct or indirect quotations from my interview.

I am aware that I can withdraw my consent at any time without giving reasons, without the incurrence of any disadvantages for me. For the processing of the provided data, I can also revoke my consent at any time without giving reasons.

I am aware that I can no longer withdraw my consent after completion of the study, which means the obtained anonymised data from the study can no longer be destroyed.

_____ _____

Signature of interviewee Signature of researcher

I believe the interviewee is giving informed consent to participate in this study

_____

Date and place

APPENDIX D: LIST OF INTERVIEWS

LIST OF INSTITUTIONS

- LVR-Institut für Landeskunde und Regionalgeschichte (Germany) [Pilot-LRV]
- Prussian Cultural Heritage Foundation (Germany) [SPK], including:
    - National Museums in Berlin [SMB]
        - Museum of European Cultures [MEK]
        - Museum of Islamic Art [MIK]
    - Institute for Museum Research [IMR]
    - Prussian Privy State Archives [GSTA]
- State Archives of Baden-Württemberg (Germany) [LBW]
- Alvin Consortium (Sweden) [ALV]
- Swedish National Heritage Board (Sweden) [RAA], including:
    - DIGISAM - Swedish national coordination of digitisation, digital preservation and digital access to cultural heritage [DIG]
- National Historical Museums (Sweden) [SHM]
- Glasgow Museums - Glasgow Life (Scotland) [GM]
- Historic Environment Scotland (Scotland) [HES]
- Hunterian Museum and Art Gallery (Scotland) [HUN]
- National Library of Scotland (Scotland) [NLS]
- National Museum of Scotland (Scotland) [Pilot-NMS]

LIST OF PARTICIPANTS & INTERVIEW CODES

Some participant names have been altered for the purpose of anonymisation. These are mark with *.

Pilot interviews (2)

Date	Participant	Code
February 2019	Christian	Pilot-LVR
August 2019	Hazel and Elaine	Pilot-NMS

Staff interviews (23)

Date	Participant	Code
August 2019	John	GLA1
August 2019	Nicky	HUN1
August 2019	Vicky*	GLA2
August 2019	Robin and Emily	NLS
August 2019	Malcolm	HUN2
December 2019	Per and Stefan	ALV1
April 2020	Karl* and Hannah*	SPK1
June 2020	Wilhelm	SHM1
June 2020	Kent-Inge	ALV2
June 2020	Erik	SHM2

July 2020	Marcus	RAA
July 2020	Henrik	DIG
July 2020	Sophia	HES
September 2020	Susanna	SHM3
October 2020	Frank	IMR
October 2020	Silke	GSTA
October 2020	Thomas	MIK
October 2020	Jana	MEK1
October 2020	Samia*	MEK2
October 2020	Tanja*	MEK3
October 2020	Theo*	SMB1
November 2020	Vera*	SHM4
January 2021	Niels*	LBW

REFERENCES

Aanestad, M., Grisot, M., Hanseth, O., & Vassilakopoulou, P. (2017a). Information Infrastructures for eHealth. In M. Aanestad, M. Grisot, O. Hanseth, & P. Vassilakopoulou (Eds.), *Information infrastructures within European health care: Working with the installed base* (pp. 11–23). Springer. https://doi.org/10.1007/978-3-319-51020-0_2

Aanestad, M., Grisot, M., Hanseth, O., & Vassilakopoulou, P. (Eds.). (2017b). *Information infrastructures within European health care: Working with the installed base*. Springer.

Aanestad, M., Grisot, M., Hanseth, O., & Vassilakopoulou, P. (2017c). Strategies for Building eHealth Infrastructures. In M. Aanestad, M. Grisot, O. Hanseth, & P. Vassilakopoulou (Eds.), *Information infrastructures within European health care: Working with the installed base* (pp. 35–51). Springer. https://doi.org/10.1007/978-3-319-51020-0_4

Andersen, S. T., & Jansen, A. (2012). Installed base as a facilitator for user-driven innovation: How can user innovation challenge existing institutional barriers? *International Journal of Telemedicine and Applications*, *2012*, 673731. https://doi.org/10.1155/2012/673731

Andersson, S., Cullhed, P., Wachenfeldt, M. von, & Östlund, K. (2011, March 28). *LUPP : Digitaliseringssamarbete mellan Stiftsbiblioteket vid Linköpings stadsbibliotek och Uppsala universitetsbibliotek*. Uppsala universitetsbibliotek. http://uu.diva-portal.org/smash/record.jsf?pid=diva2%3A1133881

Appadurai, A. (2000). Grassroots globalization and the research imagination. *Public Culture*, *12*(1), 1–19.

Appel, H., Anand, N., & Gupta, A. (Eds.). (2015). *The Infrastructure Toolbox*. Cultural Anthropology. https://culanth.org/fieldsights/series/the-infrastructure-toolbox

Bak, G., & Armstrong, P. (2008). Points of convergence: Seamless long-term access to digital publications and archival records at library and archives Canada. *Archival Science*, *8*(4), 279–293. https://doi.org/10.1007/s10502-009-9091-4

Barney, D., Coleman, G., Ross, C., Sterne, J., & Tembeck, T. (Eds.). (2016). *The participatory condition in the digital age*. University of Minnesota Press.

Baszanger, I., & Dodier, N. (2004). Ethnography: Relating the part to the whole. In D. Silverman (Ed.), *Qualitative research: Theory, method and practice* (2nd ed., pp. 9–34). SAGE.

Bearman, D. (2008). Representing Museum Knowledge. In P. F. Marty & K. Jones (Eds.), *Museum Informatics: People, information, and technology in museums* (pp. 35–57). Routledge.

Becker, H. S. (1982). *Art worlds*. University of California Press.

Beer, D. (2009). Power through the algorithm? Participatory web cultures and the technological unconscious. *New Media & Society*, *11*(6), 985–1002.

Benardou, A., Champion, E. M., Dallas, C., & Hughes, L. (Eds.). (2018). *Cultural Heritage Infrastructures in Digital Humanities*. Routledge.

Bennett, T. (2007). Making culture, changing society: The perspective of 'culture studies'. *Cultural Studies*, *21*(4-5), 610–629. https://doi.org/10.1080/09502380701278988

Bennett, T. (2013). *Making culture, changing society. Culture, economy and the social*. Routledge.

Berg, M. (1998). Order(s) and Disorder(s): Of Protocols and Medical Practices. In M. Berg & A. Mol (Eds.), *Differences in medicine: Unraveling practices, techniques, and bodies* (pp. 226–246). Duke University Press.

Bernhardt, J. C. (2021). Slow participation: The case of the Baden State Museum. In G. Black (Ed.), *Museums and the challenge of change: Old institutions in a new world* (pp. 196–203). Routledge.

Bijker, W. E. (1995). *Of bicycles, bakelites, and bulbs: Toward a theory of sociotechnical change*. MIT Press.

Bijker, W. E., & Law, J. (Eds.). (1992). *Inside technology. Shaping Technology/Building Society: Studies in Sociotechnical Change*. MIT Press.

Binter, J. T. S. (2019). Beyond Exhibiting the Experience of Empire? Challenging Chronotopes in the Museum. *Third Text*, *33*(4-5), 575–593. https://doi.org/10.1080/09528822.2019.1651510

Bjögvinsson, E., Ehn, P., & Hillgren, P.-A. (2012). Design things and design thinking: Contemporary participatory design challenges. *Design Issues*, *28*(3), 101–116.

Björgvinsson, E., Ehn, P., & Hillgren, P.-A. (2012). Agonistic participatory design: working with marginalised social movements. *CoDesign*, *8*(2-3), 127–144. https://doi.org/10.1080/15710882.2012.672577

Black, G. (Ed.). (2021). *Museums and the challenge of change: Old institutions in a new world.* Routledge.

Blomberg, J., & Karasti, H. (2013). Reflections on 25 Years of Ethnography in CSCW. *Computer Supported Cooperative Work (CSCW)*, *22*(4-6), 373–423. https://doi.org/10.1007/s10606-012-9183-1

Botero, A., Karasti, H., Saad-Sulonen, J., Geirbo, C. G., Baker, K. S., Parmiggiani, E., & Marttila, S. (2019). *Drawing together, Infrastructuring and politics for participatory design.* University of Oulu, Finland.

Bowker, G. C. (1994a). Information mythology and infrastructure. In L. Bud-Frierman (Ed.), *Information acumen: The understanding and use of knowledge in modern business* (pp. 231–247). Routledge.

Bowker, G. C. (1994b). *Science on the run: Information management and industrial geophysics at Schlumberger, 1920-1940*. MIT Press.

Bowker, G. C. (2005). *Memory practices in the sciences*. MIT Press.

Bowker, G. C. (2018). Sustainable Knowledge Infrastructures. In N. Anand, A. Gupta, & H. Appel (Eds.), *The promise of infrastructure* (pp. 203–222). Duke University Press.

Bowker, G. C., & Star, S. L. (1996). How things (actor-net) work: Classification, magic and the ubiquity of standards. *Philosophia*, *25*(3-4), 195–220.

Bowker, G. C., & Star, S. L. (1998). Building information infrastructures for social worlds—The role of classifications and standards. In T. Ishida (Ed.), *Community computing and support systems: social interaction in networked communities* (231-248). Springer Science & Business Media.

Bowker, G. C., & Star, S. L. (1999). *Sorting Things Out: Classification and Its Consequences*. MIT Press.

Bowker, G. C., & Star, S. L. (2000). Invisible Mediators of Action: Classification and the Ubiquity of Standards. *Mind, Culture, and Activity*, *7*(1-2), 147–163. https://doi.org/10.1080/10749039.2000.9677652

Bowker, G. C., Timmermans, S., Clarke, A., & Balka, E. (Eds.). (2015). *Boundary objects and beyond: Working with Leigh Star*. MIT Press.

Boylan, P. J. (2006). The Museum Profession. In S. Macdonald (Ed.), *A companion to museum studies* (pp. 415–430). Blackwell.

Brinkmann, S. (2014). Unstructured and Semi-Structured Interviewing. In P. Leavy (Ed.), *The Oxford handbook of qualitative research* (pp. 277–299). Oxford university press.

Brockmeier, J. (2010). After the archive: Remapping memory. *Culture & Psychology*, *16*(1), 5–35.

Brulon Soares, B. (2019). Every museum has a God, or God is in every museum? *ICOFOM Study Series*(47(1-2)), 57–72. https://doi.org/10.4000/iss.1358

Brusius, M., & Singh, K. (Eds.). (2018). *Museum storage and meaning: Tales from the crypt*. Routledge.

Buchczyk, M. (2022). Transforming legacies, habits and futures: reshaping the collection at the Museum of European Cultures. *International Journal of Heritage Studies*, 1–15.

Cameron, F. (2006). Beyond surface representations: museums,'edgy'topics, civic responsiblities and modes of engagement. *Open Museum Journal: Contest and Contemporary Society*.

Cameron, F. R. (2007). Beyond the Cult of the Replicant: Museums and Historical Digital Objects—Traditional Concerns, New Discourses. In F. R. Cameron & S. Kenderdine (Eds.), *Theorizing digital cultural heritage: A critical discourse* (pp. 49–75). MIT Press.

Cameron, F. R., & Kenderdine, S. (Eds.). (2007). *Theorizing digital cultural heritage: A critical discourse*. MIT Press.

Cameron, F. R., & Robinson, H. (2003). *Knowledge Objects: Multidisciplinary Approaches to Collections Documentation.*

Candlin, F. (2016). *Micromuseology: An analysis of small independent museums*. Bloomsbury Academic.

Canning, E. (2019). Affect in Information Systems: A Knowledge Organization System Approach to Documenting Visitor-Artwork Experiences. *Museums and the Web 19: MW 2019*. https://mw19.mwconf.org/paper/affect-in-information-systems-a-knowledge-organization-system-approach-to-documenting-visitor-artwork-experiences/

Carr, D. (2003). *The promise of cultural institutions*. AltaMira Press.

Carr, M., Clarkin-Phillips, J., Beer, A., Thomas, R., & Waitai, M. (2012). Young children developing meaning-making practices in a museum: the role of boundary objects. *Museum Management and Curatorship*, *27*(1), 53–66.

Cefaï, D. (2017). Social Worlds: The Legacy of Mead's Social Ecology in Chicago Sociology. In H. Joas & D. R. Huebner (Eds.), *The timeliness of George Herbert Mead* (pp. 165–184). The University of Chicago Press.

Charmaz, K. (2000). Grounded theory: Objectivist and contructivist methods. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of Qualitative Research* (2nd ed., pp. 509–535). Sage Publications.

Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative analysis*. Sage Publications.

Charmaz, K. (2008). Grounded Theory as an Emergent Method. In S. N. Hesse-Biber & P. Leavy (Eds.), *Handbook of Emergent Methods* (pp. 155–170). Guilford Publications.

Charmaz, K. (2014). *Constructing grounded theory* (2nd edition). SAGE.

Charmaz, K., & Belgrave, L. L. (2019). Thinking About Data With Grounded Theory. *Qualitative Inquiry*, *25*(8), 743–753. https://doi.org/10.1177/1077800418809455

Charmaz, K., & Bryant, A. (2011). Grounded Theory and Credibility. In D. Silverman (Ed.), *Qualitative research* (3rd ed., pp. 291–309). SAGE.

Charmaz, K., & Mitchell, R. G. (2001). Grounded theory in ethnography. In P. Atkinson, A. Coffey, S. Delamont, J. Lofland, & L. Lofland (Eds.), *Handbook of ethnography* (pp. 160–174). SAGE.

Ciborra, C. U., & Hanseth, O. (1998). From tool to Gestell: Agendas for managing the information infrastructure. *Information Technology & People*, *11*(4), 305–327.

Clarke, A. (1998). *Disciplining reproduction: Modernity, American life sciences, and "the problems of sex"*. University of California Press.

Clarke, A., & Montini, T. (1993). The many faces of RU486: Tales of situated knowledges and technological contestations. *Science, Technology, & Human Values*, *18*(1), 42–78. https://doi.org/10.1177/016224399301800104

Clarke, A., & Star, S. L. (2008). The Social Worlds Framework: A Theory/Methods Package. In E. J. Hackett, O. Amsterdamska, M. Lynch, & J. Wajcman (Eds.), *The handbook of science and technology studies* (pp. 113–137). MIT Press.

Clarke, A. E. (1991). Social Worlds/Arenas Theory as Organizational Theory. In D. R. Maines (Ed.), *Social organization and social process: Essays in honor of Anselm Strauss* (pp. 119–158). Aldine de Gruyter.

Clifford, J. (1997). Spatial Practices: Fieldwork, Travel, and the Disciplining of Anthropology. In A. Gupta & J. Ferguson (Eds.), *Anthropological Locations: Boundaries and Grounds of a Field Science* (pp. 185–222). Univ of California Press.

Clough, G. W. (2013). *Best of Both Worlds: Museums, Libraries, and Archives in a Digital Age*. Smithsonian Institution.

Colenbrander, S., Birungi, C., & Mbonye, A. K. (2015). Consensus and contention in the priority setting process: Examining the health sector in Uganda. *Health Policy and Planning*, *30*(5), 555–565. https://doi.org/10.1093/heapol/czu030

Collet, D. (2014). Staging Separation: Distant Worlds in Early Museums. In L. Förster (Ed.), *Transforming Knowledge Orders: Museums, Collections and Exhibitions* (pp. 47–71). Wilhelm Fink.

Collier, S. J., & Ong, A. (2005). Global assemblages, anthropological problems. In A. Ong & S. J. Collier (Eds.), *Global Assemblages: Technology, Politics, and Ethics as Anthropological Problems* (pp. 3–21). Blackwell Publishing.

Cook, T. (2013). Evidence, memory, identity, and community: four shifting archival paradigms. *Archival Science*, *13*(2-3), 95–120. https://doi.org/10.1007/s10502-012-9180-7

Cordella, A. (2010). Information Infrastructure: An Actor-Network Perspective. *International Journal of Actor-Network Theory and Technological Innovation*, *2*(1), 27–53.

Crimp, D. (1993). *On the museum's ruins*. MIT Press.

Crooke, E. (2021). Participation, trust, and telling difficult histories in museums. In G. Black (Ed.), *Museums and the challenge of change: Old institutions in a new world* (pp. 113–122). Routledge.

David, P. A. (1985). Clio and the Economics of QWERTY. *The American Economic Review*, *75*(2), 332–337. http://www.jstor.org/stable/1805621

Drayton, R. (2019). Rhodes Must Not Fall? *Third Text*, *33*(4-5), 651–666. https://doi.org/10.1080/09528822.2019.1653073

Drotner, K. (2021). Joint creativity for democratic transformations in museums. In G. Black (Ed.), *Museums and the challenge of change: Old institutions in a new world* (pp. 204–210). Routledge.

Eddy, D. M. (1990). Practice policies—what are they? *Journal of the American Medical Association*, *263*(6), 877–880.

Edwards, E. (2016). The colonial archival imaginaire at home. *Social Anthropology*, *24*(1), 52–66. https://doi.org/10.1111/1469-8676.12283

Edwards, E., Gosden, C., & Phillips, R. B. (Eds.). (2006). *Sensible objects: Colonialism, museums and material culture*. Berg.

Edwards, P. N. (2003). Infrastructure and Modernity: Force, Time, and Social Organization in the History of Sociotechnical Systems. In T. J. Misa, P. Brey, & A. Feenberg (Eds.), *Modernity and technology* (pp. 185–225). MIT Press.

Edwards, P. N. (2019). Infrastructuration: On Habits, Norms and Routines as Elements of Infrastructure. In M. Kornberger, G. C. Bowker, J. Elyachar, A. Mennicken, P. Miller, J. R. Nucho, & N. Pollock (Eds.), *Thinking infrastructures* (pp. 355–366). Emerald Publishing.

Edwards, P. N., Bowker, G. C., Jackson, S. J., & Williams, R. (2009). Introduction: an agenda for infrastructure studies. *Journal of the Association for Information Systems*, *10*(5), 364–374.

Edwards, P. N., Jackson, S. J., Bowker, G. C., & Knobel, C. P. (2007). Understanding infrastructure: Dynamics, tensions, and design: Report of a Workshop on "History & Theory of Infrastructure: Lessons for New Scientific Cyberinfrastructures".

Edwards, P. N., Jackson, S. J., Chalmers, M. K., Bowker, G. C., Borgman, C. L., Ribes, D., Burton, M., & Calvert, S. (2013). *Knowledge infrastructures: Intellectual frameworks and research challenges*. https://deepblue.lib.umich.edu/handle/2027.42/97552

Engel, D., & Wharton, G. (2014). Reading between the lines: Source code documentation as a conservation strategy for software-based art. *Studies in Conservation*, *59*(6), 404–415.

Engel, D., & Wharton, G. (2015). Source code analysis as technical art history. *Journal of the American Institute for Conservation*, *54*(2), 91–101.

Engel, D., & Wharton, G. (2017). Managing Contemporary Art Documentation in Museums and Special Collections. *Art Documentation: Journal of the Art Libraries Society of North America*, *36*(2), 293–311. https://doi.org/10.1086/694245

Engeström, Y., Engeström, R., & Kärkkäinen, M. (1995). Polycontextuality and boundary crossing in expert cognition: Learning and problem solving in complex work activities. *Learning and Instruction*, *5*(4), 319–336. https://doi.org/10.1016/0959-4752(95)00021-6

Eschenfelder, K. R., & Caswell, M. (2010). Digital cultural collections in an age of reuse and remixes. *Proceedings of the American Society for Information Science and Technology*, *47*(1), 1–10. https://doi.org/10.1002/meet.14504701045

Feinstein, A. R. (1974). An analysis of diagnostic reasoning. 3. The construction of clinical algorithms. *The Yale Journal of Biology and Medicine*, *47*(1), 5.

Förster, L. (Ed.). (2014). *Transforming Knowledge Orders: Museums, Collections and Exhibitions*. Wilhelm Fink.

Förster, L., Edenheiser, I., Fründt, S., & Hartmann, H. (Eds.). (2018). *Provenienzforschung zu ethnografischen Sammlungen der Kolonialzeit [Provenance research on ethnographic collections from the colonial era]*. Humboldt-Universität zu Berlin.

Fouseki, K., & Vacharopoulou, K. (2013). Digital museum collections and social media: Ethical considerations of ownership and use. *Journal of Conservation and Museum Studies*, *11*(1). https://doi.org/10.5334/jcms.1021209

Fujimura, J. H. (1992). Crafting Science: Standardized Packages, Boundary Objects, and "Translation". In A. Pickering (Ed.), *Science as practice and culture* (pp. 168–211). University of Chicago Press.

Fyfe, G. (2004). Reproductions, cultural capital and museums: aspects of the culture of copies. *Museum and Society*, *2*(1), 47–67. https://www.semanticscholar.org/paper/Reproductions%2C-cultural-capital-and-museums%3A-of-the-Fyfe/ced7adedd57bfee46715872172cd4f1bc302352b

Gaimster, D. (2016). The Hunterian, Glasgow: Enlightenment Foundations and Continuing Mission. *The Antioch Review*, *74*(2), 360. https://doi.org/10.7723/antiochreview.74.2.0360

Gasser, L. (1986). The Integration of Computing and Routine Work. *ACM Transactions on Information Systems*, *4*(3), 205–225. https://doi.org/10.1145/214427.214429

Gieryn, T. F. (1999). *Cultural boundaries of science: Credibility on the line*. University of Chicago Press.

Glaser, B. G. (2001). *The grounded theory perspective: Conceptualization contrasted with description*. Sociology Press.

Glaser, B. G., & Strauss, A. L. (1967). *Discovery of grounded theory: Strategies for qualitative research*. Adline de Gruyter.

Glassman, A., Chalkidou, K., Giedion, U., Teerawattananon, Y., Tunis, S., Bump, J. B., & Pichon-Riviere, A. (2012). Priority-setting institutions in health: Recommendations from a center for global development working group. *Global Heart*, *7*(1), 13–34. https://doi.org/10.1016/j.gheart.2012.01.007

Gobo, G. (2007). Sampling, Representativeness and Generalizability. In C. Seale, G. Gobo, J. F. Gubrium, & D. Silverman (Eds.), *Qualitative research practice* (pp. 405–426). SAGE.

Gobo, G. (2008). *Doing ethnography*. SAGE.

Gobo, G. (2018). Upside Down – Reinventing Research Design. In U. Flick (Ed.), *The Sage handbook of qualitative data collection* (pp. 65–83). Sage Publications Ltd.

Gobo, G., & Marciniak, L. T. (2016). What Is Ethnography? In D. Silverman (Ed.), *Qualitative research* (4th ed.). SAGE.

Golding, V. (2009). *Learning at the museum frontiers: Identity, race and power*. Ashgate Publishing, Ltd.

Golub, K., Ziolkowski, P. M., & Zlodi, G. (2022). Organizing subject access to cultural heritage in Swedish online museums. *Journal of Documentation*, *78*(7), 211–247. https://doi.org/10.1108/JD-05-2021-0094

Govier, L. J. (2009). *Leaders in Co-creation? Why and how Museums Could Develop Their Co-creative Practice with the Public, Building on Ideas from the Performing Arts and Other Non-museum Organisations*. Research Centre for Museums and Galleries (RCMG), University of Leicester.

Graham, H. (2017). Horizontality: Tactical Politics for Participation and Museums. In B. Onciul, M. L. Stefano, & S. K. Hawke (Eds.), *Engaging Heritage, Engaging Communities* (pp. 73–87). Boydell Press.

Graham, H. (2020a). Breaking out of the museum core: Conservation as participatory ontology and systemic action inquiry. In M. O'Neill & G. Hooper (Eds.), *Connecting museums* (pp. 80–94). Routledge.

Graham, H. (2020b). How the exhibition became co-produced: Attunement and participatory ontologies for museums. In P. Bjerregaard (Ed.), *Exhibitions as Research: Experimental Methods in Museums* (pp. 181–194). Routledge.

Graham, J. E., Holmes, C., McDonald, F. J., & Darnell, R. (Eds.). (2021). *The social life of standards: Ethnographic methods for local engagement*. UBC Press.

Graham, S., & Thrift, N. (2007). Out of Order: Understanding Repair and Maintenance. *Theory, Culture & Society*, *24*(3), 1–25. https://doi.org/10.1177/0263276407075954

Gray, C., & McCall, V. (2018). Analysing the Adjectival Museum: Exploring the bureaucratic nature of museums and the implications for researchers and the research process. *Museum and Society*, *16*(2), 124–137.

Gupta, A., & Ferguson, J. (1997). Discipline and Practice: "The Field" as Site, Method, and Location in Anthropology. In A. Gupta & J. Ferguson (Eds.), *Anthropological Locations: Boundaries and Grounds of a Field Science* (pp. 1–46). Univ of California Press.

Hanks, L. H., Hale, J., & Macleod, S. (2012). Introduction: Museum making: The place of narrative. In S. Macleod, L. H. Hanks, & J. Hale (Eds.), *Museum making: Narratives, architectures, exhibitions* (pp. xix–xxiii). Routledge.

Hanseth, O., Jacucci, E., Grisot, M., & Aanestad, M. (2006). Reflexive standardization: side effects and complexity in standard making. *MIS Quarterly*, 563–581.

Haraway, D. J. (1991). *Simians, cyborgs, and women: The reinvention of nature*. Routledge.

Harrison, R. (2013). Forgetting to remember, remembering to forget: late modern heritage practices, sustainability and the 'crisis' of accumulation of the past. *International Journal of Heritage Studies*, *19*(6), 579–595. https://doi.org/10.1080/13527258.2012.678371

Harvey, P., Jensen, C. B., & Morita, A. (Eds.). (2017a). *Infrastructures and social complexity: A companion*. Taylor & Francis.

Harvey, P., Jensen, C. B., & Morita, A. (2017b). Introduction: Infrastructural Complications. In P. Harvey, C. B. Jensen, & A. Morita (Eds.), *Infrastructures and social complexity: A companion* (pp. 1–22). Taylor & Francis.

Hine, C. (2007). Multi-sited Ethnography as a Middle Range Methodology for Contemporary STS. *Science, Technology, & Human Values*, *32*(6), 652–671. https://doi.org/10.1177/0162243907303598

Holdgaard, N., & Klastrup, L. (2014). Between control and creativity: challenging co-creation and social media use in a museum context. *Digital Creativity*, *25*(3), 190–202. https://doi.org/10.1080/14626268.2014.904364

Hooper-Greenhill, E. (2000). *Museums and the interpretation of visual culture*. Routledge.

Hoskins, A. (2018). The restless past: An introduction to digital memory and media. In A. Hoskins (Ed.), *Digital Memory Studies: Media Pasts in Transition* (pp. 1–24). Routledge.

Houssart, J., & Evens, H. (2011). Conducting task-based interviews with pairs of children: consensus, conflict, knowledge construction and turn taking. *International Journal of Research & Method in Education*, *34*(1), 63–79.

Howe, C., Lockrem, J., Appel, H., Hackett, E., Boyer, D., Hall, R., Schneider-Mayerson, M., Pope, A., Gupta, A., Rodwell, E., Ballestero, A., Durbin, T., el-Dahdah, F., Long, E., & Mody, C. (2016). Paradoxical Infrastructures. *Science, Technology, & Human Values*, *41*(3), 547–565. https://doi.org/10.1177/0162243915620017

Hudson, K. (1998). The Museum Refuses to Stand Still. *Museum International*, *50*(1), 43–50. https://doi.org/10.1111/1468-0033.00135

Huvila, I. (2013). How a museum knows? Structures, work roles, and infrastructures of information work. *Journal of the American Society for Information Science and Technology*, *64*(7), 1375–1387. https://doi.org/10.1002/asi.22852

Jackson, S. J., Edwards, P. N., Bowker, G. C., & Knobel, C. P. (2007). Understanding infrastructure: History, heuristics and cyberinfrastructure policy. *First Monday*, *12*(6). https://doi.org/10.5210/fm.v12i6.1904

Janes, R. R., & Sandell, R. (2007). Complexity and Creativity in Contemporary Museum Management. In R. Sandell & R. R. Janes (Eds.), *Museum management and marketing* (pp. 1–14). Routledge.

Janes, R. R., & Sandell, R. (Eds.). (2019). *Museum activism*. Routledge.

Jones, P., & Macleod, S. (2016). Museum architecture matters. *Museum and Society*, *14*(1), 207–219.

Kalfatovic, M. R., Kapsalis, E., Spiess, K. P., van Camp, A., & Edson, M. (2008). Smithsonian Team Flickr: A library, archives, and museums collaboration in web 2.0 space. *Archival Science*, *8*(4), 267–277. https://doi.org/10.1007/s10502-009-9089-y

Karasek, E., & Tietmeyer, E. (1999). Das Museum Europäischer Kulturen: Entstehung - Realität - Zukunft. In K. Erika (Ed.), *Faszination Bild: Kulturkontakte Europa* (pp. 13–25). Staatliche Museen zu Berlin.

Karasti, H. (2014). Infrastructuring in participatory design. In *Proceedings of the 13th Participatory Design Conference: Research Papers-Volume 1* (141-150). ACM.

Karasti, H., & Baker, K. S. (2004). Infrastructuring for the long-term: Ecological information management. *Proceedings of the 37th Hawaii International Conference on System Sciences*, 1–10. https://doi.org/10.1109/HICSS.2004.1265077

Karasti, H., Baker, K. S., & Millerand, F. (2010). Infrastructure Time: Long-term Matters in Collaborative Development. *Computer Supported Cooperative Work (CSCW)*, *19*(3-4), 377–415. https://doi.org/10.1007/s10606-010-9113-z

Karasti, H., & Blomberg, J. (2018). Studying Infrastructuring Ethnographically. *Computer Supported Cooperative Work (CSCW)*, *27*(2), 233-265. https://doi.org/10.1007/s10606-017-9296-7

Karasti, H., & Syrjänen, A.-L. (2004). Artful infrastructuring in two cases of community PD. In A. Clement (Ed.), *PDC 04: Proceedings of the eighth conference on Participatory design* (pp. 20–30). Association for Computing Machinery. https://doi.org/10.1145/1011870.1011874

Karp, I., Kratz, C. A., Szwaja, L., & Ybarra-Frausto, T. (Eds.). (2006). *Museum frictions: Public cultures, global transformations*. Duke Univ. Press.

Kattago, S. (2010). Memory, Pluralism and the Agony of Politics. *Journal of Baltic Studies*, *41*(3), 383–394. https://doi.org/10.1080/01629778.2010.498213

Keightley, E., & Pickering, M. (2014). Technologies of memory: Practices of remembering in analogue and digital photography. *New Media & Society*, *16*(4), 576–593. https://doi.org/10.1177/1461444814532062

Kelly, K. (2013). *Images of Works of Art in Museum Collections: The Experience of Open Access: A Study of 11 Museums*. Council on Library and Information Resources.

Kirchhoff, T., Schweibenz, W., & Sieglerschmidt, J. (2008). Archives, libraries, museums and the spell of ubiquitous knowledge. *Archival Science*, *8*(4), 251–266. https://doi.org/10.1007/s10502-009-9093-2

Kist, C., & Tran, Q.-T. (2021). Breaking boundaries, creating connectivities: Enabling access to digitized museum collections. In M. Rauterberg (Ed.), *Culture and Computing.*

Interactive Cultural Heritage and Arts: 9th International Conference, C&C 2021, Held as Part of the 23rd HCI International Conference, HCII 2021, Proceedings, Part I. Springer Nature.

Kling, R., & Gerson, E. M. (1978). Patterns Of Segmentation And Intersection In The Computing World. *Symbolic Interaction*, *1*(2), 24–43. https://doi.org/10.1525/si.1978.1.2.24

Knox, H. (2017). An Infrastructural Approach to Digital Ethnography: Lessons from the Manchester Infrastructures of Social Change Project. In L. Hjorth, H. A. Horst, A. Galloway, & G. Bell (Eds.), *The Routledge companion to digital ethnography* (pp. 354–362). Routledge.

Kreps, C. (1998). Museum-Making and Indigenous Curation in Central Kalimantan, Indonesia. *Museum Anthropology*, *22*(1), 5–17. https://doi.org/10.1525/mua.1998.22.1.5

Krmpotich, C., & Somerville, A. (2016). Affective Presence: The Metonymical Catalogue. *Museum Anthropology*, *39*(2), 178–191. https://doi.org/10.1111/muan.12123

Lagerkvist, A. (2016). Embodiments of Memory: Toward an Existential Approach to the Culture of Connectivity. In L. Bond, S. Craps, & P. Vermeulen (Eds.), *Memory unbound: Tracing the dynamics of memory studies* (pp. 173–194). Berghahn Books.

Law, J., & Mol, A. (1995). Notes on Materiality and Sociality. *The Sociological Review*, *43*(2), 274–294. https://doi.org/10.1111/j.1467-954X.1995.tb00604.x

Lievrouw, L. A., & Livingstone, S. (Eds.). (2006). *Handbook of new media: Social shaping and consequences of ICTs*. SAGE.

Lomas, H. (2014). *A guide to selecting a review methodology for collections rationalisation.* Collections Trust. https://collectionstrust.org.uk/wp-content/uploads/2016/11/a_guide_to_selecting_a_review_methodology_for_collections_rationalisation.pdf

Lubar, S. (2015). Fifty Years of Collecting: Curatorial Philosophy at the National Museum of American History. *Federal History*, *7*, 82–106.

Ludwig, T., Pipek, V., & Tolmie, P. (2018). Designing for Collaborative Infrastructuring: Supporting Resonance Activities. *PACMHCI Proceedings of the ACM on Human-Computer Interaction*, *2*(CSCW), Article 112. https://doi.org/10.1145/3274382

Lynch, B. (2013). Reflective debate, radical transparency and trust in the museum. *Museum Management and Curatorship*, *28*(1), 1–13. https://doi.org/10.1080/09647775.2012.754631

Lynch, B. (2014). *Whose cake is it anyway? A collaborative investigation into engagement and participation in 12 museums and galleries in the UK*. Paul Hamlyn Foundation. https://www.phf.org.uk/publications/whose-cake-anyway/

Lynch, B. (2017). The Gate in the Wall: Beyond Happiness-making in Museums. In B. Onciul, M. L. Stefano, & S. K. Hawke (Eds.), *Engaging Heritage, Engaging Communities* (pp. 11–29). Boydell Press.

Lynch, B. (2020). Notes from the frontline. In M. O'Neill & G. Hooper (Eds.), *Connecting museums* (pp. 33–47). Routledge.

Lynch, B. T., & Alberti, S. J.M.M. (2010). Legacies of prejudice: racism, co-production and radical trust in the museum. *Museum Management and Curatorship*, *25*(1), 13–35. https://doi.org/10.1080/09647770903529061

Macchia, T., & D'Andrea, V. (2014). Infrastructuring museum exhibition. *International Reports on Socio-Informatics (IRSI)*, *11*(2), 19–28.

Macchia, T., Diaz-Kommonen, L., & D'Andrea, V. (2014). Participating in infrastructuring. The active role of visitors and curators in museum. In C. Coletta, S. Colombo, P. Magaudda, A. Mattozzi, L. L. Parolin, & L. Rampino (Eds.), *A Matter of Design: Making Society trough Science and Technology: Proceedings of the 5th STS Italia Conference* (pp. 383–394). STS Italia.

Macchia, T., Poderi, G., & D'Andrea, V. (2015). Infrastructuring Knowledge in Cultural Infrastructure: Informal Example of Participatory Design for Museum Exhibition. *International Journal of Sociotechnology and Knowledge Development (IJSKD)*, *7*(1), 16–32.

Macdonald, S. (2002). *Behind the scenes at the Science Museum*. Berg.

Macdonald, S. (2006). Collecting Practices. In S. Macdonald (Ed.), *A companion to museum studies* (pp. 81–97). Blackwell.

Macdonald, S. (2012). Presencing Europe's Pasts. In U. Kockel, M. Nic Craith, & J. Frykman (Eds.), *A Companion to the Anthropology of Europe* (233-252). Wiley-Blackwell.

Macdonald, S., & Morgan, J. (2018). 'How Can We Know the Future?' Uncertainty, Transformation and Magical Techniques of Significance Assessment in Museum Collecting. In R. Falkenberg & T. Jander (Eds.), *Assessment of Significance: Deuten - Bedeuten - Umdeuten* (pp. 20–26). Deutsche Historische Museum.

Macdonald, S., & Morgan, J. (2019). What not to collect? Post-Connoisseurial Dystopia and the Profusion of Things. In P. Schorch & C. McCarthy (Eds.), *Curatopia: Histories, Theories, Practices* (pp. 29–43). Manchester University Press.

Marcus, G. E. (1986). Contemporary Problems of Ethnography in the Modern World System. In J. Clifford & G. E. Marcus (Eds.), *Writing culture: The poetics and politics of ethnography* (pp. 165–193). Univ of California Press.

Marcus, G. E. (1995). Ethnography in/of the World System: The Emergence of Multi-Sited Ethnography. *Annual Review of Anthropology*, *24*(1), 95-117. https://doi.org/10.1146/annurev.an.24.100195.000523

Marcus, G. E. (1998). *Ethnography through thick and thin*. Princeton University Press.

Marcus, G. E. (1999). What is at stake–and is not–in the idea and practice of multi-sited ethnography. *Canberra Anthropology*, *22*(2), 6–14.

Marcus, G. E. (2012). Multi-sited Ethnography: Five or Six Things I Know About it Now. In S. Coleman & P. von Hellermann (Eds.), *Multi-sited ethnography: Problems and possibilities in the translocation of research methods* (pp. 16–32). Routledge.

Marcus, G. E., & Fischer, M. M. J. (1999). *Anthropology as cultural critique: An experimental moment in the human sciences* (2nd ed.). University of Chicago Press. (Original work published 1986)

Marstine, J. (2006a). Introduction. In J. Marstine (Ed.), *New museum theory and practice: an introduction* (pp. 1–36). Blackwell Publishing.

Marstine, J. (Ed.). (2006b). *New museum theory and practice: an introduction*. Blackwell Publishing.

Marttila, S., & Botero, A. (2017). Infrastructuring for Cultural Commons. *Computer Supported Cooperative Work (CSCW)*, *26*(1-2), 97–133. https://doi.org/10.1007/s10606-017-9273-1

Marttila, S., & Botero, A. (2021). Infrastructuring for Collective Heritage Knowledge Production. In M. Rauterberg (Ed.), *Culture and Computing. Design Thinking and Cultural Computing: 9th International Conference, C&C 2021, Held as Part of the 23rd HCI International Conference, HCII 2021, Proceedings, Part II* (pp. 95–112). Springer Nature Switzerland.

Marty, P. F. (2014). Digital convergence and the information profession in cultural heritage organizations: Reconciling internal and external demands. *Library Trends*, *62*(3), 613–627.

Maxwell, J. A. (2018). Collecting Qualitative Data: A Realist Approach. In U. Flick (Ed.), *The Sage handbook of qualitative data collection* (pp. 19–32). Sage Publications Ltd.

Mayernik, M. S. (2019). Metadata accounts: Achieving data and evidence in scientific research. *Social Studies of Science*, *49*(5), 732–757. https://doi.org/10.1177/0306312719863494

McSweeney, K., & Kavanagh, J. (Eds.). (2016). *Museum participation: New directions for audience collaboration*. Museums Etc.

Merriam, S. B., & Tisdell, E. J. (2016). *Qualitative research: A guide to design and implementation* (4th edition). Jossey-Bass.

Merriman, N. (2008). Museum collections and sustainability. *Cultural Trends*, *17*(1), 3–21. https://doi.org/10.1080/09548960801920278

Merriman, N. (2015). The Future of Collecting in "Disciplinary" Museums: Interpretive, Thematic, Relational. In C. McCarthy (Ed.), *International Handbook of Museum Studies: Vol. 2. Museum practice: Critical Debates in the Museum Sector* (Vol. 13, pp. 249–265). Wiley-Blackwell.

Mesman, J. (2008). *Uncertainty in medical innovation: Experienced pioneers in neonatal care*. Palgrave Macmillan.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook* (2nd ed.). SAGE.

Miles, M. B., Huberman, A. M., & Saldaña, J. (2020). *Qualitative data analysis: A methods sourcebook* (Fourth edition). SAGE.

Miller, P [Phil] (2013, March 30). Hunterian moves to Kelvin Hall to form cultural hub. *HeraldScotland*. https://www.heraldscotland.com/news/13098101.hunterian-moves-to-kelvin-hall-to-form-cultural-hub/

Mongili, A., Pellegrino, G., & Bowker, G. C. (Eds.). (2014). *Information infrastructure(s): Boundaries, ecologies, multiplicity*. Cambridge Scholars Publishing.

Morgan, J. (2012). The multisensory museum. *Glasnik Etnografskog Instituta*, *60*(1), 65–77. https://doi.org/10.2298/GEI1201065M

Morgan, J. (2018). Assembling the New: Studying Change Through the 'Mundane' in the Museum as Organization. *Museum and Society*, *16*(2), 157–170.

Morgan, J., & Macdonald, S. (2020). De-growing museum collections for new heritage futures. *International Journal of Heritage Studies*, *26*(1), 56–70. https://doi.org/10.1080/13527258.2018.1530289

Morphy, H. (2014). Open access versus the culture of protocols. In R. Silverman (Ed.), *Museum as process: Translating local and global knowledges* (pp. 90–104). Routledge.

Morris, A. (2003). Redrawing the boundaries: Questioning the geographies of Britishness at Tate-Britain. *Museum and Society*, *1*(3), 170–182.

Morse, N. (2018). Patterns of accountability: An organizational approach to community engagement in museums. *Museum and Society*, *16*(2), 171–186.

Morse, N. (2020). *The Museum as a Space of Social Care*. Routledge.

Morse, N., & Munro, E. (2018). Museums' community engagement schemes, austerity and practices of care in two local museum services. *Social & Cultural Geography*, *19*(3), 357–378. https://doi.org/10.1080/14649365.2015.1089583

Morse, N., Rex, B., & Richardson, S. H. (2018). Editorial: Methodologies for Researching the Museum as Organization. *Museum and Society*, *16*(2), 112–123.

Munkhammar, L. (2010). *Codex Argenteus and its printed editions*. Uppsala University Library.

Munro, E. (2013). "People just need to feel important, like someone is listening": Recognising museums' community engagement programmes as spaces of care. *Geoforum*, *48*, 54–62. https://doi.org/10.1016/j.geoforum.2013.04.008

Museum of European Cultures. (2014). *Systematik – Katalog: Museum Europäischer Kulturen – Staatliche Museen zu Berlin*.

Museum of European Cultures. (2019). *Collection Concept for the Museum Europäischer Kulturen – Staatliche Museen zu Berlin*. https://www.smb.museum/fileadmin/website/Museen_und_Sammlungen/Museum_Europaeischer_Kulturen/02_Sammeln_und_Forschen/MEK_Sammlungskonzept_EN.pdf

Museums Association (2014). Disposal toolkit: Guidelines for museums. https://www.museumsassociation.org/app/uploads/2020/06/31032014-disposal-toolkit-8.pdf

Neumann, L. J., & Star, S. L. (1996). Making infrastructure: The dream of a common language. In J. Blomberg, F. Kensing, & E. Dykstra-Erickson (Eds.), *Proceedings of the 4th Biennial Participatory Design Conference 1996* (pp. 231–240). Computer Professionals for Social Responsibility.

Öberg, G., Merlinsky, M. G., LaValle, A., Morales, M., & Tobias, M. M. (2014). The notion of sewage as waste: a study of infrastructure change and institutional inertia in Buenos Aires, Argentina and Vancouver, Canada. *Ecology and Society*, *19*(2).

Onciul, B. (2013). Community Engagement, Curatorial Practice, and Museum Ethos in Alberta, Canada. In V. Golding & W. Modest (Eds.), *Museums and communities: Curators, collections and collaboration* (pp. 79–97). A&C Black.

Onciul, B. (2015). *Museums, heritage and indigenous voice: Decolonizing engagement*. Routledge.

O'Neill, M. (2002). The good enough visitor. In R. Sandell (Ed.), *Museums, Society, Inequality* (pp. 24–40). Routledge.

O'Neill, M. (2006). Essentialism, adaptation and justice: Towards a new epistemology of museums. *Museum Management and Curatorship*, *21*(2), 95–116. https://doi.org/10.1016/j.musmancur.2006.03.007

O'Neill, M., Sandahl, J., & Mouliou, M. (Eds.). (2021). *Revisiting museums of influence: Four decades of innovation and public quality in European museums*. Routledge.

Orlikowski, W. J. (1992). The duality of technology: Rethinking the concept of technology in organizations. *Organization Science*, *3*(3), 398–427.

Oswald, M. von. (2020). Troubling Colonial Epistemologies in Berlin's Ethnologisches Museum: Provenance Research and the Humboldt Forum. In M. von Oswald & J. Tinius (Eds.), *Across anthropology: Troubling colonial legacies, museums, and the curatorial* (pp. 107–129). Leuven University Press.

Oswald, M. von, & Tinius, J. (Eds.). (2020). *Across anthropology: Troubling colonial legacies, museums, and the curatorial*. Leuven University Press.

Patrick, P. G. (2017). Visitors and alignment: actor-network theory and the ontology of informal science institutions. *Museum Management and Curatorship*, *32*(2), 176–195.

Pattersson, S., Hagedorn-Saupe, M., Jyrkkiö, T., & Weij, A. (Eds.). (2010). *Encouraging Collections Mobility: A Way Forward for Museums in Europe*. Finish National Gallery.

Patton, M. Q. (2015). *Qualitative research & evaluation methods: Integrating theory and practice* (4th edition). Sage Publications.

Pearce, S. M. (1995). *On collecting: An investigation into collecting in the European tradition*. Routledge.

Pekel, J. (2014). Democratising the Rijksmuseum. Why did the Rijksmuseum make available their highest quality material without restrictions, and what are the results? *Europeana Case Study*. https://pro.europeana.eu/post/democratising-the-rijksmuseum

Pentzold, C. (2009). Fixing the floating gap: The online encyclopaedia Wikipedia as a global memory place. *Memory Studies*, *2*(2), 255–272. https://doi.org/10.1177/1750698008102055]

Perry, S. E. (2019). The enchantment of the archaeological record. *European Journal of Archaeology*.

Pinch, T. (2010). On making infrastructure visible: putting the non-humans to rights. *Cambridge Journal of Economics*, *34*(1), 77–89. https://doi.org/10.1093/cje/bep044

Pipek, V., & Wulf, V. (2009). Infrastructuring: Toward an Integrated Perspective on the Design and Use of Information Technology. *Journal of the Association for Information Systems*, *10*(5), 447–473. https://doi.org/10.17705/1jais.00195

Proctor, N. (2010). Digital: Museum as Platform, Curator as Champion, in the Age of Social Media. *Curator: The Museum Journal*, *53*(1), 35–43. https://doi.org/10.1111/j.2151-6952.2009.00006.x

Puig de la Bellacasa, María (2011). Matters of care in technoscience: Assembling neglected things. *Social Studies of Science*, *41*(1), 85–106. https://doi.org/10.1177/0306312710380301

Ravitch, S. M., & Carl, N. M. (2015). *Qualitative Research: Bridging the Conceptual, Theoretical, and Methodological*. Sage Publications.

Rex, B. (2018). Exploring Relations to Documents and Documentary Infrastructures: The Case of Museum Management After Austerity. *Museum and Society*, *16*(2), 187–200. https://doi.org/10.29311/mas.v16i2.2781

Rinehart, R., & Ippolito, J. (2014). *Re-collection: Art, new media, and social memory*. *Leonardo*. The MIT Press.

Robinson, H. (2012). Remembering things differently: museums, libraries and archives as memory institutions and the implications for convergence. *Museum Management and Curatorship*, *27*(4), 413–429. https://doi.org/10.1080/09647775.2012.720188

Rubio, F. D. (2020). *Still Life: Ecologies of the Modern Imagination at the Art Museum*. University of Chicago Press.

Sandell, R. (2007). *Museums, Prejudice and the Reframing of Difference*. Routledge.

Sandell, R., & Janes, R. R. (Eds.). (2007). *Museum management and marketing*. Routledge.

Sanner, T. A., Manda, T. D., & Nielsen, P. (2014). Grafting: balancing control and cultivation in information infrastructure innovation. *Journal of the Association for Information Systems*, *15*(4), 220–243.

Sennett, R. (2008). *The craftsman*. Yale University Press.

Shapin, S. (1989). The Invisible Technician. *American Scientist*, *77*(6), 554–563. http://www.jstor.org/stable/27856006

Silverman, D. (2013). *Doing qualitative research* (4th edition). Sage Publications.

Simon, N. (2010). *The participatory museum*. Museum 2.0.

Simonsen, J., Karasti, H., & Hertzum, M. (2019). Infrastructuring and Participatory Design: Exploring infrastructural inversion as analytic, empirical and generative. *Computer Supported Cooperative Work (CSCW)*, 1–37. https://doi.org/10.1007/s10606-019-09365-w

Slota, S. C., & Bowker, G. C. (2017). How infrastructures matter. In U. Felt, R. Fouché, C. A. Miller, & L. Smith-Doerr (Eds.), *The handbook of science and technology studies* (4th ed., pp. 529–554). The MIT Press.

Srinivasan, R. (2017). *Whose global village? Rethinking how technology shapes our world*. NYU Press.

Star, S. L. (1991a). Invisible Work and Silenced Dialogues in Knowledge Representation. In I. Eriksson, B. A. Kitchenham, & K. Tijdens (Eds.), *Women, Work and Computerization: Understanding and Overcoming Bias in Work and Education* (pp. 81–92). North-Holland.

Star, S. L. (1991b). Power, technology and the phenomenology of conventions: on being allergic to onions. In J. Law (Ed.), *A Sociology of monsters: Essays on power, technology and domination* (pp. 26–56). Routledge.

Star, S. L. (1999). The ethnography of infrastructure. *American Behavioral Scientist*, *43*(3), 377-391.

Star, S. L. (2002). Infrastructure and ethnographic practice: Working on the fringes. *Scandinavian Journal of Information Systems*, *14*(2), 107–122.

Star, S. L., & Bowker, G. C. (2006). How to infrastructure. In L. A. Lievrouw & S. Livingstone (Eds.), *Handbook of new media: Social shaping and consequences of ICTs* (pp. 230–245). SAGE.

Star, S. L., & Griesemer, J. R. (1989). Institutional Ecology, 'Translations' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39. *Social Studies of Science*, *19*(3), 387–420. https://doi.org/10.1177/030631289019003001

Star, S. L., & Ruhleder, K. (1996). Steps toward an ecology of infrastructure: Design and access for large information spaces. *Information Systems Research*, *7*(1), 111-134.

Star, S. L., & Strauss, A. (1999). Layers of silence, arenas of voice: The ecology of visible and invisible work. *Computer Supported Cooperative Work (CSCW)*, *8*(1-2), 9–30.

Statens Historiska Museer. (2019). *Årsredovisning [Annual Report]*.

Strauss, A. (1978). A social world perspective. *Studies in Symbolic Interaction*, *1*(1), 119–128.

Strauss, A. (1982). Social worlds and legitimation processes. *Studies in Symbolic Interaction*, *4*(17), 171–190.

Strauss, A. (1984). Social worlds and their segmentation processes. *Studies in Symbolic Interaction*, *5*(1), 123–139.

Strauss, A., & Corbin, J. (1990). *Basics of Qualitative Research: Grounded Theory Procedures and Techniques*. SAGE.

Strauss, A. L. (1987). *Qualitative analysis for social scientists*. Cambridge University Press.

Stuedahl, D. (2007). Convergence, Museums and Digital Cultural Heritage. In T. Storsul & D. Stuedahl (Eds.), *Ambivalence towards convergence: Digitalization and media change* (pp. 129–144). Nordicom.

Stuedahl, D., Runardotter, M., & Mörtberg, C. (2016). Attachments to Participatory Digital Infrastructures in the Cultural Heritage Sector. *Science & Technology Studies*, *29*(4), 50-69.

Stuedahl, D., Skåtun, T., Lefkaditou, A., & Messenbrink, T. (2020). Participation and dialogue: Curatorial reflexivity in participatory processes. In A. Galani, R. Mason, & G. Arrigoni (Eds.), *European Heritage, Dialogue and Digital Practices*. Routledge. 62-83.

Suchman, L. (1995). Making Work Visible. *Communications of the ACM*, *38*(9), 56–64. https://doi.org/10.1145/223248.223263

Suchman, L. (1996). Supporting Articulation Work. In R. Kling (Ed.), *Computerization and controversy: Value conflicts and social choices* (2nd ed., pp. 407–423). Academic Press.

Suchman, L. (1997). Centers of coordination: A case and some themes. In L. B. Resnick, R. Säljö, C. Pontecorvo, & B. Burge (Eds.), *Discourse, Tools and Reasoning: Essays on Situated Cognition* (pp. 41–62). Springer Verlag-Berlin Heidelberg.

Svensson, J. (2015). Kulturarvet på fickan: Digitalisering ger nya möjligheter. *Universen*(2), 14–16.

Tanner, S. (2004). *Reproduction charging models & rights policy for digital images in American art museums: A Mellon Foundation study*. KDCS Digital Consultancy.

Tietmeyer, E. (2013). The Challenge of "Displaying Europe": Experiences of the Museum Europäischer Kulturen – Staatliche Museen zu Berlin. In C. Whitehead, R. Mason, S. Eckersley, & K. J. Lloyd (Eds.), *"Placing" Europe in the Museum: People (s), Places, Identities* (pp. 61–73). Politecnico di Milano.

Turner, H. (2017). Organizing Knowledge in Museums: A Review of Concepts and Concerns. *Knowledge Organization*, *44*(7), 472–484.

Turner, H. (2020). *Cataloguing Culture: Legacies of Colonialism in Museum Documentation*. UBC Press.

Usherwood, B., Wilson, K., & Bryson, J. (2005). Relevant repositories of public knowledge? Libraries, museums and archives in 'the information age'. *Journal of Librarianship and Information Science*, *37*(2), 89–98.

van Dijck, J., & Poell, T. (2015). Social Media and the Transformation of Public Space. *Social Media + Society*, *1*(2), 205630511562248. https://doi.org/10.1177/2056305115622482

van Dijck, J., Poell, T., & Waal, M. de. (2018). *The platform society: Public values in a connective world*. Oxford university press.

van Passel, E., & Rigole, J. (2014). Fictional institutions and institutional frictions: creative approaches to open GLAMs. *Digital Creativity*, *25*(3), 203–211. https://doi.org/10.1080/14626268.2014.904363

van Saaze, V. (2013). *Installation art and the museum: Presentation and conservation of changing artworks*. Amsterdam University Press. https://doi.org/10.2307/j.ctt46n18r

van Saaze, V., Wharton, G., & Reisman, L. (2018). Adaptive Institutional Change: Managing Digital Works at the Museum of Modern Art. *Museum and Society*, *16*(2), 220–239. https://doi.org/10.29311/mas.v16i2.2774

Varutti, M. (2014). Polysemic Objects and Partial Translations: Museums and the Interpretation of Indigenous Material Culture in Taiwan. *Museum Anthropology*, *37*(2), 102–117. https://doi.org/10.1111/muan.12056

Veale, K. (2004). Online Memorialisation: The Web As A Collective Memorial Landscape For Remembering The Dead(3). https://three.fibreculturejournal.org/fcj-014-online-memorialisation-the-web-as-a-collective-memorial-landscape-for-remembering-the-dead/

Wade, R. (1999). The very model of a modern library consortium. *Library Consortium Management: An International Journal*, *1*(1/2), 5–18. https://doi.org/10.1108/14662769910284230

Waterton, E., & Dittmer, J. (2014). The museum as assemblage: bringing forth affect at the Australian War Memorial. *Museum Management and Curatorship*, *29*(2), 122–139. https://doi.org/10.1080/09647775.2014.888819

Watson, S. (2007). History museums, community identities and a sense of place: Rewriting histories. In S. J. Knell, S. Macleod, & S. E. R. Watson (Eds.), *Museum revolutions: How museums change and are changed* (pp. 160–172). Routledge.

Wellcome Historical Medical Museum. (1927). *Lister Centenary Exhibition at the Wellcome Historical Medical Museum Handbook 1927*. The Wellcome Foundation ltd. https://archive.org/details/b20457261

Wissenschaftsrat. (2020). *Strukturempfehlungen zur Stiftung Preußischer Kulturbesitz (SPK), Berlin*. https://www.wissenschaftsrat.de/download/2020/8520-20.pdf

Witcomb, A. (2003). *Re-imagining the museum: Beyond the mausoleum*. Routledge.

Witcomb, A. (2007). The materiality of virtual technologies: A new approach to thinking about the impact of multimedia in museums. In F. R. Cameron & S. Kenderdine (Eds.), *Theorizing digital cultural heritage: A critical discourse* (pp. 35–48). MIT Press.

Wu, K. J. (2020, February 25). Smithsonian Releases 2.8 Million Images Into Public Domain. *Smithsonian Magazine*. https://www.smithsonianmag.com/smithsonian-institution/smithsonian-releases-28-million-images-public-domain-180974263/

Eidesstattliche Versicherung / Declaration on Oath

Hiermit erkläre ich an Eides statt, dass ich die vorliegende Dissertationsschrift selbst verfasst und keine anderen als die angegebenen Quellen und Hilfsmittel benutzt habe.

I hereby declare upon oath that I have written the present dissertation independently and have not used further resources and aids than those stated.

Hamburg, den 14. März 2022

Unterschrift / Signature

Quoc-Tan Tran